

General information

Except as otherwise noted, each output field should be saved for the entire duration of each and every run.

The specifications for archiving model output, as described in the following tables, assume the following (please advise us if the assumptions are incorrect):

1. Sea ice fields and ocean biogeochemistry fields will be archived on the same grid as ocean fields.
2. Land fields (including ice and snow on land) and land biogeochemistry fields will be archived on the same grid as the atmosphere.

The following rules and recommendations for how to calculate quantities should be followed unless a different method is explicitly indicated in the notes that appear in the following tables.

1. It is recommended that ocean and sea-ice output (including O_clim, O_annual, O_mon, and OI_mon) be reported on the ocean's native grid. Unless noted otherwise in the tables, all other output should be reported on the atmospheric grid.
2. Unless otherwise specified, the ocean and sea-ice output (including O_clim, O_annual, O_mon, and OI_mon) represents a mean over only the sea portion of each grid cell (i.e., it is interpreted as "where ocean over ocean"), and a value of 0.0 should be reported where the sea fraction is 0.
3. Unless otherwise specified, the land output (in the L_mon and LI_mon tables) represents a mean over only the land portion of each grid cell (i.e., it is interpreted as "where land over land"), and a value of 0.0 should be reported where the land fraction is 0.
4. The default interpretation of a OI_mon field is that the quantity is averaged over the entire ocean portion of each grid-cell (with a value of zero applying anywhere the quantity is absent in this portion of the cell) and then averaged in time.
4. The default interpretation of a LI_mon field is that the quantity is averaged over the entire land portion of each grid-cell (with a value of zero applying anywhere the quantity is absent in this portion of the cell) and then averaged in time.

A note on priorities.

The priorities noted in the tables have been largely set by scientists who have participated in model intercomparison activities and have needed these variables in their own research. Since the priorities in different tables were set by different groups of scientists, the priorities in one table may have a different meaning from the priorities in another table. We hope that the vast majority of fields listed in all the tables will be archived by all the modeling groups, but in many cases where a group has not saved a particular field in the past, this may require non-trivial effort. The priorities listed here, along with the participating group's expert judgement should be considered when deciding which fields to save. Please make every effort to save as many of the fields as possible.

CMOR Dimensions

| CMOR table(s) | CMOR dimension | output dimension name | description | standard name | long name | axis | units | index axis? | coords_attrb | bounds? | stored direction | valid_min |
|---|----------------|-----------------------|--|---------------|--------------------------------|------|---------------|-------------|--------------|---------|------------------|-----------|
| fx, Amon, Lmon, LImon, OImon, aero, da, 6hrLev, 6hrPlev, 3hr, Oclim, Oyr, Omon, cfMon, cfOff, cfDa, cf3hr | longitude | lon | | longitude | longitude | X | degrees_east | | | yes | increasing | 0 |
| fx, Amon, Lmon, LImon, OImon, aero, da, 6hrLev, 6hrPlev, 3hr, Oclim, Oyr, Omon, cfMon, cfOff, cfDa, cf3hr | latitude | lat | | latitude | latitude | Y | degrees_north | | | yes | increasing | -90 |
| Amon | plev17 | plev | | pressure | pressure | Z | Pa | | | no | decreasing | |
| da | plev6 | plev | | pressure | pressure | Z | Pa | | | no | decreasing | |
| 6hrPlev | plev3 | plev | | pressure | pressure | Z | Pa | | | no | decreasing | |
| cfMon, cfDa | plev7 | plev | 7 pressure layers defined by ISCCP simulator | pressure | pressure | Z | Pa | | | yes | decreasing | |
| cfDa | p500 | plev | 500 hPa | pressure | pressure | Z | Pa | | | no | decreasing | |
| cfDa | p700 | plev | 700 hPa | pressure | pressure | Z | Pa | | | no | decreasing | |
| cfMon, cfOff, cf3hr | p220 | plev | pressure layer of high-level cloud in ISCCP simulator | pressure | pressure | Z | Pa | | | no | decreasing | |
| cfMon, cfOff, cf3hr | p560 | plev | pressure layer of mid-level cloud in ISCCP simulator | pressure | pressure | Z | Pa | | | no | decreasing | |
| cfMon, cfOff, cf3hr | p840 | plev | pressure layer of low-level cloud in ISCCP simulator | pressure | pressure | Z | Pa | | | no | decreasing | |
| Amon, aero, 6hrLev, cfMon, cfDa, cf3hr, cf30min | alevel | lev | atmospheric model level (What if a model has altitude as the vertical coordinate?) | | atmospheric model level | Z | | ok | | yes | increasing | |
| cfMon, cfDa, cf3hr | alevbnds | lev | atmospheric model "half" level | | atmospheric model half-level | Z | | ok | | no | increasing | |
| aero | alev1 | lev | atmospheric model's lowest level | | lowest atmospheric model level | Z | | ok | | yes | increasing | |
| cfMon, cfOff, cfDa, cf3hr | alt | alt | CloudSat vertical coordinate heights | altitude | altitude | Z | m | | | yes | increasing | |
| Oyr, Amon, Lmon, LImon, OImon, aero, da, 3hr, Omon, cfMon, cfOff, cfDa, cf3hr | time | time | for time-mean fields | time | time | T | days since ? | | | yes | increasing | |
| 6hrLev, 6hrPlev, 3hr, cf3hr, cf30min | time1 | time | synoptic times (for fields that are not time-means) | time | time | T | days since ? | | | no | increasing | |
| Oclim | time2 | time | climatological times | time | time | T | days since ? | | | yes | increasing | |
| Amon, da, 3hr, cf3hr, cf30min | height2m | height | ~2 m standard surface air temperature and surface humidity height | height | height | Z | m | | | no | increasing | 1 |

| | | | | | | | | | | | |
|-------------------------------|-----------|-----------|---|---|---|---|--------|----|-----------|------------|------------|
| Amon, da, 3hr, cf3hr, cf30min | height10m | height | ~10 m standard wind speed height | height | height | Z | m | | no | increasing | 1 |
| Lmon, LImon | sdepth | depth | coordinate values for soil layers (depth) | depth | depth | Z | m | | yes | increasing | 0 |
| Lmon | sdepth1 | depth | coordinate value for topmost 0.1 meter layer of soil | depth | depth | Z | m | | yes | increasing | 0 |
| cfMon, cfDa | tau | tau | isccp optical depth categories | cloud_optical_depth | cloud optical depth | | 1 | | yes | increasing | |
| cfOff, cf3hr | scatratio | scatratio | 15 bins of scattering ratio for the CALIPSO simulator CFAD | backwards_scattering_coefficient_of_lidar_signal? | lidar backscattering ratio | | 1 | | yes | increasing | |
| cfOff, cf3hr | dbze | dbze | 15 bins of radar reflectivity for CloudSat simulator CFAD | equivalent_reflectivity_factor? | CloudSat simulator equivalent radar reflectivity factor | | dB | | yes | increasing | |
| cfMon, cfOff, cfDa, cf3hr | sza5 | sza | 5 solar zenith angles for PARASOL reflectances | solar_zenith_angle | solar zenith angle | | degree | | no | increasing | |
| cf30min | site | site | an integer assigned to each of 115 stations (standard) and 73 stations (aquaplanet) | ? | site index | | - | ok | no | | |
| Omon | basin | basin | | region | ocean basin | | - | ok | region | no | |
| Omon | rho | rho | density? Potential density? | ? | ? | Z | ? | | yes | decreasing | |
| fx, Oclim, Oyr, Omon | olevel | lev | ocean model level (What about a model that has a true, dimensioned, vertical coordinate, like "depth below the surface"?) | | ocean model level | Z | ? | ok | yes | decreasing | |
| Omon | xline | xline | opening, passage, strait, channel, etc. | ? | ocean passage | | - | ok | passage | no | |
| cf3hr | location | loc | COSP profile in instantaneous curtain mode | ? | location index | | - | ok | no | increasing | |
| Lmon | vegtype | type | plant functional type | | plant functional type | | - | ok | described | no | increasing |
| Olmon | icetype | type | sea ice category | ? | sea ice thickness category | | - | ok | described | no | increasing |

| valid_max | type | positive | value | bounds_values | requested | bounds_requested | tol_on_request s: variance from requested values that is tolerated |
|-----------|--------|----------|--------|---|--|------------------|---|
| 360 | double | | | | | | |
| 180 | double | | | | | | |
| | double | down | | 100000. 92500. 85000. 70000. 60000. 50000. 40000. 30000. 25000. 20000. 15000. 10000. 7000. 5000. 3000. 2000. 1000. | | | 0.001 |
| | double | down | | 100000. 85000. 70000. 50000. 25000. 10000. | | | 0.001 |
| | double | down | | 85000. 50000. 25000. | | | 0.001 |
| | double | down | | | 100000. 80000. 80000. 68000. 68000. 56000. 56000. 44000. 44000. 31000. 31000. 18000. 18000. 0. | | 0.001 |
| | double | down | 50000. | | | | |
| | double | down | 70000. | | | | |
| | double | down | 22000. | 0. 44000. | | | |
| | double | down | 56000. | 44000. 68000. | | | |
| | double | down | 84000. | 680. 100000. | | | |
| | double | | | | | | |
| | double | | | | | | |
| | double | | | | | | |
| | double | up | | . 0. 480. 480. 960. 960. 1440. 1440. 1920. 1920. 2400. 2400. 2880. 2880. 3360. 3360. 3840. 3840. 4320. 4320. 4800. 4800. 5280. 5280. 5760. 5760. 6240. 6240. 6720. 6720. 7200. 7200. 7680. 7680. 8160. 8160. 8640. 8640. 9120. 9120. 9600. 9600. 10080. 10080. 10560. 10560. 11040. 11040. 11520. 11520. 12000. 12000. 12480. 12480. 12960. 12960. 13440. 13440. 13920. 13920. 14400. 14400. 14880. 14880. 15360. 15360. 15840. 15840. 16320. 16320. 16800. 16800. 17280. 17280. 17760. 17760. 18240. 18240. 18720. | | 0.001 | |
| | double | | | | | | |
| | double | | | | | | |
| | double | | | | | | |
| 10 | double | up | 2. | | | | |

CMOR Table fx: Time-Invariant Fields

fx

on atmospheric grid

Atmospheric and land fields may be submitted on a (single) grid of the modeling group's choosing. We expect most groups will elect to save output on the native grid. If data is "interpolated" to a different grid, it is important to preserve certain global mean properties (e.g., the total surface fluxes of heat, momentum, and water mass).

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|--|--------------------|---|-----------|----------------------|---|
| 1 | Atmosphere Grid-Cell Area | m ² | | | areacella | cell_area |
| 1 | Surface Altitude | m | height above the geoid; as defined here, "the geoid" is a surface of constant geopotential that, if the ocean were at rest, would coincide with mean sea level. Under this definition, the geoid changes as the mean volume of the ocean changes (e.g., due to glacial melt, or global warming of the ocean). Report here the height above the present-day geoid. Over ocean, report as 0.0 | | orog | surface_altitude |
| 1 | Land Area Fraction | % | | | sflf | land_area_fraction |
| 1 | Fraction of Grid Cell Covered with Glacier | % | fraction of grid cell occupied by "permanent" ice (i.e., glaciers). If time varying, report annual values for each year of simulation | | sfgif | land_ice_area_fraction |
| 1 | Capacity of Soil to Store Water | kg m ⁻² | "where land": divide the total water holding capacity of all the soil in the grid cell by the land area in the grid cell; report as "missing" where the land fraction is 0. | | mrsafc | soil_moisture_content_at_field_capacity |
| 1 | Maximum Root Depth | m | report the maximum soil depth reachable by plant roots (if defined in model), i.e., the maximum soil depth from which they can extract moisture; report as "missing" where the land fraction is 0. | | rootd | root_depth |

on ocean grid

The WGOMD has recommended that all ocean fields be saved on the model's native ocean grid. Many groups will also elect to save the sea ice fields on the ocean grid. (The alternative is to save sea ice fields on the atmosphere grid.) If data is "interpolated" from its native grid, it is important to preserve certain global mean properties (e.g., the total surface fluxes of heat, momentum, and water mass into the ocean).

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|------------------------|----------------|--|---|----------------------|---|
| 1 | Sea Floor Depth | m | Ocean bathymetry. Report here the sea floor depth for present day. Report as missing for land grid cells. | | deptho | sea_floor_depth_below_geoid |
| 1 | Ocean Grid-Cell Volume | m ³ | 3-D field: grid-cell volume ca. 2000. | | volcello | ocean_volume |
| 1 | Ocean Grid-Cell Area | m ² | | | areacello | cell_area |
| 1 | Sea Area Fraction | % | Report on the ocean grid. For completeness, please provide this even if the ocean grid is the same as the atmospheric grid. | Should this be recorded as a function of depth? | sftof | sea_area_fraction |
| 1 | Region Selection Index | | flag_values=0,1,2,3,4,5,6,7,8,9,10 corresponding to flag_meanings=global_land, southern_ocean, atlantic_ocean, pacific_ocean, arctic_ocean, indian_ocean, mediterranean_sea, black_sea, hudson_bay, baltic_sea, red_sea. | CMOR must write flag_values and flag_meanings | basin | region |
| 1 | Region Selection Index | | flag_values=0,1,2,3,4,5,6,7,8,9,10 corresponding to flag_meanings=global_land, southern_ocean, atlantic_ocean, pacific_ocean, arctic_ocean, indian_ocean, mediterranean_sea, black_sea, hudson_bay, baltic_sea, red_sea. | CMOR must write flag_values and flag_meanings | basinv | region |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|------|--------------------|--------------------------|------------|
| | m2 | | 500 | 2.50E+05 | | | | real | longitude latitude | areacella | atmos land |
| | m | | -700 | 1.00E+04 | | | | real | longitude latitude | orog | atmos |
| | % | | 0 | 100 | | | | real | longitude latitude | sftlf | atmos |
| | % | | 0 | 100 | | | | real | longitude latitude | sftgif | land |
| | kg m-2 | | | | | | | real | longitude latitude | mrsofc | land |
| | m | | 0 | 30 | | | | real | longitude latitude | rootd | land |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|---------|---------------------------|--------------------------|-------|
| | m | | 0 | 10000 | 2000 | 5000 | | real | longitude latitude | deptho | ocean |
| | m3 | | 1000 | 1.00E+15 | 1.00E+10 | 1.00E+15 | | real | longitude latitude olevel | volcello | ocean |
| | m2 | | 10 | 2.50E+05 | | | | real | longitude latitude | areacello | ocean |
| | % | | 0 | 100 | | | | real | longitude latitude | sftof | ocean |
| | 0 | | 1 | 10 | | | | integer | longitude latitude | basin | ocean |
| | 0 | | 1 | 10 | | | | integer | longitude latitude | basinv | ocean |

CMOR Table Oclim: Monthly Mean Ocean Climatology (Jan. 1986-Dec. 2005)

Oclim

(All Saved on the Ocean Grid)

Further explanation of the fields in the following tables can be found in Griffies et al., available at http://eprints.soton.ac.uk/65415/01/137_WGOMD_ModelOutput.pdf. Some of the information in that document will be transcribed into the "comment" column of this spreadsheet.

In CMOR Table Oclim: WGOMD Table 2.9

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|----------------------------|---------|-----------|----------------------|---|
| 3 | Ocean Vertical Heat Diffusivity | $\text{m}^2 \text{s}^{-1}$ | | | difvho | ocean_vertical_heat_diffusivity |
| 3 | Ocean Vertical Salt Diffusivity | $\text{m}^2 \text{s}^{-1}$ | | | difvso | |
| 3 | Ocean Vertical Tracer Diffusivity due to Background | $\text{m}^2 \text{s}^{-1}$ | | | difvtrbo | ocean_vertical_tracer_diffusivity_due_to_background |
| 3 | Ocean Vertical Tracer Diffusivity due to Tides | $\text{m}^2 \text{s}^{-1}$ | | | difvtrto | ocean_vertical_tracer_diffusivity_due_to_tides |
| 3 | Tendency of Ocean Potential Energy Content | W m^{-2} | | | tnpeo | tendency_of_ocean_potential_energy_content |
| 3 | Tendency of Ocean Potential Energy Content due to Tides | W m^{-2} | | | tnpeot | tendency_of_ocean_potential_energy_content_due_to_tides |
| 3 | Tendency of Ocean Potential Energy Content due to Background | W m^{-2} | | | tnpeotb | tendency_of_ocean_potential_energy_content_due_to_background |
| 3 | Ocean Vertical Momentum Diffusivity | $\text{m}^2 \text{s}^{-1}$ | | | difvmo | ocean_vertical_momentum_diffusivity |
| 3 | Ocean Vertical Momentum Diffusivity due to Background | $\text{m}^2 \text{s}^{-1}$ | | | difvmba | ocean_vertical_momentum_diffusivity_due_to_background |
| 3 | Ocean Vertical Momentum Diffusivity due to Tides | $\text{m}^2 \text{s}^{-1}$ | | | difvmta | ocean_vertical_momentum_diffusivity_due_to_tides |
| 3 | Ocean Vertical Momentum Diffusivity due to Form Drag | $\text{m}^2 \text{s}^{-1}$ | | | difvmfa | ocean_vertical_momentum_diffusivity_due_to_form_drag |
| 3 | Ocean Kinetic Energy Dissipation Per Unit Area due to Vertical Friction | W m^{-2} | | | dispkvfo | ocean_kinetic_energy_dissipation_per_unit_area_due_to_vertical_friction |

In CMOR Table Oclim: WGOMD Table 2.9

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|----------------------------|---------|-----------|----------------------|---|
| 3 | Ocean Tracer Bolus Laplacian Diffusivity | $\text{m}^2 \text{s}^{-1}$ | | | diftrblo | ocean_tracer_bolus_laplacian_diffusivity |
| 3 | Ocean Tracer Bolus Biharmonic Diffusivity | $\text{m}^4 \text{s}^{-1}$ | | | diftrbbo | ocean_tracer_bolus_biharmonic_diffusivity |

| | | | | |
|---|--|----------------------------|-----------|--|
| 3 | Ocean Tracer Epineutral Laplacian Diffusivity | $\text{m}^2 \text{s}^{-1}$ | difrelo | ocean_tracer_epineutral_laplacian_diffusivity |
| 3 | Ocean Tracer Epineutral Biharmonic Diffusivity | $\text{m}^2 \text{s}^{-1}$ | difrebo | ocean_tracer_epineutral_biharmonic_diffusivity |
| 3 | Ocean Tracer XY Laplacian Diffusivity | $\text{m}^2 \text{s}^{-1}$ | diftrxylo | ocean_tracer_xy_laplacian_diffusivity |
| 3 | Ocean Tracer XY Biharmonic Diffusivity | $\text{m}^2 \text{s}^{-1}$ | diftrxybo | ocean_tracer_xy_biharmonic_diffusivity |
| 3 | Tendency of Ocean Eddy Kinetic Energy Content due to Bolus Transport | W m^{-2} | tnkebto | tendency_of_ocean_eddy_kinetic_energy_content_due_to_bolus_transport |
| 3 | Ocean Momentum XY Laplacian Diffusivity | $\text{m}^2 \text{s}^{-1}$ | difmxylo | ocean_momentum_xy_laplacian_diffusivity |
| 3 | Ocean Momentum XY Biharmonic Diffusivity | $\text{m}^2 \text{s}^{-1}$ | difmxybo | ocean_momentum_xy_biharmonic_diffusivity |
| 3 | Ocean Kinetic Energy Dissipation Per Unit Area due to XY Friction | W m^{-2} | dispkxyfo | ocean_kinetic_energy_dissipation_per_unit_area_due_to_xy_friction |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|----------------------|---|-----------|-----------|-------------------------|-------------------------|----------|------|---------------------------------|--------------------------|-------|
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvho | ocean |
| ocean_vertical_salt_diffusivity_due_to_ background | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvso | ocean |
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvtrbo | ocean |
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvtrto | ocean |
| | W m-2 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | tnpeo | ocean |
| | W m-2 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | tnpeot | ocean |
| | W m-2 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | tnpeotb | ocean |
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvmo | ocean |
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvmbo | ocean |
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvmto | ocean |
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | difvmfdo | ocean |
| | W m-2 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | dispkvfo | ocean |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|---|-----------|-----------|-------------------------|-------------------------|----------|------|---------------------------------|--------------------------|-------|
| | m2 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | diftrblo | ocean |
| | m4 s-1 | time: mean within years time: mean over years | | | | | | real | longitude latitude olevel time2 | diftrbbo | ocean |

| | | | | | |
|--------|---|------|---------------------------------|-----------|-------|
| m2 s-1 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | difrelo | ocean |
| m2 s-1 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | difrebo | ocean |
| m2 s-1 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | difrxvlo | ocean |
| m2 s-1 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | difrxvbo | ocean |
| W m-2 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | tnkebo | ocean |
| m2 s-1 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | difmxvlo | ocean |
| m2 s-1 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | difmxvbo | ocean |
| W m-2 | time: mean within years time: mean over years | real | longitude latitude olevel time2 | dispkxyfo | ocean |

CMOR Table Oyr: Annual Mean Ocean Fields, Including Biogeochemical Fields

Oyr

(All Saved on the Ocean Grid)

In CMOR Table Oyr: 3-D Marine Biogeochemical Tracer Fields

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|--|------------------------------------|---|---|----------------------|---|
| 1 | Dissolved Inorganic Carbon Concentration | mol C m ⁻³ | Dissolved inorganic carbon (CO ₃ +HCO ₃ +H ₂ CO ₃) concentration | | dissic | |
| 2 | Dissolved Organic Carbon Concentration | mol C m ⁻³ | Dissolved organic carbon concentration | | dissoc | |
| 2 | Phytoplankton Carbon Concentration | mol C m ⁻³ | sum of phytoplankton carbon component concentrations | | phyc | |
| 2 | Zooplankton Carbon Concentration | mol C m ⁻³ | sum of zooplankton carbon component concentrations | | zooc | |
| 3 | Bacterial Carbon Concentration | mol C m ⁻³ | sum of bacterial carbon component concentrations | | bacc | |
| 2 | Detrital Organic Carbon Concentration | mol C m ⁻³ | sum of detrital organic carbon component concentrations | | detoc | |
| 2 | Calcite Concentration | mol C m ⁻³ | sum of particulate calcite component concentrations (e.g. Phytoplankton, Detrital, etc.) | | calc | |
| 2 | Aragonite Concentration | mol C m ⁻³ | sum of particulate aragonite components (e.g. Phytoplankton, Detrital, etc.) | | arag | |
| 3 | Diatom Carbon Concentration | mol C m ⁻³ | carbon from the diatom phytoplankton component concentration alone | | phycdiat | |
| 3 | Non-Diatom Phytoplankton Carbon Concentration | mol C m ⁻³ | carbon from additional phytoplankton component concentrations alone (e.g. Calc., diaz., cyano., etc) | | phycmisc | |
| 3 | Other Zooplankton Carbon Concentration | mol C m ⁻³ | carbon from additional zooplankton component concentrations alone (e.g. Micro, meso) | How does this differ from "sum of zooplankton carbon component concentrations"? | zoocmisc | |
| 1 | Total Alkalinity | eq m ⁻³ | total alkalinity equivalent concentration (including carbonate, nitrogen, silicate, and borate components) | Is "eq" in udunits? Is "equivalents" preferred to, say, 10 ⁻⁶ (i.e., ppm) or kmol/m ³ ? | talk | |
| 1 | pH | ? | negative log of hydrogen ion concentration with the concentration expressed as mol H kg ⁻¹ . | | ph | |
| 1 | Dissolve Oxygen Concentration | mol O ₂ m ⁻³ | dissolved oxygen gas concentration in sea water | | o2 | |
| 1 | Dissolved Nitrate Concentration | mol N m ⁻³ | dissolved nitrate concentration in sea water | | no3 | |
| 2 | Dissolved Ammonium Concentration | mol N m ⁻³ | dissolved ammonium concentration in sea water | | nh4 | |
| 1 | Dissolved Phosphate Concentration | mol P m ⁻³ | dissolved Phosphate concentration in sea water | | po4 | |
| 1 | Dissolved Iron Concentration | mol Fe m ⁻³ | dissolved iron concentration in sea water | | dfe | |
| 1 | Dissolved Silicate Concentration | mol Si m ⁻³ | dissolved silicate concentration in sea water | | si | |
| 1 | Total Chlorophyll Mass Concentration | mg Chl m ⁻³ | sum of chlorophyll from all phytoplankton group concentrations | | chl | |
| 3 | Diatom Chlorophyll Mass Concentration | mg Chl m ⁻³ | chlorophyll from diatom phytoplankton component concentration alone | | chldiat | |
| 3 | Other Phytoplankton Chlorophyll Mass Concentration | mg Chl m ⁻³ | chlorophyll from additional phytoplankton component concentrations alone | | chlmisc | |
| 3 | Particulate Organic Nitrogen Concentration | mol N m ⁻³ | sum of particulate organic nitrogen component concentrations | | pon | |
| 3 | Particulate Organic Phosphorus Concentration | mol P m ⁻³ | sum of particulate organic phosphorus component concentrations | | pop | |

| | | | | |
|---|---|-------------------------|--|-------|
| 3 | Particulate Biogenic Iron Concentration | mol Fe m ⁻³ | sum of particulate organic iron component concentrations | bfe |
| 3 | Particulate Biogenic Silica Concentration | mol Si m ⁻³ | sum of particulate silica component concentrations | bsi |
| 3 | Phytoplankton Nitrogen Concentration | mol N m ⁻³ | sum of phytoplankton nitrogen component concentrations | phyn |
| 3 | Phytoplankton Phosphorus Concentration | mol P m ⁻³ | sum of phytoplankton phosphorus components | phyp |
| 3 | Phytoplankton Iron Concentration | mol Fe m ⁻³ | sum of phytoplankton iron component concentrations | phyfe |
| 3 | Phytoplankton Silica Concentration | mol Si m ⁻³ | sum of phytoplankton silica component concentrations | physi |
| 3 | Dimethyl Sulphide Concentration | mol DMS m ⁻³ | dimethyl sulphide concentration | dms |

In CMOR Table **Oyr: Marine Biogeochemical 3-D Fields: Rates of Production and Removal**

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|--|---|--|----------------------|---|
| 3 | Primary Carbon Production by Phytoplankton | mol C m ⁻³ s ⁻¹ | total primary (organic carbon) production by phytoplankton | | pp | |
| 3 | Primary Carbon Production by Phytoplankton Based on NO3 Alone | mol C m ⁻³ s ⁻¹ | Primary (organic carbon) production by phytoplankton based on NO3 alone | | pnew | |
| 3 | Biogenic Iron Production | mol Fe m ⁻³ s ⁻¹ | Biogenic iron production | | pbfe | |
| 3 | Biogenic Silica Production | mol Si m ⁻³ s ⁻¹ | Biogenic silica production | | pbsi | |
| 3 | Calcite Production | mol C m ⁻³ s ⁻¹ | calcite production | Is this reported in units of C or is this wrong? Is calcite a carbon compound? | pcalc | |
| 3 | Aragonite Production | mol C m ⁻³ s ⁻¹ | aragonite production | Is this reported in units of C or is this wrong? Is aragonite a carbon compound? | parag | |
| 3 | Sinking Particulate Organic Carbon Flux | mol C m ⁻² s ⁻¹ | sinking flux of organic carbon | Should these and following fluxes normally be reported on half levels? Are these really fluxes or divergence of vertical fluxes? | expc | |
| 3 | Sinking Particulate Organic Nitrogen Flux | mol N m ⁻² s ⁻¹ | sinking flux of organic nitrogen | | expn | |
| 3 | Sinking Particulate Organic Phosphorus Flux | mol P m ⁻² s ⁻¹ | sinking flux of organic phosphorus | | expp | |
| 3 | Sinking Particulate Iron Flux | mol Fe m ⁻² s ⁻¹ | sinking flux of iron | | expcfe | |
| 3 | Sinking Particulate Silica Flux | mol Si m ⁻² s ⁻¹ | sinking flux of silica | | expsi | |
| 3 | Sinking Calcite Flux | mol C m ⁻² s ⁻¹ | sinking flux of calcite | Is this reported in units of C or is this wrong? Is calcite a carbon compound? | expcalc | |
| 3 | Sinking Aragonite Flux | mol C m ⁻² s ⁻¹ | sinking flux of aragonite | Is this reported in units of C or is this wrong? Is aragonite a carbon compound? | exparag | |
| 3 | Calcite Dissolution | mol C m ⁻³ s ⁻¹ | calcite dissolution | Is this reported in units of C or is this wrong? Is calcite a carbon compound? | dcalc | |
| 3 | Aragonite Dissolution | mol C m ⁻³ s ⁻¹ | aragonite dissolution | Is this reported in units of C or is this wrong? Is aragonite a carbon compound? | darag | |

| | | | | |
|---|---|---------------------------------------|--|--|
| 3 | Diatom Primary Carbon Production | $\text{mol C m}^{-3} \text{ s}^{-1}$ | Primary (organic carbon) production by the diatom component alone | pdi |
| 3 | Other Phytoplankton Carbon Production | $\text{mol C m}^{-3} \text{ s}^{-1}$ | Primary (organic carbon) production by other phytoplankton components alone | What is left out of "other"? Diatoms? Anything else? phypmisc |
| 3 | Rate of Change of Dissolved Inorganic Carbon due to Biological Activity | $\text{mol C m}^{-3} \text{ s}^{-1}$ | Net of biological terms in time rate of change of dissolved inorganic carbon | bddtdic |
| 3 | Rate of Change of Nitrogen Nutrient due to Biological Activity | $\text{mol N m}^{-3} \text{ s}^{-1}$ | Net of biological terms in time rate of change of nitrogen nutrients (e.g. NO_3+NH_4) | bddtdin |
| 3 | Rate of Change of Dissolved Phosphate due to Biological Activity | $\text{mol P m}^{-3} \text{ s}^{-1}$ | Net of biological terms in time rate of change of dissolved phosphate | bddtdip |
| 3 | Rate of Change of Dissolved Inorganic Iron due to Biological Activity | $\text{mol Fe m}^{-3} \text{ s}^{-1}$ | Net of biological terms in time rate of change of dissolved inorganic iron | bddtdife |
| 3 | Rate of Change of Dissolved Inorganic Silicate due to Biological Activity | $\text{mol Si m}^{-3} \text{ s}^{-1}$ | Net of biological terms in time rate of change of dissolved inorganic silicate | bddtdisi |
| 3 | Rate of Change of Alkalinity due to Biological Activity | $\text{eq m}^{-3} \text{ s}^{-1}$ | Net of biological terms in time rate of change of alkalinity | Is "equivalents" preferred to, say, ppm or kmol/m**3? bddtalk |
| 3 | Nonbiogenic Iron Scavenging | $\text{mol Fe m}^{-3} \text{ s}^{-1}$ | Dissolved Fe removed through nonbiogenic scavenging onto particles | fescav |
| 3 | Particle Source of Dissolved Iron | $\text{mol Fe m}^{-3} \text{ s}^{-1}$ | Dissolution, remineralization and desorption of iron back to the dissolved phase | fediss |
| 3 | Total Grazing of Phytoplankton by Zooplankton | $\text{mol Fe m}^{-3} \text{ s}^{-1}$ | Total grazing of phytoplankton by zooplankton | graz |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---------------------------------------|-------------------|------------------------------------|-----------|-----------|-------------------|-------------------|----------|------|--------------------------------|--------------------|-----------|
| dissolved_inorganic_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | dissic | ocnBgchem |
| dissolved_organic_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | dissoc | ocnBgchem |
| phytoplankton_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | phyc | ocnBgchem |
| zooplankton_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | zooc | ocnBgchem |
| bacterial_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | bacc | ocnBgchem |
| detrital_organic_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | detoc | ocnBgchem |
| calcite | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | calc | ocnBgchem |
| aragonite | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | arag | ocnBgchem |
| diatom_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | phycdiat | ocnBgchem |
| other_phytoplankton_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | phycmisc | ocnBgchem |
| other_zooplankton_carbon | mol C m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | zoocmisc | ocnBgchem |
| total_alkalinity | eq m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | talk | ocnBgchem |
| ph | ? | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | ph | ocnBgchem |
| oxygen | mol O2 m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | o2 | ocnBgchem |
| nitrate | mol N m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | no3 | ocnBgchem |
| ammonium | mol N m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | nh4 | ocnBgchem |
| phosphate | mol P m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | po4 | ocnBgchem |
| iron | mol Fe m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | dfe | ocnBgchem |
| silicate | mol Si m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | si | ocnBgchem |
| total_chlorophyll | mg Chl m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | chl | ocnBgchem |
| diatom_chlorophyll | mg Chl m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | chldiat | ocnBgchem |
| other_phytoplankton_chlorophyll | mg Chl m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | chlmisc | ocnBgchem |
| particulate_organic_nitrogen | mol N m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | pon | ocnBgchem |
| particulate_organic_phosphorus | mol P m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | pop | ocnBgchem |

| | | | | | | | | | | | |
|-----------------------------|-------------|------------------------------------|--|--|--|--|--|------|--------------------------------|-------|-----------|
| particulate_biogenic_iron | mol Fe m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | bfe | ocnBgchem |
| particulate_biogenic_silica | mol Si m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | bsi | ocnBgchem |
| phytoplankton_nitrogen | mol N m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | phyn | ocnBgchem |
| phytoplankton_phosphorus | mol P m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | phyp | ocnBgchem |
| phytoplankton_iron | mol Fe m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | phyfe | ocnBgchem |
| phytoplankton_silica | mol Si m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | physi | ocnBgchem |
| dimethylsulfide | mol DMS m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | dms | ocnBgchem |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|----------------------|------------------------------------|-----------|-----------|-------------------------|-------------------------|----------|------|--------------------------------|--------------------------|-----------|
| primary_production | mol C m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | pp | ocnBgchem |
| new_production | mol C m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | pnew | ocnBgchem |
| biogenic_iron_production | mol Fe m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | pbfe | ocnBgchem |
| biogenic_silica_production | mol Si m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | pbsi | ocnBgchem |
| calcite_production | mol C m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | pcalc | ocnBgchem |
| aragonite_production | mol C m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | parag | ocnBgchem |
| sinking_particulate_organic_carbon_export | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | expc | ocnBgchem |
| sinking_particulate_organic_nitrogen_export | mol N m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | expn | ocnBgchem |
| sinking_particulate_organic_phosphorus_export | mol P m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | expP | ocnBgchem |
| sinking_particulate_iron_export | mol Fe m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | expcfe | ocnBgchem |
| sinking_particulate_silica_export | mol Si m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | expsi | ocnBgchem |
| sinking_calcite_export | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | expcalc | ocnBgchem |
| sinking_aragonite_export | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | exparag | ocnBgchem |
| calcite_dissolution | mol C m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | dcalc | ocnBgchem |
| aragonite_dissolution | mol C m-3 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | darag | ocnBgchem |

| | | | | | | |
|--|----------------|------------------------------------|------|--------------------------------|----------|-----------|
| diatom_production | mol C m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | pdi | ocnBgchem |
| other_phytoplankton_production | mol C m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | phypmisc | ocnBgchem |
| net_biological_dic_rate_of_change | mol C m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | bddtdic | ocnBgchem |
| net_biological_din_rate_of_change | mol N m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | bddtdin | ocnBgchem |
| net_biological_dip_rate_of_change | mol P m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | bddtdip | ocnBgchem |
| net_biological_dife_rate_of_change | mol Fe m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | bddtdife | ocnBgchem |
| net_biological_disi_rate_of_change | mol Si m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | bddtdisi | ocnBgchem |
| net_biological_alkalinity_rate_of_change | eq m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | bddtalk | ocnBgchem |
| nonbiogenic_iron_scavenging | mol Fe m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | fescav | ocnBgchem |
| dissolved_iron_source_from_particles | mol Fe m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | fediss | ocnBgchem |
| total_grazing | mol Fe m-3 s-1 | time: mean area: mean where sea | real | longitude latitude olevel time | graz | ocnBgchem |

CMOR Table Amon: Monthly Mean Atmospheric Fields and Some Surface Fields

Amon

(All Saved on the Atmospheric Grid)

In CMOR Table **Amon**: 2-D fields on atmospheric grid

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|------------------------------------|--|-----------|----------------------|--|
| 1 | Near-Surface Air Temperature | K | near-surface (usually, 2 meter) air temperature. | | tas | air_temperature |
| 1 | Surface Temperature | K | "skin" temperature (i.e., SST for open ocean) | | ts | surface_temperature |
| 1 | Daily Minimum Near-Surface Air Temperature | K | monthly mean of the daily-minimum near-surface (usually, 2 meter) air temperature. | | tasmin | air_temperature |
| 1 | Daily Maximum Near-Surface Air Temperature | K | monthly mean of the daily-maximum near-surface (usually, 2 meter) air temperature. | | tasmax | air_temperature |
| 1 | Sea Level Pressure | Pa | not, in general, the same as surface pressure | | psl | air_pressure_at_sea_level |
| 1 | Surface Air Pressure | Pa | not, in general, the same as mean sea-level pressure | | ps | surface_air_pressure |
| 1 | Eastward Near-Surface Wind Speed | m s ⁻¹ | near-surface (usually, 10 meters) eastward component of wind. | | uas | eastward_wind |
| 1 | Northward Near-Surface Wind Speed | m s ⁻¹ | near-surface (usually, 10 meters) northward component of wind. | | vas | northward_wind |
| 1 | Near-Surface Wind Speed | m s ⁻¹ | near-surface (usually, 10 meters) wind speed. This is the mean of the speed, not the speed computed from the mean u and v components of wind | | sfcWind | wind_speed |
| 1 | Near-Surface Relative Humidity | % | near-surface (usually, 2meters) relative humidity expressed as a percentage. This is the relative humidity with respect to liquid water for T> 0 C, and with respect to ice for T<0 C. | | hurs | relative_humidity |
| 1 | Near-Surface Specific Humidity | 1 | near-surface (usually, 2 meters) specific humidity. | | huss | specific_humidity |
| 1 | Precipitation | kg m ⁻² s ⁻¹ | at surface; includes both liquid and solid phases from all types of clouds (both large-scale and convective) | | pr | precipitation_flux |
| 1 | Snowfall Flux | kg m ⁻² s ⁻¹ | at surface; includes precipitation of all forms of water in the solid phase | | prsn | snowfall_flux |
| 1 | Convective Precipitation | kg m ⁻² s ⁻¹ | at surface; includes both liquid and solid phases. | | prc | convective_precipitation_flux |
| 1 | Evaporation | kg m ⁻² s ⁻¹ | at surface; flux of water into the atmosphere due to conversion of both liquid and solid phases to vapor (from underlying surface and vegetation) | | evspsbl | water_evaporation_flux |
| 1 | Surface Snow and Ice Sublimation Flux | kg m ⁻² s ⁻¹ | The snow and ice sublimation flux is the loss of snow and ice mass from the surface resulting from their conversion to water vapor that enters the atmosphere. | | sbl | water_sublimation_flux |
| 1 | Surface Downward Eastward Wind Stress | Pa | | | tauu | surface_downward_eastward_stress |
| 1 | Surface Downward Northward Wind Stress | Pa | | | tauv | surface_downward_northward_stress |
| 1 | Surface Upward Latent Heat Flux | W m ⁻² | includes both evaporation and sublimation | | hfsl | surface_upward_latent_heat_flux |
| 1 | Surface Upward Sensible Heat Flux | W m ⁻² | | | hfss | surface_upward_sensible_heat_flux |
| 1 | Surface Downwelling Longwave Radiation | W m ⁻² | | | rlds | surface_downwelling_longwave_flux_in_air |
| 1 | Surface Upwelling Longwave Radiation | W m ⁻² | | | rlus | surface_upwelling_longwave_flux_in_air |
| 1 | Surface Downwelling Shortwave Radiation | W m ⁻² | | | rsds | surface_downwelling_shortwave_flux_in_air |
| 1 | Surface Upwelling Shortwave Radiation | W m ⁻² | | | rsus | surface_upwelling_shortwave_flux_in_air |
| 1 | Surface Downwelling Clear-Sky Shortwave Radiation | W m ⁻² | | | rsdscs | surface_downwelling_shortwave_flux_in_air_assumin g clear sky |
| 1 | Surface Upwelling Clear-Sky Shortwave Radiation | W m ⁻² | | | rsusc | surface_upwelling_shortwave_flux_in_air_assuming_ clear sky |

| | | | | | |
|---|--|----------------------|--|-------------------------|---|
| 1 | Surface Downwelling Clear-Sky Longwave Radiation | $W m^{-2}$ | | rldscs | surface_downwelling_longwave_flux_in_air_assuming_clear_sky |
| 1 | TOA Incident Shortwave Radiation | $W m^{-2}$ | incident shortwave at the top of the atmosphere | rsdt | toa_incoming_shortwave_flux |
| 1 | TOA Outgoing Shortwave Radiation | $W m^{-2}$ | at the top of the atmosphere | rsut | toa_outgoing_shortwave_flux |
| 1 | TOA Outgoing Longwave Radiation | $W m^{-2}$ | at the top of the atmosphere (to be compared with satellite measurements) | rlut | toa_outgoing_longwave_flux |
| 1 | TOA Outgoing Clear-Sky Longwave Radiation | $W m^{-2}$ | | rlutcs | toa_outgoing_longwave_flux_assuming_clear_sky |
| 1 | TOA Outgoing Clear-Sky Shortwave Radiation | $W m^{-2}$ | | rsutcs | toa_outgoing_shortwave_flux_assuming_clear_sky |
| 1 | Atmosphere Water Vapor Content | $kg m^{-2}$ | vertically integrated through the atmospheric column for the whole atmospheric column, as seen from the surface or the top of the atmosphere. Include both large-scale and convective cloud. | prw | atmosphere_water_vapor_content |
| 1 | Total Cloud Fraction | % | include both liquid and ice phases, consider all the mass of condensed water in the column and divide by the grid-cell area (in the longitude-latitude plane) | clt | cloud_area_fraction |
| 1 | Column Integrated Cloud Water Content | $kg m^{-2}$ | consider all the mass of ice-phase water in the column and divide by the grid-cell area (in the longitude-latitude plane) | clwvi | atmosphere_cloud_condensed_water_content |
| 1 | Column Integrated Cloud Ice Content | $kg m^{-2}$ | i.e., at the top of that portion of the atmosphere where dynamics are explicitly treated by the model. Report only if this differs from the net downward radiative flux at the top of the atmosphere. | clivi | atmosphere_cloud_ice_content |
| 1 | Net Downward Flux at Top of Model | $W m^{-2}$ | | rtmt | net_downward_radiative_flux_at_top_of_atmosphere_model |
| 1 | Air Pressure at Convective Cloud Base | Pa | | ccb | air_pressure_at_convective_cloud_base |
| 1 | Air Pressure at Convective Cloud Top | Pa | | cct | air_pressure_at_convective_cloud_top |
| 1 | Fraction of Time Convection Occurs | 1 | Fraction of time that convection occurs in the grid cell . | ci | |
| 2 | Fraction of Time Shallow Convection Occurs | 1 | Fraction of time that shallow convection occurs in the grid cell. (For models with a distinct shallow convection scheme only) | sci | |
| 1 | Total Anthropogenic CO2 Flux (All Emissions) | $kg C m^{-2} s^{-1}$ | This is requested only for the emission-driven coupled carbon climate model runs. Do not include natural fire sources, but include all anthropogenic sources, including fossil fuel use, cement production, agricultural burning, and all sources associated with anthropogenic land use change. | Chris Jones is checking | fco2antt |
| 1 | Fossil Fuel Anthropogenic CO2 Flux (Fossil Fuel Emissions) | $kg C m^{-2} s^{-1}$ | This is requested only for the emission-driven coupled carbon climate model runs. Report the prescribed anthropogenic CO2 flux from fossil fuel use. | Chris Jones is checking | fco2fos |

| | | | | | | |
|---|---|--------------------------------------|--|-------------------------|---------|--|
| 1 | Natural Net Surface Flux of CO2 into The Atmosphere | kg C m ⁻² s ⁻¹ | Report from all simulations (both emission-driven and concentration-driven) performed by models with fully interactive and responsive carbon cycles. This is what the atmosphere sees (<i>on its own grid</i>). This field should be equivalent to the combined natural fluxes of carbon (requested in the L_mon and O_mon tables) that account for natural exchanges between the atmosphere and land or ocean reservoirs (i.e., "net biospheric productivity", for land, and "air to sea CO2 flux", for ocean.) | Chris Jones is checking | fco2nat | |
|---|---|--------------------------------------|--|-------------------------|---------|--|

In CMOR Table **Amon**: *Atmospheric 3-D fields on standard pressure levels, except 4 cloud fields which are on model levels.*

Include the following mandatory pressure levels (which are available from all available reanalyses and CMIP3): 1000, 925, 850, 700, 600, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, and 10 hPa; Also include, when appropriate, output on the following additional pressure levels: 7, 5, 3, 2, 1 and 0.4 hPa.

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|-------------------------------------|------------------------------------|---|--|----------------------|---|
| 1 | Cloud Area Fraction | % | Report on model layers (not standard pressures). Include both large-scale and convective cloud. | | cl | cloud_area_fraction_in_atmosphere_layer |
| 1 | Mass Fraction of Cloud Liquid Water | 1 | Report on model layers (not standard pressures). Include both large-scale and convective cloud. Calculate as the mass of cloud liquid water in the grid cell divided by the mass of air (including the water in all phases) in the grid cells. | | clw | mass_fraction_of_cloud_liquid_water_in_air |
| 1 | Mass Fraction of Cloud Ice | 1 | Report on model layers (not standard pressures). Include both large-scale and convective cloud. Calculate as the mass of cloud ice in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | | cli | mass_fraction_of_cloud_ice_in_air |
| 1 | Convective Mass Flux | kg m ⁻² s ⁻¹ | Report on model layers (not standard pressures). The atmosphere convective mass flux is the vertical transport of mass for a field of cumulus clouds or thermals, given by the product of air density and vertical velocity. The flux is computed as the mass divided by the area of the grid cell. | | mc | convective_mass_flux |
| 1 | Air Temperature | K | | | ta | air_temperature |
| 1 | Eastward Wind | m s ⁻¹ | | | ua | eastward_wind |
| 1 | Northward Wind | m s ⁻¹ | | | va | northward_wind |
| 1 | Specific Humidity | 1 | | | hus | specific_humidity |
| 1 | Relative Humidity | % | This is the relative humidity with respect to liquid water for T> 0 C, and with respect to ice for T<0 C. | | hur | relative_humidity |
| 1 | omega (=dp/dt) | Pa s ⁻¹ | commonly referred to as "omega", this represents the vertical component of velocity in pressure coordinates (positive down) | | wap | lagrangian_tendency_of_air_pressure |
| 1 | Geopotential Height | m | | | zg | geopotential_height |
| 1 | Mole Fraction of O3 | 1e-9 | if climatologically specified, report only 12 months, starting with January. (Note: include all 12 months even if the values don't vary seasonally.) | Are these the preferred units or should it be a unitless fraction? Should this field be reported instead on model levels? Or should we also require either the vertically integrated mole fraction (or mass?) of this species or the vertically integrated globally averaged mole fraction (or mass?)? | tro3 | mole_fraction_of_ozone_in_air |

| | | | | | | |
|---|---|------|--|--|---------|--|
| 1 | Mole Fraction of CO2 | 1e-6 | This field should not be reported for models simulations in which CO2 is well-mixed (i.e., uniform everywhere). For some simulations (e.g., prescribed concentration pi-control run), this will not vary from one year to the next, and so report values for only 12 months (starting with January. (Note: include all 12 months even if the values don't vary seasonally.)) | Are these the preferred units or should it be a unitless fraction? Should this field be reported instead on model levels? Or should we also require either the vertically integrated mole fraction (or mass?) of this species or the vertically integrated globally averaged mole fraction (or mass?)? | co2 | mole_fraction_of_carbon_dioxide_in_air |
| 1 | Total Atmospheric Mass of CO2 | kg | For some simulations (e.g., prescribed concentration pi-control run), this will not vary from one year to the next, and so report values for only 12 months (starting with January. (Note: include all 12 months even if the values don't vary seasonally.)) | | co2mass | |
| 1 | Mole Fraction of CH4 | 1e-9 | If assumed spatially uniform, report only time-series of the single value. For some simulations (e.g., prescribed concentration pi-control run), this will not vary from one year to the next, and so report values for only 12 months (starting with January. (Note: include all 12 months even if the values don't vary seasonally.)) | Are these the preferred units or should it be a unitless fraction? Should this field be reported instead on model levels? Or should we also require either the vertically integrated mole fraction (or mass?) of this species or the vertically integrated globally averaged mole fraction (or mass?)? | ch4 | mole_fraction_of_methane_in_air |
| 1 | Mole Fraction of N2O | 1e-9 | If assumed spatially uniform, report only time-series of the single value. For some simulations (e.g., prescribed concentration pi-control run), this will not vary from one year to the next, and so report values for only 12 months (starting with January. (Note: include all 12 months even if the values don't vary seasonally.)) | Are these the preferred units or should it be a unitless fraction? Should this field be reported instead on model levels? Or should we also require either the vertically integrated mole fraction (or mass?) of this species or the vertically integrated globally averaged mole fraction (or mass?)? | n2o | mole_fraction_of_nitrous_oxide_in_air |
| 1 | Mole Fraction of Other Radiatively Important Trace Gases (That Are Evolving in Time). | ??? | If assumed spatially uniform, report only time-series of the single value. For some simulations (e.g., prescribed concentration pi-control run), this will not vary from one year to the next, and so report values for only 12 months (starting with January. (Note: include all 12 months even if the values don't vary seasonally.)) | Please let me know what (if any) other trace gas concentrations should be included. | ??? | |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--|-----------|-----------|-------------------------|-------------------------|----------|------|--------------------------------------|--------------------------|-------|
| | K | time: mean | | | | | | real | longitude latitude time height2m | tas | atmos |
| | K | time: mean | | | | | | real | longitude latitude time | ts | atmos |
| | K | time: minimum within days time: mean over time time: maximum within days time: mean over time | | | | | | real | longitude latitude time height2m | tasmin | atmos |
| | K | time: mean | | | | | | real | longitude latitude time height2m | tasmax | atmos |
| | Pa | time: mean | | | | | | real | longitude latitude time | psl | atmos |
| | Pa | time: mean | | | | | | real | longitude latitude time | ps | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude time height10m | uas | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude time height10m | vas | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude time height10m | sfcWind | atmos |
| | % | time: mean | | | | | | real | longitude latitude time height2m | hurs | atmos |
| | 1 | time: mean | | | | | | real | longitude latitude time height2m | huss | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | pr | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | prsn | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | prc | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | evspsbl | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | sbl | atmos |
| | Pa | time: mean | | | | | down | real | longitude latitude time | tauu | atmos |
| | Pa | time: mean | | | | | down | real | longitude latitude time | tauv | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | hfls | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | hfss | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude time | rlds | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | rlds | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude time | rsds | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsus | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude time | rsdscs | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsuscs | atmos |

| | | | | | | | | |
|--|--------------|------------|--|------|------|-------------------------|----------|-------|
| | W m-2 | time: mean | | down | real | longitude latitude time | rldscs | atmos |
| | | | | | | | | atmos |
| | W m-2 | time: mean | | down | real | longitude latitude time | rsdt | atmos |
| | W m-2 | time: mean | | up | real | longitude latitude time | rsut | atmos |
| | W m-2 | time: mean | | up | real | longitude latitude time | rlut | atmos |
| | W m-2 | time: mean | | up | real | longitude latitude time | rlutcs | atmos |
| | W m-2 | time: mean | | up | real | longitude latitude time | rsutcs | atmos |
| | | | | | real | | | atmos |
| | kg m-2 | time: mean | | | real | longitude latitude time | prw | atmos |
| | % | time: mean | | | real | longitude latitude time | clt | atmos |
| | kg m-2 | time: mean | | | real | longitude latitude time | clwvi | atmos |
| | kg m-2 | time: mean | | | real | longitude latitude time | clvi | atmos |
| | | | | | | | | atmos |
| | W m-2 | time: mean | | down | real | longitude latitude time | rtmt | atmos |
| | Pa | time: mean | | | real | longitude latitude time | ccb | atmos |
| | Pa | time: mean | | | real | longitude latitude time | cct | atmos |
| NOT PROPOSED. If it is a yes/no indicator of whether convection occurred, suggest a name of convection_type (by analogy with soil_type). A variable with this standard name could contain a string such as 'shallow' or 'deep' or contain integer values which would be explained by flag_values and flag_meanings attributes. If it is proportion of time that convection occurred, maybe we need time_fraction names like area_fraction names. | 1 | time: mean | | | real | longitude latitude time | ci | atmos |
| | 1 | time: mean | | | real | longitude latitude time | sci | atmos |
| NOT PROPOSED. Recommend anthropogenic_carbon_flux for consistency with biomass_burning_carbon_flux, etc. | kg C m-2 s-1 | time: mean | | up | real | longitude latitude time | fco2antt | atmos |
| NOT PROPOSED. Recommend fossil_fuel_burning_carbon_flux for consistency with biomass_burning_carbon_flux, etc. | kg C m-2 s-1 | time: mean | | up | real | longitude latitude time | fco2fos | atmos |

NOT PROPOSED. Recommend tendency_of_atmosphere_mass_content_of_carbon_dioxide_due_to_biogenic_emission for consistency with chemistry names.

kg C m-2 s-1 time: mean up real longitude latitude time fco2nat atmos

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---------------------------------------|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|--------------------------------|--------------------|--------------------|
| | % | time: mean | | | | | | real | longitude latitude alevel time | cl | atmos |
| | 1 | time: mean | | | | | | real | longitude latitude alevel time | clw | atmos |
| | 1 | time: mean | | | | | | real | longitude latitude alevel time | cli | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude alevel time | mc | atmos |
| | K | time: mean | | | | | | real | longitude latitude plev17 time | ta | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude plev17 time | ua | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude plev17 time | va | atmos |
| | 1 | time: mean | | | | | | real | longitude latitude plev17 time | hus | atmos |
| | % | time: mean | | | | | | real | longitude latitude plev17 time | hur | atmos |
| | Pa s-1 | time: mean | | | | | | real | longitude latitude plev17 time | wap | atmos |
| | m | time: mean | | | | | | real | longitude latitude plev17 time | zg | atmos |
| | 1e-9 | time: mean | | | | | | real | longitude latitude plev17 time | tro3 | atmos atmosChem |

| | | | | | |
|------|------------|------|--------------------------------|-----|-------|
| 1e-6 | time: mean | real | longitude latitude plev17 time | co2 | atmos |
|------|------------|------|--------------------------------|-----|-------|

| | | | | | |
|----|------------|------|------|-----------|-------|
| kg | time: mean | real | time | co2global | atmos |
|----|------------|------|------|-----------|-------|

| | | | | | |
|------|------------|------|--------------------------------|-----|--------------------|
| 1e-9 | time: mean | real | longitude latitude plev17 time | ch4 | atmos atmosChem |
|------|------------|------|--------------------------------|-----|--------------------|

| | | | | | |
|------|------------|------|--------------------------------|-----|--------------------|
| 1e-9 | time: mean | real | longitude latitude plev17 time | n2o | atmos atmosChem |
|------|------------|------|--------------------------------|-----|--------------------|

| | | | | | |
|-----|--|------|--------------------------------|-----|--------------------|
| ??? | | real | longitude latitude plev17 time | ??? | atmos atmosChem |
|-----|--|------|--------------------------------|-----|--------------------|

CMOR Table Omon: Monthly Mean Ocean Fields, Including Biogeochemical Fields

Omon

(All Saved on the Ocean Grid)

In CMOR Table Omon: Marine Biogeochemical 2-D Fields

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|--|---|---|----------------------|---|
| 2 | Surface Concentrations | mol XXX m ⁻³ | surface concentrations of all 3D tracers. See first table in Oyr for a complete list of these tracers. "Tracer" concentrations should be reported even if they are diagnosed rather than prognostically calculated. | | sfc+short name | |
| 1 | Primary Organic Carbon Production by All Types of Phytoplankton | mol C m ⁻² s ⁻¹ | Vertically integrated total primary (organic carbon) production by phytoplankton | | intpp | |
| 2 | Primary Organic Carbon Production by Phytoplankton Based on NO3 Alone | mol C m ⁻² s ⁻¹ | Vertically integrated primary (organic carbon) production by phytoplankton based on NO3 alone | Will it be clear to most people what "based on NO3 alone" means? | intpnew | |
| 2 | Primary Organic Carbon Production by Diatom Phytoplankton | mol C m ⁻² s ⁻¹ | Vertically integrated primary (organic carbon) production by the diatom phytoplankton component alone | | intpdia | |
| 3 | Primary Organic Carbon Production by Other Phytoplankton | mol C m ⁻² s ⁻¹ | Vertically integrated total primary (organic carbon) production by other phytoplankton components alone | Should the sum of this and the previous field add up to the field in line 14? Intpdia+intpnew=intpp? | intpphymisc | |
| 3 | Iron Production | mol Fe m ⁻² s ⁻¹ | Vertically integrated biogenic iron production | | intpbfe | |
| 3 | Silica Production | mol Si m ⁻² s ⁻¹ | Vertically integrated biogenic silica production | | intpbsi | |
| 3 | Calcite Production | mol C m ⁻² s ⁻¹ | Vertically integrated calcite production | | intpcalc | |
| 3 | Aragonite Production | mol C m ⁻² s ⁻¹ | Vertically integrated aragonite production | | intparag | |
| 1 | Downward Flux of Particle Organic Carbon at 100M | mol C m ⁻² s ⁻¹ | sinking flux of organic carbon at 100m | | epc100 | |
| 3 | Downward Flux of Particulate Iron at 100M | mol Fe m ⁻² s ⁻¹ | sinking flux of biogenic and scavenged iron at 100m | | epfe100 | |
| 3 | Downward Flux of Particulate Silica at 100M | mol Si m ⁻² s ⁻¹ | sinking flux of biogenic silica at 100m | | epsi100 | |
| 1 | Downward Flux of Calcite at 100M | mol C m ⁻² s ⁻¹ | sinking flux of calcite at 100m | | epcalc100 | |
| 1 | Downward Flux of Aragonite at 100M | mol C m ⁻² s ⁻¹ | sinking flux of aragonite at 100m | | eparag100 | |
| 2 | Dissolved Inorganic Carbon Content | kg m ⁻² | Vertically integrated dDIC | | intdic | |
| 1 | Surface Aqueous Partial Pressure of CO2 | uatm | Surface aqueous partial pressure of CO2 | Are these correct and preferred units? Why not some variant on Pa? | spco2 | |
| 3 | Delta PCO2 | uatm | Difference between atmospheric and oceanic partial pressure of CO2 (positive meaning ocean > atmosphere) | Are these correct and preferred units? Why not some variant on Pa? | dpco2 | |
| 3 | Delta PO2 | uatm | Difference between atmospheric and oceanic partial pressure of O2 (positive meaning ocean > atmosphere) | Are these correct and preferred units? Why not some variant on Pa? | dpo2 | |
| 1 | Surface Downward CO2 Flux | kg C m ⁻² s ⁻¹ | Gas exchange flux of CO2 (positive into ocean) | For consistency with other fluxes, shouldn't this have units of mol C m ⁻² s ⁻¹ | fgco2 | |
| 1 | Surface Downward O2 Flux | mol O ₂ m ⁻² s ⁻¹ | Gas exchange flux of O2 (positive into ocean) | | fgo2 | |

| | | | | | |
|---|---|---|---|---|-----------|
| 3 | Surface Upward DMS Flux | mol DMS m ⁻² s ⁻¹ | Gas exchange flux of DMS (positive into atmosphere) | | fgdms |
| 3 | Flux of Carbon Into Ocean Surface by Runoff and Sediment Dissolution | mol C m ⁻² s ⁻¹ | Carbon supply to ocean through runoff and sediment dissolution (neglects gas exchange) | | fsc |
| 3 | Downward Carbon Flux at Ocean Bottom | mol C m ⁻² s ⁻¹ | Carbon loss to sediments | | frc |
| 3 | Nitrogen Fixation Rate in Ocean | mol N m ⁻² s ⁻¹ | Vertically integrated nitrogen fixation | | intpn2 |
| 3 | Surface Downward Net Flux of Nitrogen | mol N m ⁻² s ⁻¹ | N supply through deposition flux onto sea surface, nitrogen fixation, and runoff | | fsn |
| 3 | Nitrogen Loss to Sediments and through Denitrification | mol N m ⁻² s ⁻¹ | N loss to sediment and water column denitrification | | fm |
| 3 | Surface Downward Net Flux of Iron | mol Fe m ⁻² s ⁻¹ | Iron supply through deposition flux onto sea surface, runoff, coasts, sediments, etc | | fsfe |
| 3 | Iron Loss to Sediments | mol Fe m ⁻² s ⁻¹ | Iron loss to sediments | | frfe |
| 3 | Oxygen Minimum Concentration | mol O ₂ m ⁻³ | Vertical minimum concentration of dissolved oxygen gas | | o2min |
| 3 | Depth of Oxygen Minimum Concentration | mol O ₂ m ⁻⁵ | Depth of vertical minimum concentration of dissolved oxygen gas (if two, then the shallower) | | zo2min |
| 3 | Calcite Saturation Depth | m | Depth of calcite saturation horizon (0 if < surface, "missing" if > bottom, if two, then the shallower) | | zsatcalc |
| 3 | Aragonite Saturation Depth | m | Depth of aragonite saturation horizon (0 if < surface, "missing" if > bottom, if two, then the shallower) | | zsatarag |
| 3 | Rate of Change of Net Dissolved Inorganic Carbon | mol C m ⁻² s ⁻¹ | Net time rate of change of dissolved inorganic carbon | Is this the rate of change integrated through the entire water column? | fddtdic |
| 3 | Rate of Change in Upper 100 m of Net Dissolved Inorganic Nitrogen | mol N m ⁻² s ⁻¹ | Net time rate of change of nitrogen nutrients (e.g. NO ₃ +NH ₄) in upper 100m | | fddtdin |
| 3 | Rate of Change in Upper 100 m of Net Dissolved Inorganic Phosphate | mol P m ⁻² s ⁻¹ | vertical integral of net time rate of change of phosphate in upper 100m | | fddtdip |
| 3 | Rate of Change in Upper 100 m of Net Dissolved Inorganic Iron | mol Fe m ⁻² s ⁻¹ | vertical integral of net time rate of change of dissolved inorganic iron in upper 100m | | fddtdife |
| 3 | Rate of Change in Upper 100 m of Net Dissolved Inorganic Silicate | mol Si m ⁻² s ⁻¹ | vertical integral of net time rate of change of dissolved inorganic silicate in upper 100m | | fddtdisi |
| 3 | Rate of Change in Upper 100 m of Alkalinity | eq m ⁻² s ⁻¹ | vertical integral of net time rate of change of alkalinity in upper 100m | Is "equivalents" preferred to, say, 10** ⁻⁶ (i.e., ppm) or kmol/m** ³ ? | fddtalk |
| 3 | Rate of Change in Upper 100 m of Dissolved Inorganic Carbon due to Biological Activity | mol C m ⁻² s ⁻¹ | vertical integral of net biological terms in time rate of change of dissolved inorganic carbon in upper 100m | Does it make sense for "inorganic carbon" to change due to biology? | fbddtdic |
| 3 | Rate of Change in Upper 100 m of Dissolved Inorganic Nitrogen due to Biological Activity | mol N m ⁻² s ⁻¹ | vertical integral of net biological terms in time rate of change of nitrogen nutrients (e.g. NO ₃ +NH ₄) in upper 100m | | fbddtdin |
| 3 | Rate of Change in Upper 100 m of Dissolved Inorganic Phosphate due to Biological Activity | mol P m ⁻² s ⁻¹ | vertical integral of net biological terms in time rate of change of phosphate in upper 100m | | fbddtdip |
| 3 | Rate of Change in Upper 100 m of Dissolved Inorganic Iron due to Biological Activity | mol Fe m ⁻² s ⁻¹ | vertical integral of net biological terms in time rate of change of dissolved inorganic iron in upper 100m | | fbddtdife |
| 3 | Rate of Change in Upper 100 m of Dissolved Inorganic Silicate due to Biological Activity | mol Si m ⁻² s ⁻¹ | vertical integral of net biological terms in time rate of change of dissolved inorganic silicate in upper 100m | | fbddtdisi |
| 3 | Rate of Change in Upper 100 m of Biological Alkalinity due to Biological Activity | eq m ⁻² s ⁻¹ | vertical integral of net biological terms in time rate of change of alkalinity in upper 100m | Is "equivalents" preferred to, say, 10** ⁻⁶ (i.e., ppm) or kmol/m** ³ ? | fbddtalk |

Further explanation of the fields in the following tables can be found in Griffies et al., available at http://eprints.soton.ac.uk/65415/01/137_WGOMD_ModelOutput.pdf.

In CMOR Table **Omon**: *WGOMD Table 2.2*

| Priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|--|----------------------|---|---|----------------------|--|
| 1 | Sea Water Mass | kg | | | masso | sea_water_mass |
| 1 | Sea Water Pressure at Sea floor | dbar | | | pbo | sea_water_pressure_at_sea_floor |
| 2 | Sea Water Pressure at Sea Water Surface | dbar | | | psa | sea_water_pressure_at_sea_water_surface |
| 1 | Sea Water Volume | m ³ | | | volv | sea_water_volume |
| 1 | Sea Surface Height Above Geoid | m | | | zos | sea_surface_height_above_geoid |
| 3 | Square of Sea Surface Height Above Geoid | m ² | | | zossq | square_of_sea_surface_height_above_geoid |
| 1 | Global Average Sea Level Change | m | | | zosga | global_average_sea_level_change |
| 1 | Global Average Steric Sea Level Change | m | | | zossga | global_average_steric_sea_level_change |
| 1 | Global Average Thermosteric Sea Level Change | m | | | zostoga | global_average_thermosteric_sea_level_change |
| 1 | Sea Water Mass Per Unit Area | kg m ⁻² | | | masscello | sea_water_mass_per_unit_area |
| 1 | Ocean Model Cell Thickness | m | | | thkcello | cell_thickness |
| 1 | Sea Water Potential Temperature | K | | | thetao | sea_water_potential_temperature |
| 1 | Global Average Sea Water Potential Temperature | K | | | thetaoga | sea_water_potential_temperature |
| 2 | Sea Surface Temperature | K | this may differ from "surface temperature" in regions of sea ice. | | tos | sea_surface_temperature |
| | | | | MOVED: "daily sea surface temperature" moved to "da" spreadsheet. | | |
| 3 | Square of Sea Surface Temperature | K ² | | | tossq | square_of_sea_surface_temperature |
| | | | | MOVED: "daily mean square of sea surface temperature" to "da" spreadsheet | | |
| 1 | Sea Water Salinity | psu | | | so | sea_water_salinity |
| 1 | Global Mean Sea Water Salinity | psu | | | soga | sea_water_salinity |
| 2 | Sea Surface Salinity | psu | | | sos | sea_surface_salinity |
| 3 | Sea Water Potential Density | kg m ⁻³ | | | rhopot | sea_water_potential_density |
| 3 | Sea Water Age Since Surface Contact | yr | | | agessc | sea_water_age_since_surface_contact |
| 3 | Moles Per Unit Mass of CFC-11 in Sea Water | mol kg ⁻¹ | | | cfc11 | moles_per_unit_mass_of_cfc11_in_sea_water |
| 3 | Ocean Barotropic Mass Streamfunction | kg s ⁻¹ | differs from CMIP3 because it includes mass. | | msftbarot | ocean_barotropic_mass_streamfunction |
| 3 | Ocean Mixed Layer Thickness Defined by Sigma T | m | | | mlost | ocean_mixed_layer_thickness_defined_by_sigma_t |
| 3 | Square of Ocean Mixed Layer Thickness Defined by Sigma T | m ² | | | mlostsq | square_of_ocean_mixed_layer_thickness_defined_by_sigma_t |

| | | | | | |
|---|---|---|--|----------|--|
| 3 | Mean Daily Maximum Ocean Mixed Layer Thickness Defined by Mixing Scheme | m | This might get moved to the "da" page, because the WGOMD requests that the daily maximum be saved every day. | omldamax | ocean_mixed_layer_thickness_defined_by_mixing_scheme |
| 3 | Monthly Maximum Ocean Mixed Layer Thickness Defined by Mixing Scheme | m | | omlmax | ocean_mixed_layer_thickness_defined_by_mixing_scheme |

In CMOR Table **Omon**: *WGOMD Table 2.3*

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|---------------------------------|---|---|----------------------|---|
| 1 | Sea Water X Velocity | m s ⁻¹ | | | uo | sea_water_x_velocity |
| 1 | Sea Water Y Velocity | m s ⁻¹ | | | vo | sea_water_y_velocity |
| 1 | Upward Ocean Mass Transport | kg s ⁻¹ | differs from CMIP3, which only had upward velocity. | | wmo | upward_ocean_mass_transport |
| 1 | Square of Upward Ocean Mass Transport | kg ² s ⁻² | | | wmosq | square_of_upward_ocean_mass_transport |
| 2 | Ocean Mass X Transport | kg s ⁻¹ | | | umo | ocean_mass_x_transport |
| 2 | Ocean Mass Y Transport | kg s ⁻¹ | | | vmo | ocean_mass_y_transport |
| 2 | Ocean Meridional Overturning Mass Streamfunction | kg s ⁻¹ | function of Y, Z, basin. differs from CMIP3 because it includes mass. | | msftmyz | ocean_meridional_overturning_mass_streamfunction |
| 2 | Ocean Meridional Overturning Mass Streamfunction | kg s ⁻¹ | function of Y-rho-basin. | | msftmrhoz | ocean_meridional_overturning_mass_streamfunction |
| 2 | Ocean Y Overturning Mass Streamfunction | kg s ⁻¹ | function of Y, Z, basin. | | msftyyz | ocean_y_overturning_mass_streamfunction |
| 2 | Ocean Y Overturning Mass Streamfunction | kg s ⁻¹ | function of Y, rho, basin. | | msftyrhoz | ocean_y_overturning_mass_streamfunction |
| 3 | Ocean Meridional Overturning Mass Streamfunction due to Bolus Advection | kg s ⁻¹ | function of Y, Z, basin. | | msftmyzba | ocean_meridional_overturning_mass_streamfunction_due_to_bolus_advection |
| 3 | Ocean Meridional Overturning Mass Streamfunction due to Bolus Advection | kg s ⁻¹ | function of Y, rho, basin. | | msftmrhozba | ocean_meridional_overturning_mass_streamfunction_due_to_bolus_advection |
| 3 | Ocean Y Overturning Mass Streamfunction due to Bolus Advection | kg s ⁻¹ | function of Y, Z, basin. | | msftyzba | ocean_y_overturning_mass_streamfunction_due_to_bolus_advection |
| 3 | Ocean Y Overturning Mass Streamfunction due to Bolus Advection | kg s ⁻¹ | function of Y, rho, basin. | | msftyrhozba | ocean_y_overturning_mass_streamfunction_due_to_bolus_advection |
| 2 | Northward Ocean Heat Transport | W | | | hfnorth | northward_ocean_heat_transport |
| 3 | Northward Ocean Heat Transport due to Bolus Advection | W | | | hfyba | northward_ocean_heat_transport_due_to_bolus_advection |
| 3 | Northward Ocean Heat Transport due to Diffusion | W | | | hfydiff | northward_ocean_heat_transport_due_to_diffusion |
| 2 | Ocean Heat X Transport | W | | | | ocean_heat_x_transport |
| 2 | Ocean Heat Y Transport | W | | For models with a latlon grid, is this the same as "northward ocean heat transport" (in row 105)? | hfy | ocean_heat_y_transport |
| 3 | Ocean Heat X Transport due to Bolus Advection | W | | | hfxba | ocean_heat_x_transport_due_to_bolus_advection |
| 3 | Ocean Heat X Transport due to Diffusion | W | | | hfxdiff | ocean_heat_x_transport_due_to_diffusion |
| 3 | Ocean Heat Y Transport due to Bolus Advection | W | | | hfyba | ocean_heat_y_transport_due_to_bolus_advection |
| 3 | Ocean Heat Y Transport due to Diffusion | W | | | hfydiff | ocean_heat_y_transport_due_to_diffusion |
| 2 | Northward Ocean Heat Transport due to Gyre | W | | | htovgyre | northward_ocean_heat_transport_due_to_gyre |
| 2 | Northward Ocean Heat Transport due to Overturning | W | | | htovovrt | northward_ocean_heat_transport_due_to_overturning |
| 2 | Northward Ocean Salt Transport due to Gyre | kg s ⁻¹ | | | sltovgyre | northward_ocean_salt_transport_due_to_gyre |

| | | | | | | |
|---|---|--------------------|--|--|----------|---|
| 2 | Northward Ocean Salt Transport due to Overturning | kg s ⁻¹ | | | stovovrt | northward_ocean_salt_transport_due_to_overturning |
|---|---|--------------------|--|--|----------|---|

In CMOR Table **Omon**: *WGOMD Table 2.4*

sea water transport through (or associated with) the following straits, openings, channels, passages, etc.: barents_opening, bering_strait, canadian_archipelago, denmark_strait, drake_passage, english_channel, **pacific_equatorial_undercurrent**, faroe_scotland_channel, **florida_bahamas_straight**, fram_strait, iceland_faroe_channel, indonesian_thoughflow, mozambique_channel, taiwan_luzon_straits, and windward_passage. For definitions see WGOMD document referenced above. All transports will be stored in a single variable with a dimension that covers the set of regions listed here.

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---------------------|--------------------|---------|-----------|----------------------|---|
| 2 | Sea Water Transport | kg s ⁻¹ | | | ? | sea_water_transport_across_line |

In CMOR Table **Omon**: *WGOMD Table 2.5*

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|------------------------------------|---|---|----------------------|---|
| 2 | Rainfall Flux where Ice Free Ocean over Sea | kg m ⁻² s ⁻¹ | compute as the total mass of liquid water falling as liquid rain into the ice-free portion of the ocean divided by the area of the ocean portion of the grid cell. | | pr | rainfall_flux |
| 2 | Snowfall Flux where Ice Free Ocean over Sea | kg m ⁻² s ⁻¹ | compute as the total mass of ice directly falling as snow into the ice-free portion of the ocean divided by the area of the ocean portion of the grid cell. | | prsn | snowfall_flux |
| 2 | Water Evaporation Flux Where Ice Free Ocean over Sea | kg m ⁻² s ⁻¹ | compute as the total mass of water vapor evaporating from the ice-free portion of the ocean divided by the area of the ocean portion of the grid cell. | | evs | water_evaporation_flux |
| 2 | Water Flux into Sea Water From Rivers | kg m ⁻² s ⁻¹ | compute as the river flux of water into the ocean divided by the area of the ocean portion of the grid cell. | | friver | water_flux_into_sea_water_from_rivers |
| 2 | Water Flux into Sea Water From Icebergs | kg m ⁻² s ⁻¹ | compute as the iceberg melt water flux into the ocean divided by the area of the ocean portion of the grid cell. | | ficeberg | water_flux_into_sea_water_from_icebergs |
| 1 | Water Flux into Sea Water due to Sea Ice Thermodynamics | kg m ⁻² s ⁻¹ | compute as the sea ice thermodynamic water flux into the ocean divided by the area of the ocean portion of the grid cell. | The priority set by the WGOMD was 2 for this field. The sea-ice folks requested that the priority be raised to 1. | fsitherm | water_flux_into_sea_water_due_to_sea_ice_thermodynamics |
| 2 | Water Flux into Sea Water | kg m ⁻² s ⁻¹ | compute as the water flux into the ocean divided by the area of the ocean portion of the grid cell. This is the sum of the next two variables in this table. | | wfo | water_flux_into_sea_water |
| 2 | Water Flux into Sea Water Without Flux Correction | kg m ⁻² s ⁻¹ | compute as the water flux (without flux correction) into the ocean divided by the area of the ocean portion of the grid cell. This is the sum of the first 6 variables in this table? | | wfonocorr | water_flux_into_sea_water_without_flux_correction |
| 2 | Water Flux Correction | kg m ⁻² s ⁻¹ | If this does not vary from one year to the next, report only a single year. Positive flux implies correction adds water to ocean. | | wfcorr | water_flux_correction |

In CMOR Table **Omon**: *WGOMD Table 2.6*

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|--|------------------------------------|--|---|----------------------|--|
| 2 | Virtual Salt Flux into Sea Water due to Rainfall | kg m ⁻² s ⁻¹ | | | vsfpr | virtual_salt_flux_into_sea_water_due_to_rainfall |
| 2 | Virtual Salt Flux into Sea Water due to Evaporation | kg m ⁻² s ⁻¹ | | | vsfevap | virtual_salt_flux_into_sea_water_due_to_evaporation |
| 2 | Virtual Salt Flux into Sea Water From Rivers | kg m ⁻² s ⁻¹ | | | vsfriver | virtual_salt_flux_into_sea_water_from_rivers |
| 1 | Virtual Salt Flux into Sea Water due to Sea Ice Thermodynamics | kg m ⁻² s ⁻¹ | This variable measures the virtual salt flux into sea water due to the melting of sea ice. It is set to zero in models which receive a real water flux. | The priority set by the WGOMD was 2 for this field. The sea-ice folks requested that the priority be raised to 1. | vsfsit | virtual_salt_flux_into_sea_water_due_to_sea_ice_thermodynamics |
| 2 | Virtual Salt Flux into Sea Water | kg m ⁻² s ⁻¹ | If this does not vary from one year to the next, report only a single year. Positive flux implies correction increases salinity of water. This includes all virtual salt flux, including that due to a salt flux correction. | | vsf | virtual_salt_flux_into_sea_water |
| 2 | Virtual Salt Flux Correction | kg m ⁻² s ⁻¹ | | | wfcorr | virtual_salt_flux_correction |
| 1 | Downward Sea Ice Basal Salt Flux | kg m ⁻² s ⁻¹ | This field is physical, and it arises since sea ice has a nonzero salt content, so it exchanges salt with the liquid ocean upon melting and freezing. | The priority set by the WGOMD was 2 for this field. The sea-ice folks requested that the priority be raised to 1. | sfsdi | downward_sea_ice_basal_salt_flux |
| 2 | Salt Flux into Sea Water from Rivers | kg m ⁻² s ⁻¹ | | | sfriver | salt_flux_into_sea_water_from_rivers |

In CMOR Table **Omon**: *WGOMD Table 2.7*

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|-------------------|---|-----------|----------------------|---|
| 2 | Upward Geothermal Heat Flux at Sea Floor | W m ⁻² | | | hfgeou | upward_geothermal_heat_flux_at_sea_floor |
| 2 | Temperature Flux due to Rainfall Expressed as Heat Flux into Sea Water | W m ⁻² | This is defined as "where ice_free_sea over sea"; i.e., compute the total flux (considered here) entering the ice-free portion of the grid cell divided by the area of the ocean portion of the grid cell. | | hfrainds | temperature_flux_due_to_rainfall_expressed_as_heat_flux_into_sea_water |
| 2 | Temperature Flux due to Evaporation Expressed as Heat Flux Out of Sea Water | W m ⁻² | This is defined as "where ice_free_sea over sea" | | hfevapds | temperature_flux_due_to_evaporation_expressed_as_heat_flux_out_of_sea_water |
| 2 | Temperature Flux due to Runoff Expressed as Heat Flux into Sea Water | W m ⁻² | In general this should be reported as a function of depth, (i.e., it will be a function of the generic "XYZ" dimensions). Include enough depth levels to represent the non-zero values of this field everywhere on the globe. | | hfrunoffds | temperature_flux_due_to_runoff_expressed_as_heat_flux_into_sea_water |
| 2 | Heat Flux into Sea Water due to Snow Thermodynamics | W m ⁻² | In general this should be reported as a function of depth, (i.e., it will be a function of the generic "XYZ" dimensions). Include enough depth levels to represent the non-zero values of this field everywhere on the globe. | | hfsntherm | heat_flux_into_sea_water_due_to_snow_thermodynamics |

| | | | | | | |
|---|--|-------------------|---|---|--------------|--|
| 1 | Heat Flux into Sea Water due to Sea Ice Thermodynamics | W m ⁻² | In general this should be reported as a function of depth, (i.e., it will be a function of the generic "XYZ" dimensions). Include enough depth levels to represent the non-zero values of this field everywhere on the globe. | The priority set by the WGOMD was 2 for this field. The sea-ice folks requested that the priority be raised to 1. | hfsithermnds | heat_flux_into_sea_water_due_to_sea_ice_thermodynamics |
| 2 | Heat Flux into Sea Water due to Iceberg Thermodynamics | W m ⁻² | In general this should be reported as a function of depth, (i.e., it will be a function of the generic "XYZ" dimensions). Include enough depth levels to represent the non-zero values of this field everywhere on the globe. | | hfibthermnds | heat_flux_into_sea_water_due_to_iceberg_thermodynamics |
| 2 | Surface Net Downward Longwave Radiation | W m ⁻² | This is defined as "where ice_free_sea over sea" | | rlds | surface_net_downward_longwave_flux |
| 2 | Surface Downward Latent Heat Flux | W m ⁻² | This is defined as "where ice_free_sea over sea" | | hfls | surface_downward_latent_heat_flux |
| 2 | Surface Downward Sensible Heat Flux | W m ⁻² | This is defined as "where ice_free_sea over sea" | | hfss | surface_downward_sensible_heat_flux |
| 2 | Net Downward Shortwave Radiation at Sea Water Surface | W m ⁻² | This is the flux into the surface of liquid sea water only. This excludes shortwave flux absorbed by sea ice, but includes any light that passes through the ice and is absorbed by the ocean. | | rsntds | |
| 2 | Downwelling Shortwave Radiation in Sea Water | W m ⁻² | In general the shortwave flux should be reported as a function of ocean depth, (i.e., it will be a function of the generic "XYZ" dimensions). Include enough depth levels to represent the non-zero values of this field everywhere on the globe. | | rsds | downwelling_shortwave_flux_in_sea_water |
| 2 | Heat Flux Correction | W m ⁻² | If this does not vary from one year to the next, report only a single year. Positive indicates correction adds heat to ocean. | | hfcorr | heat_flux_correction |
| 1 | Downward Heat Flux at Sea Water Surface | W m ⁻² | This is the net flux of heat entering the liquid water column through its upper surface (excluding any "flux adjustment") . | | hfds | |

In CMOR Table **Omon**: *WGOMD Table 2.8*

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|--------------------------------------|-------------------|--|-----------|----------------------|---|
| 2 | Surface Downward X Stress | N m ⁻² | This is the stress on the liquid ocean from overlying atmosphere, sea ice, ice shelf, etc. | | tauuo | surface_downward_x_stress |
| 2 | Surface Downward Y Stress | N m ⁻² | This is the stress on the liquid ocean from overlying atmosphere, sea ice, ice shelf, etc. | | tauvo | surface_downward_y_stress |
| 2 | Surface Downward X Stress Correction | N m ⁻² | This is the stress on the liquid ocean from overlying atmosphere, sea ice, ice shelf, etc. If this does not vary from one year to the next, report only a single year. | | taucorr | surface_downward_x_stress_correction |
| 2 | Surface Downward Y Stress Correction | N m ⁻² | This is the stress on the liquid ocean from overlying atmosphere, sea ice, ice shelf, etc. If this does not vary from one year to the next, report only a single year. | | tauvcorr | surface_downward_y_stress_correction |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|------------------------------------|-----------|-----------|-------------------------|-------------------------|----------|------|-------------------------|--------------------------|-----------|
| | mol XXX m-3 | time: mean area: mean where sea | | | | | | real | longitude latitude time | sfc+short name | ocnBgchem |
| integrated_primary_production | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | intpp | ocnBgchem |
| integrated_new_production | mol C m-2 s-1 | time: mean arera: where sea | | | | | | real | longitude latitude time | intpnew | ocnBgchem |
| integrated_diatom_phytoplankton_production | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | intpdiat | ocnBgchem |
| integrated_other_phytoplankton_production | mol C m-2 s-1 | time: mean arera: where sea | | | | | | real | longitude latitude time | intpphymisc | ocnBgchem |
| integrated_iron_production | mol Fe m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | intpbfe | ocnBgchem |
| integrated_silica_production | mol Si m-2 s-1 | time: mean arera: where sea | | | | | | real | longitude latitude time | intpbsi | ocnBgchem |
| integrated_calcite_production | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | intpcalc | ocnBgchem |
| integrated_aragonite_production | mol C m-2 s-1 | time: mean arera: where sea | | | | | | real | longitude latitude time | intparag | ocnBgchem |
| sinking_particle_organic_carbon_export | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | epc100 | ocnBgchem |
| sinking_particulate_iron_export | mol Fe m-2 s-1 | time: mean arera: where sea | | | | | | real | longitude latitude time | epfe100 | ocnBgchem |
| sinking_particulate_silica_export | mol Si m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | epsi100 | ocnBgchem |
| sinking_calcite | mol C m-2 s-1 | time: mean arera: where sea | | | | | | real | longitude latitude time | epcalc100 | ocnBgchem |
| sinking_aragonite | mol C m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | eparag100 | ocnBgchem |
| dic_inventory | kg m-2 | time: mean arera: where sea | | | | | | real | longitude latitude time | intdic | ocnBgchem |
| surface_pco2 | uatm | time: mean area: mean where sea | | | | | | real | longitude latitude time | spco2 | ocnBgchem |
| delta_pco2 | uatm | time: mean arera: where sea | | | | | | real | longitude latitude time | dpco2 | ocnBgchem |
| delta_po2 | uatm | time: mean area: mean where sea | | | | | | real | longitude latitude time | dpo2 | ocnBgchem |
| air_to_sea_co2_flux | kg C m-2 s-1 | time: mean arera: where sea | | | | | | real | longitude latitude time | fgco2 | ocnBgchem |
| air_to_sea_o2_flux | mol O2 m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | fgo2 | ocnBgchem |

| | | | | | | |
|--|-----------------|------------------------------------|------|-------------------------|-----------|-----------|
| sea_to_air_dms_flux | mol DMS m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fgdms | ocnBgchem |
| carbon_source_flux | mol C m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | fsc | ocnBgchem |
| carbon_removal_flux | mol C m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | frc | ocnBgchem |
| integrated_nitrogen_fixation | mol N m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | intpn2 | ocnBgchem |
| nitrogen_source_flux | mol N m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fsn | ocnBgchem |
| nitrogen_removal_flux | mol N m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | frn | ocnBgchem |
| iron_source_flux | mol Fe m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fsfe | ocnBgchem |
| iron_removal_flux | mol Fe m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | frfe | ocnBgchem |
| oxygen_minimum | mol O2 m-3 | time: mean arera: where sea | real | longitude latitude time | o2min | ocnBgchem |
| oxygen_minimum_depth | mol O2 m-3 | time: mean area: mean where sea | real | longitude latitude time | zo2min | ocnBgchem |
| calcite_saturation_depth | m | time: mean arera: where sea | real | longitude latitude time | zsatcalc | ocnBgchem |
| aragonite_saturation_depth | m | time: mean area: mean where sea | real | longitude latitude time | zsatarag | ocnBgchem |
| net_dic_rate_of_change | mol C m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fddtdic | ocnBgchem |
| net_din_rate_of_change | mol N m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | fddtdin | ocnBgchem |
| net_dip_rate_of_change | mol P m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fddtdip | ocnBgchem |
| net_dife_rate_of_change | mol Fe m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | fddtdife | ocnBgchem |
| net_disi_rate_of_change | mol Si m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fddtdisi | ocnBgchem |
| net_alkalinity_rate_of_change | eq m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | fddtalk | ocnBgchem |
| net_biological_dic_rate_of_change | mol C m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fbddtdic | ocnBgchem |
| net_biological_din_rate_of_change | mol N m-3 s-1 | time: mean area: mean where sea | real | longitude latitude time | fbddtdin | ocnBgchem |
| net_biological_dip_rate_of_change | mol P m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fbddtdip | ocnBgchem |
| net_biological_dife_rate_of_change | mol Fe m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | fbddtdife | ocnBgchem |
| net_biological_disi_rate_of_change | mol Si m-2 s-1 | time: mean arera: where sea | real | longitude latitude time | fbddtdisi | ocnBgchem |
| net_biological_alkalinity_rate_of_change | eq m-2 s-1 | time: mean area: mean where sea | real | longitude latitude time | fbddtalk | ocnBgchem |

| unconfirmed or proposed standard name | unformatted | | valid min | valid max | mean absolute | mean absolute | positive | type | CMOR dimensions | CMOR variable | realm |
|--|-------------|------------------------------------|-----------|-----------|------------------|------------------|----------|------|---------------------------------|------------------|-------|
| | units | cell_methods | | | min | max | | | | name | |
| | kg | time: mean area: sum where sea | | | | | | real | time | masso | ocean |
| | dbar | time: mean | | | | | | real | longiutude latitude time | pbo | ocean |
| | dbar | time: mean | | | | | | real | longiutude latitude time | pso | ocean |
| | m3 | time: mean area: sum where sea | | | | | | real | time | volo | ocean |
| | m | time: mean | | | | | | real | longiutude latitude time | zos | ocean |
| | m2 | time: mean | | | | | | real | longiutude latitude time | zossq | ocean |
| | m | time: mean area: mean where sea | | | | | | real | time | zosgga | ocean |
| | m | time: mean area: mean where sea | | | | | | real | time | zossga | ocean |
| | m | time: mean area: mean where sea | | | | | | real | time | zostoga | ocean |
| | kg m-2 | time: mean | | | | | | real | longiutude latitude olevel time | masscello | ocean |
| | m | time: mean | | | | | | real | longiutude latitude olevel time | thkcello | ocean |
| | K | time: mean | | | | | | real | longiutude latitude olevel time | thetao | ocean |
| | K | time: mean area: mean where sea | | | | | | real | time | thetaoga | ocean |
| | K | time: mean | | | | | | real | longiutude latitude time | tos | ocean |
| | | | | | | | | | | | ocean |
| | K2 | time: mean | | | | | | real | longiutude latitude time | tossq | ocean |
| | | | | | | | | | | | ocean |
| | psu | time: mean | | | | | | real | longiutude latitude olevel time | so | ocean |
| | psu | time: mean area: mean where sea | | | | | | real | time | soga | ocean |
| | psu | time: mean | | | | | | real | longitude latitude time | sos | ocean |
| | kg m-3 | time: mean | | | | | | real | longiutude latitude olevel time | rhopoto | ocean |
| | yr | time: mean | | | | | | real | longiutude latitude olevel time | agessc | ocean |
| | mol kg-1 | time: mean | | | | | | real | longiutude latitude olevel time | cfc11 | ocean |
| | kg s-1 | time: mean | | | | | | real | longitude latitude time | msftbarot | ocean |
| | m | time: mean | | | | | | real | longitude latitude time | m1otst | ocean |
| | m2 | time: mean | | | | | | real | longitude latitude time | m1otstsq | ocean |

| | | | | | |
|---|--|------|-------------------------|----------|-------|
| m | time: maximum within days time: mean over days | real | longitude latitude time | omldamax | ocean |
| m | time: maximum | real | longitude latitude time | omlmax | ocean |

| unconfirmed or proposed standard name | unformatted | | valid min | valid max | mean absolute | mean absolute | positive | type | CMOR dimensions | CMOR | realm |
|--|-------------|-------------------------------|-----------|-----------|------------------|------------------|----------|------|--------------------------------|------------------|-------|
| | units | cell_methods | | | min | max | | | | variable name | |
| | m s-1 | time: mean | | | | | | real | longitude latitude olevel time | uo | ocean |
| | m s-1 | time: mean | | | | | | real | longitude latitude olevel time | vo | ocean |
| | kg s-1 | time: mean | | | | | | real | longitude latitude olevel time | wmo | ocean |
| | kg2 s-2 | time: mean | | | | | | real | longitude latitude olevel time | wmosq | ocean |
| | kg s-1 | time: mean | | | | | | real | longitude latitude olevel time | umo | ocean |
| | kg s-1 | time: mean | | | | | | real | longitude latitude olevel time | vmo | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude olevel basin time | msftmyz | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude rho basin time | msftmrhoz | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude olevel basin time | msfyyz | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude rho basin time | msfyrhoz | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude olevel basin time | msftmyzba | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude rho basin time | msftmrhozba | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude olevel basin time | msfyyzba | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude rho basin time | msfyrhozba | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfnorth | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfyba | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfydiff | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | 0 | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfy | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfxba | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfxdiff | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfyba | ocean |
| | W | time: mean | | | | | | real | longitude latitude time | hfydiff | ocean |
| | W | time: mean longitude: mean | | | | | | real | latitude basin time | htovgyre | ocean |
| | W | time: mean longitude: mean | | | | | | real | latitude basin time | htovvrt | ocean |
| | kg s-1 | time: mean longitude: mean | | | | | | real | latitude basin time | sltovgyre | ocean |

| | | | | | | | | | | | |
|--------|-------------------------------|--|--|--|--|--|--|------|---------------------|-----------|-------|
| kg s-1 | time: mean longitude: mean | | | | | | | real | latitude basin time | sltovovrt | ocean |
|--------|-------------------------------|--|--|--|--|--|--|------|---------------------|-----------|-------|

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---------------------------------------|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|-----------------|--------------------|-------|
| | kg s-1 | time: mean | | | | | | real | xline time | ? | ocean |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---------------------------------------|-------------------|---|-----------|-----------|-------------------|-------------------|----------|------|--------------------------------|--------------------|--------------|
| | kg m-2 s-1 | time: mean area: mean where ice_free_sea over sea | | | | | | real | longitude latitude time | pr | ocean |
| | kg m-2 s-1 | time: mean area: mean where ice_free_sea over sea | | | | | | real | longitude latitude time | prsn | ocean |
| | kg m-2 s-1 | time: mean area: mean where ice_free_sea over sea | | | | | | real | longitude latitude time | evs | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | friver | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | ficeberg | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | fsitherm | ocean seaIce |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | wfo | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | wfonocorr | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | down | real | longitude latitude time | wfcorr | ocean |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute | mean absolute | positive | type | CMOR dimensions | CMOR variable | realm |
|--|----------------------|------------------------------------|-----------|-----------|------------------|------------------|----------|------|-------------------------|------------------|--------------|
| | | | | | min | max | | | | name | |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | vsfpr | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | vsfevap | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | vsfriver | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | vsfsit | ocean seaIce |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | vsf | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | wfcorr | ocean |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | sfdsi | ocean seaIce |
| | kg m-2 s-1 | time: mean area: mean where sea | | | | | | real | longitude latitude time | sfriver | ocean |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute | mean absolute | positive | type | CMOR dimensions | CMOR variable | realm |
|--|----------------------|--|-----------|-----------|------------------|------------------|----------|------|--------------------------------|------------------|-------|
| | | | | | min | max | | | | name | |
| | W m-2 | time: mean area: whre sea | | | | | up | real | longitude latitude time | hfgeou | ocean |
| | W m-2 | time: mean area: mean where ice_free_sea over sea | | | | | down | real | longitude latitude time | hfrainds | ocean |
| | W m-2 | time: mean area: mean where ice_free_sea over sea | | | | | up | real | longitude latitude time | hfevapds | ocean |
| | W m-2 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | hfrunoffds | ocean |
| | W m-2 | time: mean area: mean where sea | | | | | | real | longitude latitude olevel time | hfsnthermids | ocean |

| | | | | | | | | | | |
|--|-------|--|--|--|--|------|------|--------------------------------|--------------|--------------|
| | W m-2 | time: mean area: mean where sea | | | | | real | longitude latitude olevel time | hfsithermnds | ocean seaIce |
| | W m-2 | time: mean area: mean where sea | | | | | real | longitude latitude olevel time | hfbithermnds | ocean |
| | W m-2 | time: mean area: mean where ice_free_sea over sea | | | | down | real | longitude latitude time | rlds | ocean |
| | W m-2 | time: mean area: mean where ice_free_sea over sea | | | | down | real | longitude latitude time | hfIs | ocean |
| | W m-2 | time: mean area: mean where ice_free_sea over sea | | | | down | real | longitude latitude time | hfss | ocean |
| net_downward_shortwave_flux_at_sea _water_surface | W m-2 | time: mean area: mean where sea | | | | down | real | longitude latitude time | rsntds | ocean |
| | W m-2 | time: mean area: mean where sea | | | | down | real | longitude latitude olevel time | rsds | ocean |
| | W m-2 | time: mean area: mean where sea | | | | down | real | longitude latitude time | hfcorr | ocean |
| downward_heat_flux_at_sea_water_sur face | W m-2 | time: mean area: mean where sea | | | | down | real | longitude latitude time | hfds | ocean |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|------------------------------------|-----------|-----------|-------------------------|-------------------------|----------|------|-------------------------|--------------------------|-------|
| | N m-2 | time: mean area: mean where sea | | | | | down | real | longitude latitude time | tauuo | ocean |
| | N m-2 | time: mean area: mean where sea | | | | | down | real | longitude latitude time | tauvo | ocean |
| | N m-2 | time: mean area: mean where sea | | | | | down | real | longitude latitude time | tauucorr | ocean |
| | N m-2 | time: mean area: mean where sea | | | | | down | real | longitude latitude time | tauvcorr | ocean |

CMOR Table Lmon: Monthly Mean Land Fields, Including

Lmon

Physical, Vegetation, Soil, and Biogeochemical Variables

(All fields should be saved on the atmospheric grid; unless otherwise indicated, values are averaged over only the land portion of each grid cell and report 0.0 where land fraction is 0.)

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|------------------------------------|--|---|----------------------|--|
| 1 | Moisture in Upper 0.1 m of Soil Column | kg m ⁻² | Compute the mass of water in all phases in the upper 0.1 meters of soil. | | mrsos | moisture_content_of_soil_layer |
| 1 | Total Soil Moisture Content | kg m ⁻² | Compute the mass per unit area (summed over all soil layers) of water in all phases. | | mrso | soil_moisture_content |
| 1 | Soil Frozen Water Content | kg m ⁻² | Compute the mass (summed over all layers) of frozen water. | | mrlso | soil_frozen_water_content_ |
| 1 | Surface Runoff | kg m ⁻² s ⁻¹ | Compute the total surface runoff leaving the land portion of the grid cell. | | mrros | surface_runoff_flux |
| 1 | Total Runoff | kg m ⁻² s ⁻¹ | compute the total runoff (including "drainage" through the base of the soil model) leaving the land portion of the grid cell. | | mrro | runoff_flux |
| 2 | Precipitation onto Canopy | kg m ⁻² s ⁻¹ | Report the precipitation flux that is intercepted by the vegetation canopy (if present in model) before reaching the ground. | | prveg | precipitation_flux_onto_canopy |
| 1 | Evaporation from Canopy | kg m ⁻² s ⁻¹ | Report the canopy evaporation+sublimation (if present in model). | | evspsblveg | water_evaporation_flux_from_canopy |
| 2 | Transpiration Beta Factor | 1 | | How is this defined? Can it be calculated in most models? Is it really dimensionless? | btran | |
| 1 | Water Evaporation from Soil‡ | kg m ⁻² s ⁻¹ | includes sublimation. | what is the meaning of "‡" in the long name? | evspsblsoi | water_evaporation_flux_from_soil |
| 1 | Transpiration‡ | kg m ⁻² s ⁻¹ | | what is the meaning of "‡" in the long name? | tran | transpiration_flux |
| 1 | Water Content of Soil Layer‡ | kg m ⁻² | in each soil layer, the mass of water in all phases, including ice. | what is the meaning of "‡" in the long name? | mrlsl | moisture_content_of_soil_layer |
| 2 | Temperature of Soil | K | Temperature of each soil layer. Report as "missing" for grid cells occupied entirely by "sea". | | tsl | |
| 1 | Tree Cover Fraction | % | fraction of entire grid cell that is covered by trees. | | treeFrac | Two options for all these names: 1) Use existing standard name <i>area_fraction</i> + a scalar coordinate variable with existing standard name <i>area_type</i> . The area type names (with definitions) would then need to be proposed for inclusion in the new <i>area_type</i> table. 2) Propose the individual X_fraction names (by analogy with <i>cloud_area_fraction</i> , etc.) N.B. Neither option has been proposed so far. I recommend the first option because the <i>area_types</i> would then also be available |
| 1 | Natural Grass Fraction | % | fraction of entire grid cell that is covered by natural grass. | | grassFrac | |
| 1 | Shrub Fraction | % | fraction of entire grid cell that is covered by shrub. | | shrubFrac | |
| 1 | Crop Fraction | % | fraction of entire grid cell that is covered by crop. | | cropFrac | |
| 1 | Anthropogenic Pasture Fraction | % | fraction of entire grid cell that is covered by anthropogenic pasture. | | pastureFrac | |
| 1 | Bare Soil Fraction | % | fraction of entire grid cell that is covered by bare soil. | | baresoilFrac | |
| 1 | Fraction of Grid Cell that is Land but Neither Vegetation-Covered nor Bare Soil | % | fraction of entire grid cell that is land and is covered by "non-vegetation" and "non-bare-soil" (e.g., urban, ice, lakes, etc.) | | residualFrac | |
| 1 | Burnt Area Fraction | % | fraction of entire grid cell that is covered by burnt vegetation. | | burntArea | |

| Land Carbon & Biogeochemistry | | | | |
|-------------------------------|--|---|-------------|--|
| 1 | Carbon in Vegetation | kg C m ⁻² | cVeg | vegetation_carbon_content |
| 1 | Carbon in Litter Pool | kg C m ⁻² | cLitter | litter_carbon_content |
| 1 | Carbon in Soil Pool | kg C m ⁻² | cSoil | soil_carbon_content |
| 1 | Carbon in Products of Land Use Change | kg C m ⁻² | cProduct | |
| 1 | Leaf Area Fraction | % | lai | leaf_area_index |
| 1 | Gross Primary Production | kg C m ⁻² s ⁻¹ | gpp | gross_primary_productivity_of_carbon? |
| 1 | Autotrophic (Plant) Respiration | kg C m ⁻² s ⁻¹ | ra | plant_respiration_carbon_flux? |
| 1 | Net Primary Production | kg C m ⁻² s ⁻¹ | npp | net_primary_productivity_of_carbon? |
| 1 | Heterotrophic Respiration | kg C m ⁻² s ⁻¹ | rh | heterotrophic_respiration_carbon_flux? |
| 1 | CO2 Emission from Fire | kg C m ⁻² s ⁻¹ | fFire | |
| | | CO2 emissions from natural fires + human ignition fires as calculated by the fire module of the DGVM, but excluding any CO2 flux from fire reported under variable Lmon 58 | | |
| 1 | CO2 Flux to Atmosphere from Grazing | kg C m ⁻² s ⁻¹ | fGrazing | |
| 1 | CO2 Flux to Atmosphere from Crop Harvesting | kg C m ⁻² s ⁻¹ | fHarvest | |
| 1 | CO2 Flux to Atmosphere from Land Use Change | kg C m ⁻² s ⁻¹ | fLuc | |
| | | human changes to land accounting possibly for different time-scales related to fate of the wood, for example. | | |
| 1 | Net Biospheric Productivity | kg C m ⁻² s ⁻¹ | nbr | |
| | | This is the net flux between land and atmosphere defined as photosynthesis MINUS the sum of plant and soil respiration, carbonfluxes from fire, harvest, grazing and land use change. Positive flux is into the land. | | |
| 1 | Total Carbon Flux from Vegetation to Litter | kg C m ⁻² s ⁻¹ | fVegLitter | litter_carbon_flux? |
| 1 | Total Carbon Flux from Litter to Soil | kg C m ⁻² s ⁻¹ | fLitterSoil | |
| 1 | Total Carbon Flux from Vegetation Directly to Soil | kg C m ⁻² s ⁻¹ | fVegSoil | |
| | | In some models part of carbon (e.g., root exudate) can go directly into the soil pool without entering litter. | | |

| | | | | | |
|---|-------------------------------------|----------------------|--|---|---------------|
| 2 | Carbon in Leaves | kg C m ⁻² | | This field and some of the following may sum to yield some of the more generic carbon pool totals given above. | cLeaf |
| 2 | Carbon in Wood | kg C m ⁻² | including sapwood and hardwood. | | cWood |
| 2 | Carbon in Roots | kg C m ⁻² | including fine and coarse roots. | | cRoot |
| 2 | Carbon in Other Living Compartments | kg C m ⁻² | e.g., labile, fruits, reserves, | | cMisc |
| 2 | Carbon in Coarse Woody Debris | kg C m ⁻² | | | cCwd |
| 2 | Carbon in Above-Ground Litter | kg C m ⁻² | | | cLitterAbove |
| 2 | Carbon in Below-Ground Litter | kg C m ⁻² | | Is "below-ground" litter distinguishable from soil? | cLitterBelow |
| 2 | Carbon in Fast Soil Pool | kg C m ⁻² | fast is meant as lifetime of less than 10 years for reference climate conditions (20°C, no water limitations). | | cSoilFast |
| 2 | Carbon in Medium Soil Pool | kg C m ⁻² | medium is meant as lifetime of more than than 10 years and less than 100 years for reference climate conditions (20°C, no water limitations) | | cSoilMedium |
| 2 | Carbon in Slow Soil Pool | kg C m ⁻² | fast is meant as lifetime of more than 100 years for reference climate conditions (20°C, no water limitations) | | cSoilSlow |
| 2 | Fractional Land Cover of PFT | % | | using each individual ESM PFT definition. This includes natural PFTs, anthropogenic PFTs, bare soil, lakes, urban areas, etc. Sum of all should equal the fraction of the grid-cell that is land. Note that the "types" will be model dependent and for each type there should be a full description of the PFT (plant functional type). To facilitate model comparison, it is also requested that the aggregated land cover types called for in lines 25 to 32 be archived | landCoverFrac |

| | | | | | |
|---|--|--------------------------------------|--|--|------------------|
| 2 | Total Primary Deciduous Tree Cover Fraction | % | Agregation of model PFTs as defined in 1st priority to aid model intercomparison. This is the fraction of the entire grid cell that is covered by "total primary deciduous trees." | | treeFracPrimDec |
| 2 | Total Primary Evergreen Tree Cover Fraction | % | fraction of entire grid cell that is covered by primary evergreen trees. | | treeFracPrimEver |
| 2 | Total Secondary Deciduous Tree Cover Fraction | % | fraction of entire grid cell that is covered by secondary deciduous trees. | | treeFracSecDec |
| 2 | Total Secondary Evergreen Tree Cover Fraction | % | fraction of entire grid cell that is covered by secondary evergreen trees. | | treeFracSecEver |
| 2 | Total C3 PFT Cover Fraction | % | fraction of entire grid cell that is covered by C3 PFTs (including grass, crops, and trees). | | c3PftFrac |
| 2 | Total C4 PFT Cover Fraction | % | fraction of entire grid cell that is covered by C4 PFTs (including grass and crops). | | c4PftFrac |
| 2 | Growth Autotrophic Respiration | kg C m ⁻² s ⁻¹ | This and the following is a breakdown of the flux given in FIRST PRIORITY; thus, the sum should be identical to the earlier total fluxes. | I don't understand this. Be explicit about which terms should add together to equal earlier fluxes. | rGrowth |
| 2 | Maintenance Autotrophic Respiration | kg C m ⁻² s ⁻¹ | | Is "maintenance" precisely defined? Can we make it more understandable to the non-specialist? | rMaint |
| 2 | CO2 Flux from Atmosphere due to NPP Allocation to Leaf | kg C m ⁻² s ⁻¹ | This is the rate of carbon uptake by leaves due to NPP | | nppLeaf |
| 2 | CO2 Flux from Atmosphere due to NPP Allocation to Wood | kg C m ⁻² s ⁻¹ | This is the rate of carbon uptake by wood due to NPP | | nppWood |
| 2 | CO2 Flux from Atmosphere due to NPP Allocation to Root | kg C m ⁻² s ⁻¹ | This is the rate of carbon uptake by roots due to NPP | | nppRoot |
| ? | CO2 Flux to Atmosphere from Deforestation | kg C m ⁻² s ⁻¹ | human land use inducing forest to crops or pasture transition. This flux should account possibly for different time-scales related to fate of the wood, for example. | I don't understand the explanation written here. Does it differ from an earlier entry: CO2 flux to atmosphere from land use change? How? | fco2Deforest |
| ? | CO2 Flux to Atmosphere from Wood Harvest | kg C m ⁻² s ⁻¹ | human land use inducing forest to forest rotation. This flux should account possibly for different time-scales related to fate of the wood, for example. | I don't understand the explanation written here. Does it differ from an earlier entry: CO2 flux to atmosphere from land use change? How? | fco2WoodHarv |

Two options for all these names:
 1) Use existing standard name `area_fraction` + a scalar coordinate variable with existing standard name `area_type`. The area type names (with definitions) would then need to be proposed for inclusion in the new `area_type` table. 2) Propose the individual `X_fraction` names (by analogy with `cloud_area_fraction`, etc.) N.B. Neither option has been proposed so far. I recommend the first option because the `area_types` would then also be available

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|-------------------|----------------------------------|-----------|-----------|-------------------|-------------------|----------|------|---------------------------------|--------------------|-------|
| | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time sdepth1 | mrsos | land |
| | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time | mrso | land |
| | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time | mrlso | land |
| | kg m-2 s-1 | time: mean area: mean where land | | | | | | real | longitude latitude time | mrros | land |
| | kg m-2 s-1 | time: mean area: mean where land | | | | | | real | longitude latitude time | mrro | land |
| | kg m-2 s-1 | time: mean area: mean where land | | | | | | real | longitude latitude time | prveg | land |
| | kg m-2 s-1 | time: mean area: mean where land | | | | | up | real | longitude latitude time | evspsblveg | land |
| transpiration_beta_factor NOT PROPOSED | 1 | time: mean | | | | | | real | longitude latitude time | btran | land |
| | kg m-2 s-1 | time: mean area: mean where land | | | | | up | real | longitude latitude time | evspsblsoi | land |
| | kg m-2 s-1 | time: mean area: mean where land | | | | | up | real | longitude latitude time | tran | land |
| water_content_of_soil_layer | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude sdepth time | mrlsl | land |
| temperature_of_soil_layer NOT PROPOSED | K | time: mean | | | | | | real | longitude latitude sdepth time | tsl | land |
| tree_cover_fraction | % | time: mean | | | | | | real | longitude latitude time | treeFrac | land |
| natural_grass_fraction | % | time: mean | | | | | | real | longitude latitude time | grassFrac | land |
| shrub_fraction | % | time: mean | | | | | | real | longitude latitude time | shrubFrac | land |
| crop_fraction | % | time: mean | | | | | | real | longitude latitude time | cropFrac | land |
| anthropogenic_pasture_fraction | % | time: mean | | | | | | real | longitude latitude time | pastureFrac | land |
| bare_soil_fraction | % | time: mean | | | | | | real | longitude latitude time | baresoilFrac | land |
| fraction_of_grid_cell_which_is_non_vegetation_and_non_bare_soil | % | time: mean | | | | | | real | longitude latitude time | residualFrac | land |
| burnt_area_fraction | % | time: mean | | | | | | real | longitude latitude time | burntArea | land |

| | | | | | | | | | |
|--|--------------|-------------------------------------|----|--|------|-------------------------|-------------|--|------|
| | | | | | | | | | land |
| | kg C m-2 | time: mean area: mean where land | | | real | longitude latitude time | cVeg | | land |
| | kg C m-2 | time: mean area: mean where land | | | real | longitude latitude time | cLitter | | land |
| | kg C m-2 | time: mean area: mean where land | | | real | longitude latitude time | cSoil | | land |
| carbon_in_products_of_luc NOT PROPOSED | kg C m-2 | time: mean area: mean where land | | | real | longitude latitude time | cProduct | | land |
| | % | time: mean area: mean where land | | | real | longitude latitude time | lai | | land |
| gross_primary_production | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | gpp | | land |
| autotrophic_plant_respiration | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | ra | | land |
| net_primary_production | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | npp | | land |
| heterotrophic_respiration | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | rh | | land |
| co2_emission_from_fire NOT PROPOSED – recommend | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | fFire | | land |
| tendency_of_atmosphere_mass_content_of_carbon_dioxide_due_to_biomass_burning for consistency with chemistry names | | | | | | | | | |
| co2_flux_to_atmosphere_from_grazing NOT PROPOSED – recommend | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | fGrazing | | land |
| tendency_of_atmosphere_mass_content_of_carbon_dioxide_due_to_grazing for consistency with chemistry names | | | | | | | | | |
| co2_flux_to_atmosphere_from_crop_harvesting NOT PROPOSED – recommend | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | fHarvest | | land |
| tendency_of_atmosphere_mass_content_of_carbon_dioxide_due_to_crop_harvesting for consistency with chemistry names | | | | | | | | | |
| co2_flux_to_atmosphere_from_land_use_change NOT PROPOSED – recommend | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | fLuc | | land |
| tendency_of_atmosphere_mass_content_of_carbon_dioxide_due_to_land_use_change for consistency with chemistry names | | | | | | | | | |
| net_biospheric_productivity Is this the same as net_primary_productivity_of_carbon (also in cell G53)? | kg C m-2 s-1 | time: mean area: mean where land | up | | real | longitude latitude time | nbr | | land |
| total_carbon_flux_from_vegetation_to_litter | kg C m-2 s-1 | time: mean area: mean where land | | | real | longitude latitude time | fVegLitter | | land |
| total_carbon_flux_from_litter_to_soil NOT PROPOSED – recommend | kg C m-2 s-1 | time: mean area: mean where land | | | real | longitude latitude time | fLitterSoil | | land |
| carbon_flux_from_litter_into_soil for consistency with water and salt flux names | | | | | | | | | |
| total_carbon_flux_from_vegetation_directly_to_soil NOT PROPOSED – recommend | kg C m-2 s-1 | time: mean area: mean where land | | | real | longitude latitude time | fVegSoil | | land |
| carbon_flux_into_soil_from_plants_excluding_litter for consistency with water and salt flux names and runoff names | | | | | | | | | |

| | | | | | | |
|--|----------|-------------------------------------|------|---------------------------------|---------------|------|
| carbon_in_leaves NOT PROPOSED – recommend leaf_carbon_content for consistency with soil_carbon_content, etc. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cLeaf | land |
| carbon_in_wood NOT PROPOSED – recommend wood_carbon_content for consistency with soil_carbon_content, etc. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cWood | land |
| carbon_in_roots NOT PROPOSED – recommend root_carbon_content for consistency with soil_carbon_content, etc. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cRoot | land |
| carbon_in_other_living_compartments NOT PROPOSED – this should also be a carbon_content name, and we probably need something more specific than 'other_living_compartments' but I'm stuck for a suggestion here. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cMisc | land |
| carbon_in_coarse_woody_debris – NOT PROPOSED – recommend coarse_wood_debris_carbon_content or just wood_debris_carbon_content for consistency with soil_carbon_content, etc. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cCwd | land |
| carbon_in_aboveground_litter NOT PROPOSED – recommend surface_litter_carbon_content for consistency with soil_carbon_content, etc. and runoff names | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cLitterAbove | land |
| carbon_in_aboveground_litter N.B. Should this be belowground litter? NOT PROPOSED – recommend subsurface_litter_carbon_content for consistency with soil_carbon_content, etc. and runoff names | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cLitterBelow | land |
| carbon_in_fast_soil_pool NOT PROPOSED – recommend fast_soil_pool_carbon_content for consistency with soil_carbon_content, etc. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cSoilFast | land |
| medium_soil_pool NOT PROPOSED – recommend medium_soil_pool_carbon_content for consistency with soil_carbon_content, etc. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cSoilMedium | land |
| carbon_in_slow_soil_pool NOT PROPOSED – recommend slow_soil_pool_carbon_content for consistency with soil_carbon_content, etc. | kg C m-2 | time: mean area: mean where land | real | longitude latitude time | cSoilSlow | land |
| fractional_land_cover_types NOT PROPOSED – is this actually a separate standard name or just a list of types as in the new area type table? | % | time: mean | real | longitude latitude vegtype time | landCoverFrac | land |

| | | | | | | | | |
|---|--------------|----------------------------------|--|------|------|-------------------------|-----------------|------|
| total_primary_deciduous_tree_cover_fraction | % | time: mean | | | real | longitude latitude time | treeFracPrimDec | land |
| total_primary_evergreen_tree_cover_fraction | % | time: mean | | | real | longitude latitude time | reeFracPrimEve | land |
| total_secondary_deciduous_tree_cover_fraction | % | time: mean | | | real | longitude latitude time | treeFracSecDec | land |
| total_secondary_evergreen_tree_cover_fraction | % | time: mean | | | real | longitude latitude time | treeFracSecEver | land |
| total_c3_pft_cover_fraction | % | time: mean | | | real | longitude latitude time | c3PftFrac | land |
| total_c4_pft_cover_fraction | % | time: mean | | | real | longitude latitude time | c4PftFrac | land |
| growth_autotrophic_respiration NOT PROPOSED – recommend plant_respiration_carbon_flux_due_to_growth for consistency with row 52 | kg C m-2 s-1 | time: mean area: mean where land | | up | real | longitude latitude time | rGrowth | land |
| maintenance_autotrophic_respiration NOT PROPOSED – recommend plant_respiration_carbon_flux_due_to_maintenance for consistency with row 52 (what is 'maintenance?') | kg C m-2 s-1 | time: mean area: mean where land | | up | real | longitude latitude time | rMaint | land |
| npp_allocation_to_leaf NOT PROPOSED – what is npp? Don't understand this quantity. | kg C m-2 s-1 | time: mean area: mean where land | | down | real | longitude latitude time | nppLeaf | land |
| npp_allocation_to_wood NOT PROPOSED – what is npp? Don't understand this quantity. | kg C m-2 s-1 | time: mean area: mean where land | | down | real | longitude latitude time | nppWood | land |
| npp_allocation_to_root NOT PROPOSED – what is npp? Don't understand this quantity. | kg C m-2 s-1 | time: mean area: mean where land | | down | real | longitude latitude time | nppRoot | land |
| co2_flux_to_atmosphere_from_deforestation NOT PROPOSED – recommend tendency_of_atmosphere_mass_content_of_carbon_dioxide_due_to_deforestation for consistency with chemistry names | kg C m-2 s-1 | time: mean area: mean where land | | up | real | longitude latitude time | fco2Deforest | land |
| co2_flux_to_atmosphere_from_wood_harvest NOT PROPOSED – recommend tendency_of_atmosphere_mass_content_of_carbon_dioxide_due_to_wood_harvesting for consistency with chemistry names | kg C m-2 s-1 | time: mean area: mean where land | | up | real | longitude latitude time | fco2WoodHarv | land |

CMOR Table LImon: Monthly Mean Land Cryosphere Fields

Limon

(All fields should be saved on the atmospheric grid; unless otherwise indicated, values are averaged over only the land portion of each grid cell and report 0.0 where land fraction is 0.)

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|------------------------------------|--------------------|---|---|----------------------|---|
| 1 | Snow Area Fraction | % | Fraction of each grid cell that is occupied by snow that rests on land portion of cell. | | snc | surface_snow_area_fraction |
| 1 | Surface Snow Amount | kg m ⁻² | Compute as the mass of surface snow on the land portion of the grid cell divided by the land area in the grid cell; report as 0.0 where the land fraction is 0; exclude snow on vegetation canopy or on sea ice. | | snw | surface_snow_amount |
| 1 | Snow Depth | m | where land over land. Compute the mean thickness of snow in the land portion of the grid cell (averaging over the entire land portion, including the snow-free fraction. Report as 0.0 where the land fraction is 0. | | snd | surface_snow_thickness |
| 2 | Liquid Water Content of Snow Layer | kg m ⁻² | where land over land: compute the total mass of liquid water contained interstitially within the snow layer of the land portion of a grid cell divided by the area of the land portion of the cell. | | lwsnl | liquid_water_content_of_snow_layer |
| 1 | Soil Frozen Water Content | kg m ⁻² | summed over all soil layers, where land over land: compute by dividing the total mass of frozen water contained in the soil layer of the grid cell by the land area in the grid cell; report as 0.0 where the land fraction is 0. | | mrfso | soil_frozen_water_content |
| 2 | Soil Water Content | kg m ⁻² | summed over all soil layers, where land over land: compute by dividing the total mass of water (both liquid and ice) contained in the soil layer of the grid cell by the land area in the grid cell; report as 0.0 where the land fraction is 0. | | mfrso | soil_water_content |
| 1 | Snow Grain Size | m | When computing the time-mean here, the time-samples, weighted by the mass of snow on the the land portion of the grid cell, are accumulated and then divided by the sum of the weights. | Unless "grain size" is precisely defined, this variable will be eliminated. How, exactly, is "grain size" defined? Is it a radius, a diameter, or what? What is the correct cell_method for time? | grainsizesn | |
| 2 | Snow Soot Content | kg m ⁻² | Consider the entire land portion of the grid cell, with snow soot content set to 0.0 in regions free of snow. | | sootsn | |
| 1 | Snow Age | day | When computing the time-mean here, the time samples, weighted by the mass of snow on the land portion of the grid cell, are accumulated and then divided by the sum of the weights. Report as "missing in regions free of snow on land. | | agesno | |
| 1 | Snow Internal Temperature | K | This temperature is averaged over all the snow in the grid cell that rests on land or land ice. When computing the time-mean here, the time samples, the weighted by the mass of snow on the land portion of the grid cell, are accumulated and then divided by the sum of the weights. Report as "missing in regions free of snow on land | Is this an average of the entire snow layer? | tsn | |
| 2 | Snow Thermal Energy Content | J m ⁻² | the energy content is taken to be 0 J for snow at 0 Celcius. This quantity is averaged over all the snow in the grid cell that rests on land or land ice. When computing the time-mean here, the time samples, weighted by the mass of snow on the land portion of the grid cell, are accumulated and then divided by the sum of the weights. Report as "missing in regions free of snow on land. | Unless someone can convince me this is essential, this variable will be removed. Do we need this quantity if we have the snow_internal_temperature and snow_amount (i.e., mass)? | esn | |

| | | | | | |
|---|---|----------------------------------|---|----------|------------------------|
| 1 | Surface Snow Melt | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute as the total surface melt water on the land portion of the grid cell divided by the land area in the grid cell; report as 0.0 for snow-free land regions; report as 0.0 where the land fraction is 0. | snm | surface_snow_melt_flux |
| 1 | Surface Snow and Ice Sublimation Flux | $\text{kg m}^{-2} \text{s}^{-1}$ | The snow and ice sublimation flux is the loss of snow and ice mass resulting from their conversion to water vapor. Compute as the total sublimation on the land portion of the grid cell divided by the land area in the grid cell; report as 0.0 for snow-free land regions; report as 0.0 where the land fraction is 0. | sbl | |
| 1 | Downward Heat Flux into Snow Where Land over Land | W m^{-2} | Compute the net downward heat flux from the atmosphere into the snow that lies on land divided by the land area in the grid cell; report as 0.0 for snow-free land regions or where the land fraction is 0. | hfdsn | |
| 3 | Permafrost Layer Thickness | m | where land over land. Compute the mean thickness of the permafrost layer in the land portion of the grid cell. Report as 0.0 in permafrost-free regions. | tpf | |
| 3 | Liquid Water Content of Permafrost Layer | kg m^{-2} | "where land over land", i.e., this is the total mass of liquid water contained within the permafrost layer within the land portion of a grid cell divided by the area of the land portion of the cell. | pflw | |
| 3 | Active Layer Thickness | m | This variable will be eliminated unless the following question is answered: How, exactly, is active layer defined? | activelt | |
| 3 | Liquid Water Content of Active Layer | kg m^{-2} | This variable will be eliminated unless the following questions are answered: where land over land? How, exactly, is active layer defined? | allw | |
| 3 | Temperature Profile in Active/Permafrost Layers | K | This variable will be eliminated unless the following questions are answered: Define "profile". So is this a multi-layer field (i.e., 3d, not 2d)? Where land over land? | tapl | |
| 3 | Equilibrium Line Altitude | m | This variable will be eliminated unless the following question is answered: How, exactly, is this defined? | ela | |
| 3 | Freezing Line Altitude | m | This variable will be eliminated unless the following question is answered: How, exactly, is this defined? | fla | |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|-------------------------------------|-----------|-----------|-------------------------|-------------------------|----------|------|-------------------------|--------------------------|--------------|
| | % | time: mean | | | | | | real | longitude latitude time | snc | landIce land |
| | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time | snw | landIce land |
| | m | time: mean area: mean where land | | | | | | real | longitude latitude time | snd | landIce land |
| | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time | lwsnl | landIce land |
| | kg m-2 | time: mean | | | | | | real | longitude latitude time | mrfso | landIce land |
| | kg m-2 | time: mean | | | | | | real | longitude latitude time | mfrso | landIce land |
| snow_grain_size | m | time: mean area: mean where land | | | | | | real | longitude latitude time | grainsizesn | landIce land |
| snow_soot_content | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time | sootsn | landIce land |
| snow_age | day | time: mean area: mean where land | | | | | | real | longitude latitude time | agesno | landIce land |
| snow_temperature | K | time: mean area: mean where land | | | | | | real | longitude latitude time | tsn | landIce land |
| snow_thermal_energy | J m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time | esn | landIce land |

| | | | | | | | |
|---|------------|-------------------------------------|------|------|--------------------------------|----------|--------------|
| | kg m-2 s-1 | time: mean area: mean where land | | real | longitude latitude time | snm | landIce land |
| | kg m-2 s-1 | time: mean area: mean where land | | real | longitude latitude time | sbl | landIce land |
| net_downward_heat_flux | W m-2 | time: mean area: mean where land | down | real | longitude latitude time | hfdsn | landIce land |
| permafrost_layer_thickness | m | time: mean area: mean where land | | real | longitude latitude time | tpf | landIce land |
| liquid_water_content_of_permafrost_layer | kg m-2 | time: mean area: mean where land | | real | longitude latitude time | pflw | landIce land |
| active_layer_thickness | m | time: mean | | real | longitude latitude time | activelt | landIce land |
| liquid_water_content_of_active_layer | kg m-2 | time: mean | | real | longitude latitude time | allw | landIce land |
| temperature_profile_in_active/permafrost_layers | K | time: mean | | real | longitude latitude sdepth time | tapl | landIce land |
| equilibrium_line_altitude | m | time: mean | | real | longitude latitude time | ela | landIce land |
| freezing_line_altitude | m | time: mean | | real | longitude latitude time | fla | landIce land |

CMOR Table Olmon: Monthly Mean Ocean Cryosphere Fields

Oimon

(All saved on the ocean grid; unless otherwise indicated, values are averaged over only the ocean portion of each grid cell and report 0.0 where ocean fraction is 0.)

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|------------------------------------|---|---|----------------------|---|
| 1 | Sea Ice Area Fraction | % | fraction of grid cell covered by sea ice. | | sic | sea_ice_area_fraction |
| 1 | Sea Ice Thickness | m | Compute the mean thickness of sea ice in the ocean portion of the grid cell (averaging over the entire ocean portion, including the ice-free fraction). Report as 0.0 in regions free of sea ice. | | sit | sea_ice_thickness |
| 1 | Water Evaporation Flux from Sea Ice | kg m ⁻² s ⁻¹ | Compute the average rate that water mass evaporates (or sublimates) from the sea ice surface (i.e., kg/s) divided by the area of the ocean (i.e., open ocean + sea ice) portion of the grid cell. This quantity multiplied both by the ocean area of the grid cell and by the length of the month should yield the total mass of water evaporated (or sublimated) from the sea ice. Report as 0.0 in regions free of sea ice. | For consistency throughout, mass and heat fluxes for sea ice covered regions are all now calculated "where sea ice over sea" whereas in CMIP3 this particular flux was calculated in a different way. | evap | water_evaporation_flux |
| 1 | Snow Depth | m | Compute the mean thickness of snow in the ocean portion of the grid cell (averaging over the entire ocean portion, including the snow-free ocean fraction). Report as 0.0 in regions free of snow-covered sea ice. | | snd | surface_snow_thickness |
| 2 | Surface Snow Area Fraction | % | Fraction of entire grid cell covered by snow that lies on sea ice; exclude snow that lies on land or land ice. | | snc | surface_snow_area_fraction |
| 1 | Bare Sea Ice Albedo | 1 | Report as "missing" if there is no sunlight or if a region is free of sea ice. | Will this vary from year to year or is it a property of "bare sea ice" and sun angle? How is the time-mean calculated? | ialb | |
| 2 | Sea Ice Thickness in Categories | m | where sea over sea: For each sea ice category, compute the mean thickness of that type of sea ice in the ocean portion of the grid cell (averaging over the entire ocean portion). Report as 0.0 in regions where the given category of sea ice is absent. | What are the requested categories? Need to specify how time-averaging is done. Is the following method correct? "When computing the time-mean here, the time sample thicknesses, weighted by the area of sea ice in the grid cell, are accumulated and then divided by the sum of the weights." | sitn | |
| 2 | Sea Ice Area Fraction in Categories | % | fraction of entire grid cell occupied by each sea-ice type (i.e., category) expressed as a percentage | What are the requested categories? | sicn | |
| 3 | Sea Ice Salinity | psu | When computing the time-mean here, the time-samples, weighted by the mass of sea ice in the grid cell, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | | ssi | |
| 1 | Surface Temperature of Sea Ice | K | When computing the time-mean here, the time-samples, weighted by the area of sea ice in the grid cell, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. Note this will be the surface snow temperature in regions where snow covers the sea ice. | | tsice | |
| 1 | Temperature at Interface Between Sea Ice and Snow | K | When computing the time-mean here, the time-samples, weighted by the area of snow-covered sea ice in the grid cell, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of snow-covered sea ice. | | tsnint | |

| | | | | | |
|---|---|----------------------------------|--|-----------|--|
| 1 | Surface Rainfall Rate into the Sea Ice Portion of the Grid Cell | $\text{kg m}^{-2} \text{s}^{-1}$ | where sea ice over sea: compute the the water mass per unit time falling as rain onto the sea ice portion of a grid cell divided by the area of the ocean portion of the grid cell (including both ice-free and sea-ice covered fractions). Report as 0. in regions free of sea ice. | pr | |
| 1 | Surface Snowfall Rate into the Sea Ice Portion of the Grid Cell | $\text{kg m}^{-2} \text{s}^{-1}$ | where sea ice over sea: compute the the water mass per unit time falling as snow onto the sea ice portion of a grid cell divided by the area of the ocean portion of the grid cell (including both ice-free and sea-ice covered fractions). Report as 0. in regions free of sea ice. | prsn | |
| 3 | Age of Sea Ice | years | When computing the time-mean here, the time samples, weighted by the mass of sea ice in the grid cell, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | ageice | |
| 1 | Frazil Sea Ice Growth (Leads) Rate | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute the rate of change of sea ice mass due to frazil sea ice formation divided by the area of the ocean portion of the grid cell. Report as 0.0 in regions free of sea ice. | grFrazil | |
| 1 | Congelation Sea Ice Growth Rate | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute the rate of change of sea ice mass due to congelation sea ice divided by the area of the ocean portion of the grid cell. Report as 0.0 in regions free of sea ice. | grCongel | |
| 1 | Lateral Sea Ice Growth Rate | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute the rate of change of sea ice mass due to lateral growth alone of the sea ice divided by the area of the ocean portion of the grid cell. Report as 0.0 in regions free of sea ice. | grLateral | |
| 1 | Snow-Ice Formation Rate | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute the rate of change of sea ice mass due to transformation of snow to sea ice, divided by the area of the ocean portion of the grid cell. Report as 0.0 in regions free of snow-covered sea ice. | snoToIce | |
| 1 | Snow Melt Rate | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute the rate of change of snow mass due to melting, divided by the area of the ocean portion of the grid cell. Report as 0.0 in regions free of sea ice. | snomelt | Should this include falling snow that melts on impact with the liquid ocean? |
| 1 | Rate of Melt at Upper Surface of Sea Ice | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute the rate of change of sea ice mass due to melting at its upper surface, divided by the area of the ocean portion of the grid cell. Report as 0.0 in regions free of sea ice. | tmelt | Should this also include melting of snow that covers sea ice? |
| 1 | Rate of Melt at Sea Ice Base | $\text{kg m}^{-2} \text{s}^{-1}$ | Compute the rate of change of sea ice mass due to melting at its lower surface, divided by the area of the ocean portion of the grid cell. Report as 0.0 in regions free of sea ice. | bmelt | Is this field already requested in O_mon? |
| 2 | Sea Ice Total Heat Content | J | Ice at 0 Celsius is assumed taken to have a heat content of 0 J. When averaging over time, this quantity is weighted by the mass of sea ice. Report as "missing in regions free of snow on land. | hcice | should this include heat content of snow on sea ice? |
| 1 | Downward Shortwave over Sea Ice | W m^{-2} | Compute the downward shortwave flux in regions of sea ice divided by the area of the ocean portion of the grid cell. | rsdssi | priority was raised from 2 to 1 because snow albedo was deleted. surface_downwelling_shortwave_flux_in_air |
| 1 | Upward Shortwave over Sea Ice | W m^{-2} | Compute the upward shortwave flux in regions of sea ice divided by the area of the ocean portion of the grid cell. | rsussi | priority was raised from 2 to 1 because snow albedo was deleted. surface_upwelling_shortwave_flux_in_air |
| 2 | Downward Long Wave over Sea Ice | W m^{-2} | Compute the downward longwave flux in regions of sea ice divided by the area of the ocean portion of the grid cell. | rdssi | surface_downwelling_longwave_flux_in_air |
| 2 | Upward Long Wave over Sea Ice | W m^{-2} | Compute the upward longwave flux in regions of sea ice divided by the area of the ocean portion of the grid cell. | rlussi | surface_upwelling_longwave_flux_in_air |
| 2 | Surface Upward Sensible Heat Flux over Sea Ice | W m^{-2} | Compute the upward sensible heat flux in regions of sea ice divided by the area of the ocean portion of the grid cell. | hfssi | surface_upward_sensible_heat_flux |
| 2 | Surface Upward Latent Heat Flux over Sea Ice | W m^{-2} | Compute the upward latent heat flux in regions of sea ice divided by the area of the ocean portion of the grid cell. | hflssi | surface_upward_latent_heat_flux |
| 2 | Sublimation over Sea Ice | kg m^{-2} | Compute the upward flux of water vapor to the atmosphere due to sublimation of snow and sea ice in regions of sea ice divided by the area of the ocean portion of the grid cell. | sblsi | surface_snow_and_ice_sublimation_flux |
| 1 | Eastward Sea Ice Transport | kg s^{-1} | The sea ice transport is 0.0 in ice-free regions of the ocean. | transix | |

| | | | | | |
|---|--|--------------------|---|----------|---|
| 1 | Northward Sea Ice Transport | kg s^{-1} | The sea ice transport is 0.0 in ice-free regions of the ocean. | transiy | |
| 2 | Sea Ice Mass Transport Through Fram Strait | kg s^{-1} | | transifs | |
| 2 | Eastward Atmospheric Stress On Sea Ice | N m^{-2} | When computing the time-mean here, the time samples, weighted by the area of sea ice, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | strairx | |
| 2 | Northward Atmospheric Stress On Sea Ice | N m^{-2} | When computing the time-mean here, the time samples, weighted by the area of sea ice, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | strairy | |
| 2 | Eastward Ocean Stress On Sea Ice | N m^{-2} | When computing the time-mean here, the time samples, weighted by the area of sea ice, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | strocnx | |
| 2 | Northward Ocean Stress On Sea Ice | N m^{-2} | When computing the time-mean here, the time samples, weighted by the area of sea ice, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | strocny | |
| 2 | Compressive Sea Ice Strength | N m^{-2} | When computing the time-mean here, the time samples, weighted by the area of sea ice, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | streng | |
| 2 | Strain Rate Divergence of Sea Ice | s^{-1} | When computing the time-mean here, the time samples, weighted by the area of sea ice, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | divice | |
| 2 | Strain Rate Shear of Sea Ice | s^{-1} | When computing the time-mean here, the time samples, weighted by the area of sea ice, are accumulated and then divided by the sum of the weights. Report as "missing" in regions free of sea ice. | shrice | |
| 2 | Sea Ice Ridging Rate | s^{-1} | | ridgice | How exactly is this defined? Are time-means weighted by sea ice area? |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|-------------------|---|-----------|-----------|-------------------|-------------------|----------|------|---------------------------------|--------------------|--------------|
| | % | time: mean | | | | | | real | longitude latitude time | sic | seaIce ocean |
| | m | time: mean area: mean where sea | | | | | | real | longitude latitude time | sit | seaIce ocean |
| | kg m-2 s-1 | time: mean area: mean where sea_ice over sea | | | | | up | real | longitude latitude time | evap | seaIce |
| | m | time: mean area: mean where sea | | | | | | real | longitude latitude time | snd | seaIce |
| | % | time: mean | | | | | | real | longitude latitude time | snc | seaIce |
| bare_sea_ice_albedo | 1 | time: mean area: mean where sea_ice | | | | | | real | longitude latitude time | ialb | seaIce |
| sea_ice_thickness_in_categories | m | time: mean area: mean where sea | | | | | | real | longitude latitude icetype time | sitn | seaIce |
| sea_ice_area_fraction_in_categories | % | time: mean | | | | | | real | longitude latitude icetype time | sicn | seaIce |
| sea_ice_salinity | psu | time: mean (weighted by mass of sea ice) | | | | | | real | longitude latitude time | ssi | seaIce |
| surface_temperature_of_sea_ice | K | time: mean (weighted by area of sea ice) | | | | | | real | longitude latitude time | tsice | seaIce |
| temperature_at_interface_between_sea_ice_and_snow | K | time: mean (weighted by area of snow-covered sea ice) | | | | | | real | longitude latitude time | tsnint | seaIce |

| | | | | | | | |
|---|------------|--|------|------|-------------------------|-----------|--------|
| surface_rainfall_rate_into_the_sea_ice _portion_of_the_grid_cell | kg m-2 s-1 | time: mean area: mean where sea_ice over sea | | real | longitude latitude time | pr | seaIce |
| surface_snowfall_rate_into_the_sea_ice _portion_of_the_grid_cell | kg m-2 s-1 | time: mean area: mean where sea_ice over sea | | real | longitude latitude time | prsn | seaIce |
| age_of_sea_ice | years | time: mean (weighted b mass of sea ice) | | real | longitude latitude time | ageice | seaIce |
| frazil_sea_ice_growth_(leads)_rate | kg m-2 s-1 | time: mean area: mean where sea | | real | longitude latitude time | grFrazil | seaIce |
| congelation_sea_ice_growth_rate | kg m-2 s-1 | time: mean area: mean where sea | | real | longitude latitude time | grCongel | seaIce |
| lateral_sea_ice_growth_rate | kg m-2 s-1 | time: mean area: mean where sea | | real | longitude latitude time | grLateral | seaIce |
| snow_ice_formation_rate | kg m-2 s-1 | time: mean area: mean where sea | | real | longitude latitude time | snoToIce | seaIce |
| snow_melt_rate | kg m-2 s-1 | time: mean area: mean where sea | | real | longitude latitude time | snomelt | seaIce |
| rate_of_melt_at_upper_surface_of_sea _ice | kg m-2 s-1 | time: mean area: mean where sea | | real | longitude latitude time | tmelt | seaIce |
| rate_of_melt_at_sea_ice_base | kg m-2 s-1 | time: mean area: mean where sea | | real | longitude latitude time | bmelt | seaIce |
| sea_ice_total_heat_content | J | time: mean (weighted by mass of sea ice) | | real | longitude latitude time | hcice | seaIce |
| | W m-2 | time: mean area: mean where sea_ice over sea | down | real | longitude latitude time | rsdssi | seaIce |
| | W m-2 | time: mean area: mean where sea_ice over sea | up | real | longitude latitude time | rsussi | seaIce |
| | W m-2 | time: mean area: mean where sea_ice over sea | down | real | longitude latitude time | rdssi | seaIce |
| | W m-2 | time: mean area: mean where sea_ice over sea | up | real | longitude latitude time | rlussi | seaIce |
| | W m-2 | time: mean area: mean where sea_ice over sea | up | real | longitude latitude time | hfssi | seaIce |
| | W m-2 | time: mean area: mean where sea_ice over sea | up | real | longitude latitude time | hflssi | seaIce |
| | kg m-2 | time: mean area: mean where sea_ice over sea | up | real | longitude latitude time | sblsi | seaIce |
| | kg s-1 | time: mean | | real | longitude latitude time | transix | seaIce |

Olmon

| | | | | | | |
|--------|--|------|------|-------------------------|----------|--------------|
| kg s-1 | time: mean | | real | longitude latitude time | transiy | seaIce |
| kg s-1 | time: mean | | real | longitude latitude time | transifs | seaIce |
| N m-2 | time: mean (weighted by area of sea ice) | down | real | longitude latitude time | strairx | seaIce |
| N m-2 | time: mean (weighted by area of sea ice) | down | real | longitude latitude time | strairy | seaIce |
| N m-2 | time: mean (weighted by area of sea ice) | | real | longitude latitude time | strocnx | seaIce ocean |
| N m-2 | time: mean (weighted by area of sea ice) | | real | longitude latitude time | strocny | seaIce ocean |
| N m-2 | time: mean (weighted by area of sea ice) | | real | longitude latitude time | streng | seaIce |
| s-1 | time: mean (weighted by area of sea ice) | | real | longitude latitude time | divice | seaIce |
| s-1 | time: mean (weighted by area of sea ice) | | real | longitude latitude time | shrice | seaIce |
| s-1 | time: mean | | real | longitude latitude time | ridgice | seaIce |

CMOR Table aero: Monthly Mean Aerosol-Related Fields
(All Saved on the Atmospheric Grid)

aero

In CMOR Table **aero**: 2-D fields on atmospheric grid

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|------------------------|---|------------------------------------|---|--|----------------------|--|
| Aerosol Optics | | | | | | |
| 1 | Ambient Aerosol Optical Thickness at 550 nm | 1 | atmosphere_optical_thickness_due_to_ambient_aerosol: AOD from the ambient aerosols (i.e., includes aerosol water). Does not include AOD from stratospheric aerosols if these are prescribed but includes other possible background aerosol types. | | od550aer | |
| 1 | Ambient Fine Aerosol Optical Thickness at 550 nm | 1 | atmosphere_optical_thickness_due_to_pm1_ambient_aerosol: od550 due to particles with wet diameter less than 1 um ("ambient" means "wetted"). When models do not include explicit size information, it can be assumed that all anthropogenic aerosols and natural secondary aerosols have diameter less than 1 um | | od550lt1aer | |
| 1 | Ambient Aerosol Absorption Optical Thickness at 550 nm | 1 | atmosphere_absorption_optical_thickness_due_to_aerosol | Is this for "ambient" aerosol? | abs550aer | |
| 2 | Ambient Aerosol Optical Thickness at 870 nm | 1 | atmosphere_optical_thickness_due_to_aerosol | Is this identical to the first entry in this table, except at 870 nanometers? | od870aer | |
| Aerosol Budgets | | | | | | |
| 1 | Emission Rate of Dry Aerosol Organic Matter | kg m ⁻² s ⁻¹ | tendency of atmosphere mass content of organic matter dry aerosol due to net production and emission. This is the sum of total emission of POA and total production of SOA (see next two entries), and it should only be reported if POA and SOA cannot be separately reported. "Mass" refers to the mass of organic matter, not mass of organic carbon alone | Doesn't "emission" include "production". How do they differ? Should the long_name include "Total"? | emioa | |
| 1 | Emission Rate of Dry Aerosol Primary Organic Matter | kg m ⁻² s ⁻¹ | tendency_of_atmosphere_mass_content_of_primary_organic_matter_dry_aerosol_due_to_net_production_and_emission: "mass" refers to the mass of primary organic matter, not mass of organic carbon alone. | should this be POA or POM? Why is suggested variable name emi_pom while description is POA? | emipom | |
| 1 | Emission Rate of Dry Aerosol Secondary Organic Matter | kg m ⁻² s ⁻¹ | tendency_of_atmosphere_mass_content_of_secondary_organic_matter_dry_aerosol_due_to_net_production: If model lumps SOA emissions with POA, then report the sum of POA and SOA emissions as POA emissions. | | chepsoa | tendency_of_atmosphere_mass_content_of_secondary_particulate_organic_matter_dry_aerosol_due_to_net_chemical_production |
| 1 | Emission Rate of Black Carbon Aerosol Mass | kg m ⁻² s ⁻¹ | tendency_of_atmosphere_mass_content_of_black_carbon_dry_aerosol due to emission | | emibc | tendency_of_atmosphere_mass_content_of_black_carbon_dry_aerosol due to emission |
| 3 | Dry Deposition Rate of Dry Aerosol Organic Matter | kg m ⁻² s ⁻¹ | tendency_of_atmosphere_mass_content_of_organic_dry_aerosol_due_to_dry_deposition: This is the sum of dry deposition of POA and dry deposition of SOA (see next two entries), and it should only be reported if POA and SOA cannot be separately reported. "Mass" refers to the mass of organic matter, not mass of organic carbon alone | | ? | tendency_of_atmosphere_mass_content_of_particulate_organic_matter_dry_aerosol_due_to_dry_deposition |
| 3 | Dry Deposition Rate of Dry Aerosol Primary Organic Matter | kg m ⁻² s ⁻¹ | tendency_of_atmosphere_mass_content_of_primary_organic_matter_dry_aerosol_due_to_dry_deposition | should this be POA or POM? Why is suggested variable name drv_pom | ddeppom | tendency_of_atmosphere_mass_content_of_primary_particulate_organic_matter_dry_aerosol_due_to_dry_deposition |
| 3 | Dry Deposition Rate of Dry Aerosol Secondary Organic Matter | kg m ⁻² s ⁻¹ | tendency_of_atmosphere_mass_content_of_secondary_organic_dry_aerosol_due_to_dry_deposition | | ddepsoa | tendency_of_atmosphere_mass_content_of_secondary_particulate_organic_matter_dry_aerosol_due_to_dry_deposition |
| 3 | Dry Deposition Rate of Black Carbon Aerosol Mass | kg m ⁻² s ⁻¹ | tendency_of_atmosphere_mass_content_of_black_carbon_dry_aerosol due to dry deposition | | ddepbc | tendency_of_atmosphere_mass_content_of_black_carbon_dry_aerosol due to dry deposition |

| | | | | | |
|----------------------|---|----------------------------------|---|---------|---|
| 3 | Wet Deposition Rate of Dry Aerosol Organic Matter | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_organic_matter_dry_aerosols_due_to_wet_deposition: This is the sum of wet deposition of POA and wet deposition of SOA (see next two entries), and it should only be reported if POA and SOA cannot be separately reported. "Mass" refers to the mass of organic matter, not mass of organic carbon alone | wdepom | tendency_of_atmosphere_mass_content_of_particulate_organic_matter_dry_aerosol_due_to_wet_deposition |
| 3 | Wet Deposition Rate of Dry Aerosol Primary Organic Matter | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_primary_organic_matter_dry_aerosols_due_to_wet_deposition | wdeppom | tendency_of_atmosphere_mass_content_of_primary_particulate_organic_matter_dry_aerosol_due_to_wet_deposition |
| 3 | Wet Deposition Rate of Dry Aerosol Secondary Organic Matter | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_secondary_organic_dry_aerosol_due_to_wet_deposition | wdepsoa | tendency_of_atmosphere_mass_content_of_secondary_particulate_organic_matter_dry_aerosol_due_to_wet_deposition |
| 3 | Wet Deposition Rate of Black Carbon Aerosol Mass | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_black_carbon_dry_aerosol_due_to_wet_deposition | wdepbc | tendency_of_atmosphere_mass_content_of_black_carbon_dry_aerosol_due_to_wet_deposition |
| 1 | Total Emission of Primary Aerosol from Biomass Burning | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_primary_organic_matter_dry_aerosol_due_to_emission: This does not include sources of secondary aerosols from biomass burning aerosols, such as SO2 or SOA. | emibb | tendency_of_atmosphere_mass_content_of_primary_particulate_organic_matter_dry_aerosol_due_to_emission |
| 1 | Total Emission Rate of SO2 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_sulfur_dioxide_due_to_emission: mass refers to SO2, not S. | emiso2 | tendency_of_atmosphere_mass_content_of_sulfur_dioxide_due_to_emission |
| 1 | Total Direct Emission Rate of SO4 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_sulfate_dry_aerosol_due_to_net_production_and_emission: mass refers to SO4, not S | emiso4 | |
| 1 | Total Emission Rate of DMS | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_dimethyl_sulfide_due_to_emission: mass refers to DMS, not S | emidms | tendency_of_atmosphere_mass_content_of_dimethyl_sulfide_due_to_emission |
| 3 | Dry Deposition Rate of SO2 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_sulfur_dioxide_due_to_dry_deposition | ddepso2 | tendency_of_atmosphere_mass_content_of_sulfur_dioxide_due_to_dry_deposition |
| 1 | Dry Deposition Rate of SO4 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_sulfate_due_to_dry_deposition | ddepso4 | tendency_of_atmosphere_mass_content_of_sulfate_dry_aerosol_due_to_dry_deposition |
| 3 | Dry Deposition Rate of DMS | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_dimethyl_sulfide_due_to_dry_deposition: omit if DMS is not dry deposited in the model. | ddepdms | tendency_of_atmosphere_mass_content_of_dimethyl_sulfide_due_to_dry_deposition |
| 1 | Wet Deposition Rate of SO4 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_sulfate_dry_aerosol_due_to_wet_deposition | wdepso4 | tendency_of_atmosphere_mass_content_of_sulfate_dry_aerosol_due_to_wet_deposition |
| 3 | Wet Deposition Rate of SO2 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_sulfur_dioxide_due_to_wet_deposition | wdepso2 | tendency_of_atmosphere_mass_content_of_sulfur_dioxide_due_to_wet_deposition |
| 3 | Wet Deposition Rate of DMS | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_dimethyl_sulfide_due_to_wet_deposition: omit if DMS is not wet deposited in the model. | wdepdms | tendency_of_atmosphere_mass_content_of_dimethyl_sulfide_due_to_wet_deposition |
| 1 | Total Emission Rate of NH3 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_ammonia_due_to_emission | eminh3 | tendency_of_atmosphere_mass_content_of_ammonia_due_to_emission |
| 3 | Dry Deposition Rate of NH3 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_ammonia_due_to_dry_deposition | ddeph3 | tendency_of_atmosphere_mass_content_of_ammonia_due_to_dry_deposition |
| 1 | Dry Deposition Rate of NH4 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_ammonium_due_to_dry_deposition | ddeph4 | tendency_of_atmosphere_mass_content_of_ammonium_dry_aerosol_due_to_dry_deposition? |
| 1 | Wet Deposition Rate of NH4+NH3 | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_ammonium_due_to_wet_deposition | wdeph4 | tendency_of_atmosphere_mass_content_of_ammonium_dry_aerosol_due_to_wet_deposition? |
| 1 | Total Emission Rate of Seasalt | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_seasalt_dry_aerosol_due_to_emission | emiss | tendency_of_atmosphere_mass_content_of_seasalt_dry_aerosol_due_to_emission |
| 3 | Dry Deposition Rate of Seasalt | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_seasalt_dry_aerosol_due_to_dry_deposition | ddepss | tendency_of_atmosphere_mass_content_of_seasalt_dry_aerosol_due_to_dry_deposition |
| 3 | Wet Deposition Rate of Seasalt | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_seasalt_dry_aerosol_due_to_wet_deposition | wdepss | tendency_of_atmosphere_mass_content_of_seasalt_dry_aerosol_due_to_wet_deposition |
| 1 | Total Emission Rate of Dust | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_dust_dry_aerosol_due_to_emission | emidu | tendency_of_atmosphere_mass_content_of_dust_dry_aerosol_due_to_emission |
| 1 | Dry Deposition Rate of Dust | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_dust_dry_aerosol_due_to_dry_deposition | drydu | tendency_of_atmosphere_mass_content_of_dust_dry_aerosol_due_to_dry_deposition |
| 1 | Wet Deposition Rate of Dust | $\text{kg m}^{-2} \text{s}^{-1}$ | tendency_of_atmosphere_mass_content_of_dust_dry_aerosol_due_to_wet_deposition | wetdu | tendency_of_atmosphere_mass_content_of_dust_dry_aerosol_due_to_wet_deposition |
| Aerosol Loads | | | | | |

| | | | | | | |
|-------------------------------|---|--------------------|--|--|----------|---|
| 1 | Load of Dry Aerosol Organic Matter | kg m ⁻² | atmosphere_dry_organic_content: This is the vertically integrated sum of atmosphere_primary_organic_content and atmosphere_secondary_organic_content (see next two table entries), and therefore should only be reported if those two components cannot be separately reported. | | oavi | atmosphere_mass_content_of_particulate_organic_matter_dry_aerosol |
| 1 | Load of Dry Aerosol Primary Organic Matter | kg m ⁻² | atmosphere_primary_organic_content | why is this called "Load of POA" but the variable name is "loadpom"? | pomvi | atmosphere_mass_content_of_primary_particulate_organic_matter_dry_aerosol |
| 1 | Load of Dry Aerosol Secondary Organic Matter | kg m ⁻² | atmosphere_secondary_organic_content | | soavi | atmosphere_mass_content_of_secondary_particulate_organic_matter_dry_aerosol |
| 1 | Load of Black Carbon Aerosol | kg m ⁻² | atmosphere_black_carbon_content | | bcvi | atmosphere_mass_content_of_black_carbon_dry_aerosol |
| 1 | Load of SO4 | kg m ⁻² | atmosphere_sulfate_content | Is this "dry" or "ambient"? | so4vi | |
| 1 | Load of Dust | kg m ⁻² | atmosphere_dust_content | | dustvi | atmosphere_mass_content_of_dust_dry_aerosol |
| 1 | Load of Seasalt | kg m ⁻² | atmosphere_seasalt_content | | ssvi | atmosphere_mass_content_of_seasalt_dry_aerosol |
| 1 | Load of NO3 | kg m ⁻² | atmosphere_nitrate_content | | no3vi | atmosphere_mass_content_of_nitrate_dry_aerosol? |
| 3 | Load of NH4 | kg m ⁻² | atmosphere_ammonium_content | | nh4vi | atmosphere_mass_content_of_ammonium_dry_aerosol? |
| Surface Concentrations | | | | | | |
| 3 | Surface Concentration of Dry Aerosol Organic Matter | kg m ⁻³ | mass_concentration_of_organic_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). This is the sum of concentrations of primary and secondary organic aerosol (see next two table entries), and therefore should only be reported if those two components cannot be separately reported. | why is this called "Surface concentration of OA" but the variable name is "sfcpa"? | sfcpa | mass_concentration_of_particulate_organic_matter_dry_aerosol_in_air |
| 3 | Surface Concentration of Dry Aerosol Primary Organic Matter | kg m ⁻³ | mass_concentration_of_primary_organic_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). | | sfcpom | mass_concentration_of_primary_particulate_organic_matter_dry_aerosol_in_air |
| 3 | Surface Concentration of Dry Aerosol Secondary Organic Matter | kg m ⁻³ | mass_concentration_of_secondary_organic_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). If the model lumps SOA with POA, then report their sum as POA. | | sfcsOA | mass_concentration_of_secondary_particulate_organic_matter_dry_aerosol_in_air |
| 3 | Surface Concentration of Black Carbon Aerosol | kg m ⁻³ | mass_concentration_of_black_carbon_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). | | sfcbc | mass_concentration_of_black_carbon_dry_aerosol_in_air |
| 3 | Surface Concentration of SO4 | kg m ⁻³ | mass_concentration_of_sulfate_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). | | sfcsO4 | |
| 3 | Surface Concentration of Dust | kg m ⁻³ | mass_concentration_of_dust_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). | | sfcdust | mass_concentration_of_dust_dry_aerosol_in_air |
| 3 | Surface Concentration of Seasalt | kg m ⁻³ | mass_concentration_of_seasalt_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). | | sfcss | mass_concentration_of_seasalt_dry_aerosol_in_air |
| 3 | Surface Concentration of NO3 | kg m ⁻³ | mass_concentration_of_nitrate_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). | | sfcnO3 | mass_concentration_of_nitrate_dry_aerosol_in_air |
| 3 | Surface Concentration of NH4 | kg m ⁻³ | mass_concentration_of_ammonium_aerosol_in_air: In model lowest layer (The location of the model's lowest layer should be recorded in the netCDF output file). | | sfcnH4 | mass_concentration_of_ammonium_dry_aerosol_in_air |
| Clouds and Radiation | | | | Should we move any of this next sub-group to A_mon? perhaps at least the diffuse flux, which might be of use to the land people??? | | |
| 2 | Surface Diffuse Downward Shortwave Radiation | W m ⁻² | downwelling_diffuse_shortwave_flux_in_air | | rsdsdiff | |

| | | | | | | |
|---|--|------------|---|---|------------|---|
| 2 | Surface Diffuse Downward Clear Sky Shortwave Radiation | $W m^{-2}$ | downwelling_diffuse_shortwave_flux_in_air_assuming_clear_sky | | rsdscsdiff | |
| 1 | Liquid Cloud-Top Effective Droplet Radius | m | cloud_droplet_effective_radius_at_liquid_water_cloud_top: report value from uppermost model layer with liquid cloud or, if available, TOA two-dimensional view of liquid cloud. Weight by liquid cloud top fraction when reporting monthly mean. | | reffclwtop | |
| 1 | Liquid Cloud Droplet Number Concentration | m^{-3} | cloud_droplet_number_concentration_in_liquid_water_clouds: report value from uppermost model layer with liquid cloud or, if available, TOA two-dimensional view of liquid cloud. Weight by liquid cloud top fraction when reporting monthly mean. | Does anyone know how to calculate "liquid cloud top fraction"? | cldncl | |
| 1 | Ice Crystal Number Concentration | m^{-3} | ice_crystal_number_concentration_in_ice_water_clouds: report value from uppermost model layer with ice cloud or, if available, TOA two-dimensional view of ice cloud. Weight by ice cloud top fraction when reporting monthly mean. | Does anyone know how to calculate "ice cloud top fraction"? | cldnci | |
| 1 | Column Integrated Cloud Droplet Number | m^{-2} | weight by cloud fraction or volume on each layer when reporting monthly mean | I don't understand weighting. When computing monthly means, do you want to weight each time-sample by the total cloud fraction (as seen from TOA)? Or what? Does this include both liquid and ice crystals? | cldnvi | atmosphere_number_content_of_cloud_droplets |

In CMOR Table *aero*: 3-D aerosol-related mixing ratios and extinction on model levels

1-year samples: 1850 to 1950 every 20 years, 1960 to 2020 every 10 years, 2040 to 2100 every 20 years

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|--|-------------|---|---|----------------------|---|
| 1 | Ambient Aerosol Extinction Optical Thickness at 550 nm | m^{-1} | atmosphere_extinction_due_to_ambient_aerosol: "ambient" means "wetted" | In a previous table you ask for "optical thickness" and "absorbtion optical thickness". Why do you want "extinction optical thickness" here? | ec550aer | |
| 1 | Concentration of Dry Aerosol Organic Matter | $kg m^{-3}$ | mass_concentration_of_organic_matter_dry_aerosol_in_air | Is the following statement correct? This is the sum of concentrations of primary and secondary organic aerosols (see next two table entries), and therefore should only be reported if those two components cannot be separately reported. Why is long name "OA" and variable name has pom? | aerpom | |
| 1 | Concentration of Dry Aerosol Primary Organic Matter | $kg m^{-3}$ | mass_concentration_of_primary_organic_matter_dry_aerosol_in_air | Why is longname "POA" and variable name "pom"? | aerpom | |
| 1 | Concentration of Dry Aerosol Secondary Organic Matter | $kg m^{-3}$ | mass_concentration_of_secondary_organic_matter_dry_aerosol_in_air: If the model lumps SOA with POA, then report their sum as POA. | | aersoa | |

| | | | | | |
|---|---|--------------------|--|-------------|---|
| 1 | Concentration of Biomass Burning Aerosol | kg m ⁻³ | mass_concentration_of_biomass_burning_dry_aerosol_in_air | aerbb | |
| 1 | Concentration of Black Carbon Aerosol | kg m ⁻³ | mass_concentration_of_black_carbon_dry_aerosol_in_air | aerbc | |
| 1 | Concentration of Secondary Primary Organic Matter Dry Aerosol | kg m ⁻³ | mass_concentration_of_secondary_primary_organic_matter_dry_aerosol_in_air | aerpoa | I don't understand what is meant by "secondary primary organic matter". How does it differ from "primary organic matter" and "secondary organic matter"? |
| 1 | Concentration of Aerosol Water | kg m ⁻³ | mass_concentration_of_water_in_ambient_aerosol_in_air: "ambient" means "wetted" | aerh2o | |
| 1 | Concentration of SO4 | kg m ⁻³ | mass_concentration_of_sulfate_dry_aerosol_in_air | aerso4 | |
| 1 | Concentration of SO2 | kg m ⁻³ | mole_concentration_of_sulfur_dioxide_in_air | aerso2 | |
| 1 | Concentration of DMS | kg m ⁻³ | mole_concentration_of_dimethyl_sulfide_in_air | aerdms | |
| 1 | Concentration of NO3 Aerosol | kg m ⁻³ | mass_concentration_of_nitrate_dry_aerosol_in_air | aerno3 | |
| 1 | Concentration of NH4 | kg m ⁻³ | mass_concentration_of_ammonium_dry_aerosol_in_air | aernh4 | |
| 1 | Concentration of Seasalt | kg m ⁻³ | mass_concentration_of_seasalt_dry_aerosol_in_air | aerss | |
| 1 | Concentration of Dust | kg m ⁻³ | mass_concentration_of_dust_dry_aerosol_in_air | aerdust | |
| 2 | Aerosol Number Concentration | m ⁻³ | number_concentration_of_ambient_aerosol_in_air | aerno3 | |
| 3 | Number Concentration of Nucleation Mode Aerosol | m ⁻³ | number_concentration_of_ambient_aerosol_in_nucleation_mode_in_air: include all particles with diameter smaller than 3 nm | aernumsmall | |
| 2 | Number Concentration Coarse Mode Aerosol | m ⁻³ | number_concentration_of_ambient_aerosol_in_coarse_mode_in_air: include all particles with diameter larger than 1 micron | aernumlarge | |
| 1 | Stratiform Cloud Droplet Effective Radius | m | The effective radius is defined as the ratio of the third moment over the second moment of the particle size distribution. | reffclws | Do ice and liquid water drops all contribute? Should time-means be weighted by the extent of cloud in the layer or cloud water mass in the layer or what? Should probably make consistent with CFMIP 3-hourly data, but that data is not a time-mean. |
| 1 | Convective Cloud Droplet Effective Radius | m | The effective radius is defined as the ratio of the third moment over the second moment of the particle size distribution. | reffclwc | Do ice and liquid water drops all contribute? Should time-means be weighted by the extent of cloud in the layer or cloud water mass in the layer or what? Should probably make consistent with CFMIP 3-hourly data. |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|-------------------------|--------------------|---------|
| atmosphere_optical_thickness_due_to_ambient_aerosol PROPOSED AND UNDER DISCUSSION | 1 | time: mean | | | | | | real | longitude latitude time | od550aer | aerosol |
| atmosphere_optical_thickness_due_to_pm1_ambient_aerosol NOT PROPOSED | 1 | time: mean | | | | | | real | longitude latitude time | od550lt1aer | aerosol |
| atmosphere_absorption_optical_thickness due to aerosol | 1 | time: mean | | | | | | real | longitude latitude time | abs550aer | aerosol |
| atmosphere_optical_thickness_due_to_ambient_aerosol PROPOSED AND UNDER DISCUSSION | 1 | time: mean | | | | | | real | longitude latitude time | od870aer | aerosol |
| | | | | | | | | | | | aerosol |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | emioa | aerosol |
| tendency_of_atmosphere_mass_content_of_primary_particulate_organic_matter_dry_aerosol_due_to_net_production_and_emission PROPOSED AND UNDER DISCUSSION | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | emipom | aerosol |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | chepsoa | aerosol |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | emibc | aerosol |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | ? | aerosol |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | ddeppom | aerosol |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | ddepsoa | aerosol |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | ddepbc | aerosol |

| | | | | | | | |
|---|------------|------------|--|------|-------------------------|---------|---------|
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepom | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdeppom | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepsoa | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepbc | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | emibb | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | emiso2 | aerosol |
| tendency_of_atmosphere_mass_content_of_sulfate_dry_aerosol_due_to_net_chemical_production_and_emission PROPOSED AND UNDER DISCUSSION | kg m-2 s-1 | time: mean | | real | longitude latitude time | emiso4 | aerosol |
| tendency_of_atmosphere_mass_content_of_dimethyl_sulfide_due_to_emission | kg m-2 s-1 | time: mean | | real | longitude latitude time | emidms | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | ddepso2 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | ddepso4 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | ddepdms | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepso4 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepso2 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepdms | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | eminh3 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | ddepnh3 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | ddepnh4 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepnh4 | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | emiss | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | ddepss | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wdepss | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | emidu | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | drydu | aerosol |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | wetdu | aerosol |

| | | | | | | | |
|---|--------|------------|--|------|--------------------------------|----------|--------------|
| | kg m-2 | time: mean | | real | longitude latitude time | oavi | aerosol |
| | kg m-2 | time: mean | | real | longitude latitude time | pomvi | aerosol |
| | kg m-2 | time: mean | | real | longitude latitude time | soavi | aerosol |
| | kg m-2 | time: mean | | real | longitude latitude time | bcvi | aerosol |
| atmosphere_sulfate_content PROPOSED AND UNDER DISCUSSION | kg m-2 | time: mean | | real | longitude latitude time | so4vi | aerosol |
| | kg m-2 | time: mean | | real | longitude latitude time | dustvi | aerosol |
| | kg m-2 | time: mean | | real | longitude latitude time | ssvi | aerosol |
| | kg m-2 | time: mean | | real | longitude latitude time | no3vi | aerosol |
| | kg m-2 | time: mean | | real | longitude latitude time | nh4vi | aerosol |
| | | | | | | | |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcpa | aerosol |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcpom | aerosol |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcsoa | aerosol |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcbc | aerosol |
| mass_concentration_of_sulfate_aerosol _in_air PROPOSED AND UNDER DISCUSSION | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcso4 | aerosol |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfc dust | aerosol |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcss | aerosol |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcno3 | aerosol |
| | kg m-3 | time: mean | | real | longitude latitude alev1, time | sfcn4 | aerosol |
| | | | | | | | |
| downwelling_diffuse_shortwave_flux_ in air | W m-2 | time: mean | | real | longitude latitude time | rsdsdiff | aerosol land |

| | | | | | | | | | | | | |
|--|-------|------------|--|--|--|--|--|--|------|-------------------------|------------|--------------|
| downwelling_diffuse_shortwave_flux_in_air_assuming_clear_sky | W m-2 | time: mean | | | | | | | real | longitude latitude time | rsdscsdiff | aerosol land |
| cloud_droplet_effective_radius_at_liquid_water_cloud_top | m | time: mean | | | | | | | real | longitude latitude time | reffclwtop | aerosol |
| cloud_droplet_number_concentration_in_liquid_water_clouds | m-3 | time: mean | | | | | | | real | longitude latitude time | cldncl | aerosol |
| ice_crystal_number_concentration_in_ice_water_clouds | m-3 | time: mean | | | | | | | real | longitude latitude time | cldnci | aerosol |
| | m-2 | time: mean | | | | | | | real | longitude latitude time | cldnvi | aerosol |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|--------------------------------|--------------------|---------|
| atmosphere_extinction_due_to_ambient_aerosol | m-1 | time: mean | | | | | | | longitude latitude alevel time | ec550aer | aerosol |
| mass_concentration_of_organic_matter_dry_aerosol_in_air | kg m-3 | time: mean | | | | | | | longitude latitude alevel time | aerpom | aerosol |
| mass_concentration_of_primary_organic_matter_dry_aerosol_in_air | kg m-3 | time: mean | | | | | | | longitude latitude alevel time | aerpom | aerosol |
| mass_concentration_of_secondary_organic_matter_dry_aerosol_in_air | kg m-3 | time: mean | | | | | | | longitude latitude alevel time | aersoa | aerosol |

| | | | | | |
|---|--------|------------|--------------------------------|-------------|---------|
| mass_concentration_of_biomass_burning_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerbb | aerosol |
| mass_concentration_of_black_carbon_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerbc | aerosol |
| mass_concentration_of_secondary_primary_organic_matter_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerpoa | aerosol |
| mass_concentration_of_water_in_ambient_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerh2o | aerosol |
| mass_concentration_of_sulfate_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerso4 | aerosol |
| mole_concentration_of_sulfur_dioxide_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerso2 | aerosol |
| mole_concentration_of_dimethyl_sulfide_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerdms | aerosol |
| mass_concentration_of_nitrate_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerno3 | aerosol |
| mass_concentration_of_ammonium_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aernh4 | aerosol |
| mass_concentration_of_seasalt_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerss | aerosol |
| mass_concentration_of_dust_dry_aerosol_in_air | kg m-3 | time: mean | longitude latitude alevel time | aerdust | aerosol |
| number_concentration_of_ambient_aerosol_in_air | m-3 | time: mean | longitude latitude alevel time | aerno3 | aerosol |
| number_concentration_of_ambient_aerosol_in_nucleation_mode_in_air | m-3 | time: mean | longitude latitude alevel time | aernumsmall | aerosol |
| number_concentration_of_ambient_aerosol_in_coarse_mode_in_air | m-3 | time: mean | longitude latitude alevel time | aernumlarge | aerosol |
| | m | time: mean | longitude latitude alevel time | reffclws | aerosol |
| | m | time: mean | longitude latitude alevel time | reffclwc | aerosol |

CMOR Table da: Daily Mean Atmosphere, Ocean and Surface Fields

da

(saved on the model's atmospheric or ocean grid, as appropriate)

In CMOR Table da: 2-D daily mean atmospheric and surface fields

The following daily mean variables should be collected for all simulations (for the full duration of each experiment).

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|--|------------------------------------|--|------------------|-----------------------------|--|
| 1 | Near-Surface Specific Humidity | 1 | near-surface (usually, 2 meter) specific humidity. | | huss | specific_humidity |
| 1 | Daily Minimum Near-Surface Air Temperature | K | daily-minimum near-surface (usually, 2 meter) air temperature. | | tasmin | air_temperature |
| 1 | Daily Maximum Near-Surface Air Temperature | K | daily-maximum near-surface (usually, 2 meter) air temperature. | | tasmax | air_temperature |
| 1 | Near-Surface Air Temperature | K | daily-mean near-surface (usually, 2 meter) air temperature. | | tas | air_temperature |
| 1 | Precipitation | kg m ⁻² s ⁻¹ | at surface; includes both liquid and solid phases from all types of clouds (both large-scale and convective) | | pr | precipitation_flux |
| 1 | Sea Level Pressure | Pa | | | psl | air_pressure_at_sea_level |
| 1 | Daily-Mean Wind Speed | m s ⁻¹ | near-surface (usually, 10 meters) wind speed. | | sfcWind | wind_speed |
| 1 | Square of Sea Surface Temperature | K ² | square of temperature of liquid ocean, averaged over the day. Report on the ocean grid. This variable appears in WGOMD Table 2.2 | | tossq | square_of_sea_surface_temperature |
| 1 | Sea Surface Temperature | K | temperature of liquid ocean. Report on the ocean grid. This variable appears in WGOMD Table 2.2 | | tos | surface_temperature |

The rest of the daily mean fields on this spreadsheet should be collected only for a single member of the following simulations:

| <i>experiment</i> | <i>time-period requested</i> |
|--|--|
| historical | Jan 1950 -- Dec 2005 |
| future simulations driven by RCP concentrations or emissions | only years 2006-2100, 2181-2200, and 2281-2300 |
| AMIP | all years |

CMOR Table da: 2-D daily-mean atmospheric and surface fields

| Priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|------------------------------------|---|--|----------------------|---|
| 1 | Moisture in Upper 0.1 m of Soil Column | 1 | | What is meant by "near surface" here? . In Amon we ask for moisture_content_of_soil_layer and request the user compute the mass of water in all phases in the upper 0.1 meters of soil. Is that what is requested here? Also check units! Should this be soil moisture content with units of kg m-2? | mrsos? | |
| 1 | Near-Surface Relative Humidity | % | near-surface (usually, 2 meter) relative humidity. This is the relative humidity with respect to liquid water for T> 0 C, and with respect to ice for T<0 C. | | rhs | relative_humidity |
| 1 | Surface Daily Minimum Relative Humidity | % | near-surface (usually, 2 meter) minimum relative humidity. This is the relative humidity with respect to liquid water for T> 0 C, and with respect to ice for T<0 C. | | rhsmin | relative_humidity |
| 1 | Surface Daily Maximum Relative Humidity | % | near-surface (usually, 2 meter) maximum relative humidity. This is the relative humidity with respect to liquid water for T> 0 C, and with respect to ice for T<0 C. | | rhsmax | relative_humidity |
| 1 | Snow Area Fraction | % | | | snc | snow_area_fraction |
| 1 | Total Cloud Fraction | % | for the whole atmospheric column, as seen from the surface or the top of the atmosphere. Include both large-scale and convective cloud. | | clt | cloud_area_fraction |
| 1 | Surface Temperature Where Land or Sea Ice | K | "skin" temperature of all surfaces except open ocean. | This has been changed from soil temperature to surface skin temperature outside regions of open ocean. If you want soil temperature, you must specify what thickness of surface soil you want to average over. | tsl | |
| 1 | Surface Snow Amount | kg m ⁻² | Compute as the mass of surface snow on the land portion of the grid cell divided by the land area in the grid cell; report 0.0 where the land fraction is 0; exclude snow on vegetation canopy or on sea ice. | | snw | surface_snow_amount |
| 1 | Convective Precipitation | kg m ⁻² s ⁻¹ | at surface; includes both liquid and solid phases. | | prc | convective_precipitation_flux |
| 1 | Solid Precipitation | kg m ⁻² s ⁻¹ | at surface; includes precipitation of all forms of water in the solid phase | | prsn | solid_precipitation_flux |
| 1 | Total Runoff | kg m ⁻² s ⁻¹ | compute as the total runoff (including "drainage" through the base of the soil model) leaving the land portion of the grid cell divided by the land area in the grid cell. | | mrro | runoff_flux |
| 1 | Eastward Wind | m s ⁻¹ | near-surface (usually, 10 meters) eastward component of wind. | | uas | eastward_wind |
| 1 | Northward Wind | m s ⁻¹ | near-surface (usually, 10 meters) northward component of wind. | | vas | northward_wind |
| 1 | Daily Maximum Wind Speed | m s ⁻¹ | near-surface (usually, 10 meters) wind speed. | | sfcWindmax | wind_speed |
| 1 | Surface Upward Latent Heat Flux | W m ⁻² | | | hfls | surface_upward_latent_heat_flux |
| 1 | Surface Upward Sensible Heat Flux | W m ⁻² | | | hfss | surface_upward_sensible_heat_flux |
| 1 | Surface Downwelling Longwave Radiation | W m ⁻² | | | rlds | surface_downwelling_longwave_flux_in_air |
| 1 | Surface Upwelling Longwave Radiation | W m ⁻² | | | rfls | surface_upwelling_longwave_flux_in_air |
| 1 | Surface Downwelling Shortwave Radiation | W m ⁻² | | | rsds | surface_downwelling_shortwave_flux_in_air |
| 1 | Surface Upwelling Shortwave Radiation | W m ⁻² | | | rsus | surface_upwelling_shortwave_flux_in_air |

| | | | | | | |
|---|--|-------------------|---|--|-------|----------------------------|
| 1 | TOA Outgoing Longwave Radiation | W m^{-2} | at the top of the atmosphere. | | rlut | toa_outgoing_longwave_flux |
| 1 | Mean Square of Sea Surface Temperature | K^2 | Report on ocean's grid. This variable appears in WGOMD Table 2.2 | | tsosq | |
| 1 | Eastward Sea Ice Velocity | m s^{-1} | Report on ocean's grid. Report as "missing" in regions free of sea ice. | | usi | eastward_sea_ice_velocity |
| 1 | Northward Sea Ice Velocity | m s^{-1} | Report on ocean's grid. Report as "missing" in regions free of sea ice. | | vsi | northward_sea_ice_velocity |
| 1 | Sea Ice Area Fraction | % | fraction of grid cell covered by sea ice. Report on ocean's grid. | | sic | sea_ice_area_fraction |
| 1 | Sea Ice Thickness | m | Report on ocean's grid. Compute the mean thickness of sea ice in the ocean portion of the grid cell (averaging over the entire ocean portion, including the ice-free fraction). Report as 0.0 in regions free of sea ice. | | sit | sea_ice_thickness |

In CMOR Table da: daily mean 3-D atmospheric fields on the following pressure surfaces: 1000, 850, 700, 500, 250, 100 hPa

| <i>P</i> <i>riorit</i> <i>y</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|---------------------------------------|--------------------|--------------------|---|-----------|----------------------|---|
| 1 | Air Temperature | K | | | ta | air_temperature |
| 1 | Relative Humidity | % | This is the relative humidity with respect to liquid water for $T > 0$ C, and with respect to ice for $T < 0$ C. | | hur | relative_humidity |
| 1 | Specific Humidity | 1 | | | hus | specific_humidity |
| 1 | omega ($=dp/dt$) | Pa s^{-1} | commonly referred to as "omega", this represents the vertical component of velocity in pressure coordinates (positive down) | | wap | lagrangian_tendency_of_air_pressure |
| 1 | Northward Wind | m s^{-1} | | | va | northward_wind |
| 1 | Eastward Wind | m s^{-1} | | | ua | eastward_wind |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|---------------|-----------|-----------|-------------------------|-------------------------|----------|------|--------------------------------------|--------------------------|-------|
| | 1 | time: mean | | | | | | real | longitude latitude time height2m | huss | atmos |
| | K | time: minimum | | | | | | real | longitude latitude time height2m | tasmin | atmos |
| | K | time: maximum | | | | | | real | longitude latitude time height2m | tasmax | atmos |
| | K | time: mean | | | | | | real | longitude latitude time height2m | tas | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | pr | atmos |
| | Pa | time: mean | | | | | | real | longitude latitude time | psl | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude time height10m | sfcWind | atmos |
| | K2 | time:mean | | | | | | real | longitude latitude time | tossq | atmos |
| | K | time: mean | | | | | | real | longitude latitude time | tos | atmos |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---------------------------------------|-------------------|----------------------------------|-----------|-----------|-------------------|-------------------|----------|------|-----------------------------------|--------------------|-------|
| | 1 | time: mean | | | | | | real | longitude latitude time | mrsos? | atmos |
| | % | time: mean | | | | | | real | longitude latitude time height2m | rhs | atmos |
| | % | time: minimum | | | | | | real | longitude latitude time height2m | rhsmin | atmos |
| | % | time: maximum | | | | | | real | longitude latitude time height2m | rhsmax | atmos |
| | % | time: mean | | | | | | real | longitude latitude time | snc | atmos |
| | % | time: mean | | | | | | real | longitude latitude time | clt | atmos |
| soil_temperature | K | time: mean | | | | | | real | longitude latitude time | tsl | land |
| | kg m-2 | time: mean area: mean where land | | | | | | real | longitude latitude time | snw | land |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | prc | atmos |
| | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | prsn | atmos |
| | kg m-2 s-1 | time: mean area: mean where land | | | | | | real | longitude latitude time | mrro | land |
| | m s-1 | time: mean | | | | | | real | longitude latitude time height10m | uas | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude time height10m | vas | atmos |
| | m s-1 | time: maximum | | | | | | real | longitude latitude time height10m | sfcWindmax | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | hfls | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | hfss | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude time | rlds | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | rhus | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude time | rsds | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsus | atmos |

| | | | | | | | | | |
|--|-------|------------------------------------|--|--|----|------|-------------------------|-------|--------------|
| | W m-2 | time: mean | | | up | real | longitude latitude time | rlut | atmos |
| mean_square_of_sea_surface_temperature | K2 | time: mean | | | | real | longitude latitude time | tsosq | ocean |
| | m s-1 | time: mean | | | | real | longitude latitude time | usi | seaIce ocean |
| | m s-1 | time: mean | | | | real | longitude latitude time | vsi | seaIce ocean |
| | % | time: mean | | | | real | longitude latitude time | sic | seaIce ocean |
| | m | time: mean area: mean where sea | | | | real | longitude latitude time | sit | seaIce ocean |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|------|-------------------------------|--------------------------|-------|
| | K | time: mean | | | | | | real | longitude latitude plev6 time | ta | atmos |
| | % | time: mean | | | | | | real | longitude latitude plev6 time | hur | atmos |
| | l | time: mean | | | | | | real | longitude latitude plev6 time | hus | atmos |
| | Pa s-1 | time: mean | | | | | | real | longitude latitude plev6 time | wap | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude plev6 time | va | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude plev6 time | ua | atmos |

CMOR Table 6hrLev: Fields (Sampled Every 6 Hours) for Driving Regional Models

6hrLev

The 6-hourly data on model levels should be sampled as "*snapshots*" (*not* as 6-hour means) at 0Z, 6Z, 12Z, and 18Z and should be collected only for the following experiments and years:

| <i>experiment</i> | <i>time-period requested</i> |
|-----------------------------|------------------------------|
| decadal hindcasts/forecasts | all years |
| historical | Jan 1950 - Dec 2005 |
| AMIP | all years |
| RCP4.5 and RCP8.5 | Jan 2006 - Dec 2100 |

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|----------------------|-------------------|---|------------------|-----------------------------|--|
| 1 | Air Temperature | K | on all model levels | | ta | air_temperature |
| 1 | Eastward Wind | m s ⁻¹ | on all model levels | | ua | eastward_wind |
| 1 | Northward Wind | m s ⁻¹ | on all model levels | | va | northward_wind |
| 1 | Specific Humidity | 1 | on all model levels | | hus | specific_humidity |
| 1 | Surface Air Pressure | Pa | surface pressure, not mean sea level pressure | | ps | surface_air_pressure |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|------------------------------|---------------------|------------------|------------------|----------------------------------|----------------------------------|-----------------|-------------|---------------------------------|-----------------------------------|--------------|
| | K | | | | | | | real | longitude latitude alevel time1 | taLev | atmos |
| | m s-1 | | | | | | | real | longitude latitude alevel time1 | uaLev | atmos |
| | m s-1 | | | | | | | real | longitude latitude alevel time1 | vaLev | atmos |
| | 1 | | | | | | | real | longitude latitude alevel time1 | husLev | atmos |
| | Pa | | | | | | | real | longitude latitude time1 | ps | atmos |

**CMOR Table 6hrPlev: Fields (Sampled Every 6 Hours) for Storm-Track Analysis and other
Advanced Diagnostic Applications**

6hrPlev

The 6-hourly data on pressure levels should be sampled as "*snapshots*" (*not* as 6-hour means) at 0Z, 6Z, 12Z, and 18Z and should be collected only for the following experiments and years.

| <i>experiment</i> | <i>time-period requested</i> |
|--------------------------------|--|
| decadal hindcasts/forecasts | all years |
| historical | Jan 1950 - Dec 2005 |
| AMIP | all years |
| RCP4.5 and RCP8.5 | Jan 2006 - Dec 2100 |
| preindustrial control | 30 years -- preferably corresponding to years 1979- 2008 of the historical run |
| Last glacial maximum paleo-run | last 30 years |
| mid-Holocene paleo- run | last 30 years |

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|--------------------|-------------------|---|------------------|-----------------------------|--|
| 1 | Eastward Wind | m s ⁻¹ | on the following pressure levels: 850, 500, 250 hPa | | ua | eastward_wind |
| 1 | Northward Wind | m s ⁻¹ | on the following pressure levels: 850, 500, 250 hPa | | va | northward_wind |
| 1 | Air Temperature | K | on the following pressure levels: 850, 500, 250 hPa | | ta | air_temperature |
| 1 | Sea Level Pressure | Pa | | | psl | sea_level_pressure |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|------------------------------|---------------------|------------------|------------------|----------------------------------|----------------------------------|-----------------|-------------|--------------------------------|-----------------------------------|--------------|
| | m s-1 | | | | | | | real | longitude latitude plev3 time1 | uaPlev | atmos |
| | m s-1 | | | | | | | real | longitude latitude plev3 time1 | vaPlev | atmos |
| | K | | | | | | | real | longitude latitude plev3 time1 | taPlev | atmos |
| | Pa | | | | | | | real | longitude latitude time1 | psl | atmos |

CMOR Table 3hr: 2-D Atmospheric and Surface Fields Sampled Every 3 Hours

3hr

all saved on the atmospheric grid and (except for precipitation) sampled synoptically at 0Z, 3Z, 6Z, 9Z, 12Z, 15Z, 18Z, and 21Z; precipitation should be averaged over 3-hour intervals (0-3Z, 3-6Z, 6-9Z, 9-12Z, 12-15Z, 15-18Z, 18-21Z, 21-24Z)

The 3-hourly data should be collected only for the following experiments and years:

| <i>experiment</i> | <i>time-period requested</i> |
|--|--|
| decadal hindcasts/forecasts | all years |
| historical | Jan 1960 - Dec 2005 |
| AMIP | all years |
| future simulations driven by RCP concentrations or emissions | Jan 2026 - Dec 2045, Jan 2081-Dec 2100, 2181-2200, and 2281-2300 |

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|------------------------------------|--|--|----------------------|---|
| 1 | Precipitation | kg m ⁻² s ⁻¹ | at surface; includes both liquid and solid phases. This is the 3-hour mean precipitation flux. | | pr | precipitation_flux |
| 1 | Air Temperature | K | near-surface (usually, 2 meter) air temperature | | tas | air_temperature |
| 1 | Surface Upward Latent Heat Flux | W m ⁻² | | | hfis | surface_upward_latent_heat_flux |
| 1 | Surface Upward Sensible Heat Flux | W m ⁻² | | | hfss | surface_upward_sensible_heat_flux |
| 1 | Surface Downwelling Longwave Radiation | W m ⁻² | | | rlds | surface_downwelling_longwave_flux_in_air |
| 1 | Surface Upwelling Longwave Radiation | W m ⁻² | | | rlus | surface_upwelling_longwave_flux_in_air |
| 1 | Surface Downwelling Shortwave Radiation | W m ⁻² | | | rsds | surface_downwelling_shortwave_flux_in_air |
| 1 | Surface Upwelling Shortwave Radiation | W m ⁻² | | | rsus | surface_upwelling_shortwave_flux_in_air |
| 1 | Eastward Near-Surface Wind Speed | m s ⁻¹ | | | uas | eastward_wind |
| 1 | Northward Near-Surface Wind Speed | m s ⁻¹ | | | vas | northward_wind |
| 1 | Near-Surface Specific Humidity | 1 | near-surface (usually 2 m) specific humidity. | | huss | specific_humidity |
| 1 | Moisture in Upper 0.1 m of Soil Column | 1 | | What is meant by "near surface" here? Also check units! Should this be soil moisture content with units of kg m ⁻² . In L_mon, we ask for "moisture content of soil layer (kg/m**2)", which we define as the top-most 0.1 meters. Is that what is requested here? | mrsos? | |
| 1 | Surface Temperature Where Land or Sea Ice | K | "skin" temperature of all surfaces except open ocean. | This has been changed from soil temperature to surface skin temperature outside regions of open ocean. CMOR can't write the proper specification for cell_methods for this variable because it requires "where" more than 1 surface type (i.e., both land and sea ice). | tsl | surface_temperature |
| 1 | Sea Surface Temperature | K | temperature of surface of open ocean | | tso | sea_surface_temperature |

| | | | | | |
|---|---|----------------------------------|---|----------|--|
| 1 | Convective Precipitation | $\text{kg m}^{-2} \text{s}^{-1}$ | at surface | prc | convective_precipitation_flux |
| 1 | Snowfall Flux | $\text{kg m}^{-2} \text{s}^{-1}$ | at surface. Includes all forms of precipitating solid phase of water. | prsn | snowfall_flux |
| 1 | Total Runoff | $\text{kg m}^{-2} \text{s}^{-1}$ | compute the total runoff (including "drainage" through the base of the soil model) leaving the land portion of the grid cell divided by the land area in the grid cell. | mrro | runoff_flux |
| 1 | Surface Downwelling Clear-Sky Longwave Radiation | W m^{-2} | | rldscs | clear-sky surface downwelling longwave flux in air |
| 1 | Surface Downwelling Clear-Sky Shortwave Radiation | W m^{-2} | | rsdscs | surface_downwelling_shortwave_flux_in_air_assuming_clear_sky |
| 1 | Surface Upwelling Clear-Sky Shortwave Radiation | W m^{-2} | | rluscs | surface_upwelling_shortwave_flux_in_air_assuming_clear_sky |
| 1 | Surface Pressure | Pa | to diagnose atmospheric tides, this is better than mean sea level pressure. | ps | surface_pressure |
| 1 | Total Cloud Fraction | % | | clt | total_cloud_fraction |
| 1 | Surface Downward Diffuse Shortwave Radiation | W m^{-2} | | rsdsdiff | |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|-------------------------------------|-----------|-----------|-------------------------|-------------------------|----------|------|--------------------------------------|--------------------------|-------|
| | kg m-2 s-1 | time:mean | | | | | | real | longitude latitude time | pr | atmos |
| | K | time: point | | | | | | real | longitude latitude time height2m | tas | atmos |
| | W m-2 | time: point | | | | | up | real | longitude latitude time1 | hfls | atmos |
| | W m-2 | time: point | | | | | up | real | longitude latitude time1 | hfss | atmos |
| | W m-2 | time: point | | | | | down | real | longitude latitude time1 | rlds | atmos |
| | W m-2 | time: point | | | | | up | real | longitude latitude time1 | rlus | atmos |
| | W m-2 | time: point | | | | | down | real | longitude latitude time1 | rsds | atmos |
| | W m-2 | time: point | | | | | up | real | longitude latitude time1 | rsus | atmos |
| | | time: point | | | | | | | | | atmos |
| | m s-1 | time: point | | | | | | real | longitude latitude time height10m | uas | atmos |
| | m s-1 | time: point | | | | | | real | longitude latitude time height10m | vas | atmos |
| | 1 | time: point | | | | | | real | longitude latitude time height2m | huss | atmos |
| | 1 | time: point | | | | | | real | longitude latitude time1 | mrsos? | land |
| | K | time: point | | | | | | real | longitude latitude time1 | tsl | land |
| | K | time: point area: mean where sea | | | | | | real | longitude latitude time1 | tso | ocean |

| | | | | | | | |
|---|------------|-------------------------------------|------|------|--------------------------|----------|-------|
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | prc | atmos |
| | kg m-2 s-1 | time: mean | | real | longitude latitude time | prsn | atmos |
| | kg m-2 s-1 | time: mean area: mean where land | | real | longitude latitude time1 | mrro | land |
| | W m-2 | time: point | down | real | longitude latitude time1 | rldscs | atmos |
| | W m-2 | time: point | down | real | longitude latitude time1 | rsdscs | atmos |
| | W m-2 | time: point | up | real | longitude latitude time1 | rluscs | atmos |
| | Pa | time: point | | real | longitude latitude time1 | ps | atmos |
| | % | time: point | | real | longitude latitude time1 | clt | atmos |
| surface_diffusive_downwelling_shortw ave radiative flux in air | W m-2 | time: point | | real | longitude latitude time1 | rsdsdiff | atmos |

CMOR Table cfMon: CFMIP Monthly-Mean Cloud Diagnostic Fields

cfMon

(All Saved on the Atmospheric Grid)

For further guidance, please see <http://www.cfmip.net>

The spread sheet "CFMIP expts." specifies the simulations and time-periods for which the cloud diagnostic fields listed on this spread sheet should be saved.

In CMOR Table cfMon: "CFMIP monthly 3D"-- monthly mean 3-D fields on model levels (or half levels in the case of fluxes)

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|--|-------------------|---|-----------|----------------------|---|
| 1 | Upwelling Longwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rlu | upwelling_longwave_flux_in_air |
| 1 | Upwelling Shortwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rsu | upwelling_shortwave_flux_in_air |
| 1 | Downwelling Longwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rld | downwelling_longwave_flux_in_air |
| 1 | Downwelling Shortwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rsd | downwelling_shortwave_flux_in_air |
| 1 | Upwelling Clear-Sky Longwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rlucs | upwelling_longwave_flux_in_air_assuming_clear_sky |
| 1 | Upwelling Clear-Sky Shortwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rsucs | upwelling_shortwave_flux_in_air_assuming_clear_sky |
| 1 | Downwelling Clear-Sky Longwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rldcs | downwelling_longwave_flux_in_air_assuming_clear_sky |
| 1 | Downwelling Clear-Sky Shortwave Radiation | W m ⁻² | Include also the fluxes at the surface and TOA. | | rsdcs | downwelling_shortwave_flux_in_air_assuming_clear_sky |
| 1 | Air Temperature | K | | | ta | air_temperature |
| 1 | Tendency of Air Temperature | K s ⁻¹ | | | tnt | tendency_of_air_temperature |
| 1 | Tendency of Air Temperature due to Advection | K s ⁻¹ | | | tnta | tendency_of_air_temperature_due_to_advection |
| 1 | Tendency of Air Temperature due to Diabatic Processes | K s ⁻¹ | | | tntdp | tendency_of_air_temperature_due_to_diabatic_processes |
| 1 | Tendency of Air Temperature due to Stratiform Cloud Condensation and Evaporation | K s ⁻¹ | | | tntscce | |
| 1 | Tendency of Air Temperature due to Radiative Heating | K s ⁻¹ | | | tnttr | tendency_of_air_temperature_due_to_radiative_heating |
| 1 | Tendency of Air Temperature due to Moist Convection | K s ⁻¹ | | | tntmc | |
| 1 | Specific Humidity | 1 | | | hus | specific_humidity |
| 1 | Tendency of Specific Humidity | s ⁻¹ | | | tnhus | tendency_of_specific_humidity |
| 1 | Tendency of Specific Humidity due to Advection | s ⁻¹ | | | tnhusa | tendency_of_specific_humidity_due_to_advection |
| 1 | Tendency of Specific Humidity due to Convection | s ⁻¹ | | | tnhusc | tendency_of_specific_humidity_due_to_convection |
| 1 | Tendency of Specific Humidity due to Diffusion | s ⁻¹ | | | tnhusd | tendency_of_specific_humidity_due_to_diffusion |

| | | | | |
|---|--|--------------------|--|-----------|
| 1 | Tendency of Specific Humidity due to Stratiform Cloud Condensation and Evaporation | s^{-1} | | tnhussce |
| 1 | Tendency of Specific Humidity due to Model Physics | s^{-1} | Can you give examples of what should and should not be included in "model physics"? | tnhusmp |
| 1 | Eddy Viscosity Coefficients for Momentum | $m^2 s^{-1}$ | | eviscu |
| 1 | Eddy Diffusivity Coefficients for Temperature | $m^2 s^{-1}$ | | evisct |
| 1 | Eddy Diffusivity Coefficients for Water | $m^2 s^{-1}$ | | eviscw |
| 2 | Convective Cloud Area Fraction | % | | clc |
| 2 | Mass Fraction of Convective Cloud Liquid Water | 1 | Calculate as the mass of convective cloud liquid water in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clwc |
| 2 | Mass Fraction of Convective Cloud Ice | 1 | Calculate as the mass of convective cloud ice in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clic |
| 2 | Stratiform Cloud Area Fraction | % | | cls |
| 2 | Mass Fraction of Stratiform Cloud Liquid Water | 1 | Calculate as the mass of stratiform cloud liquid water in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clws |
| 2 | Mass Fraction of Stratiform Cloud Ice | 1 | Calculate as the mass of stratiform cloud ice in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clis |
| 2 | Updraught Convective Mass Flux | $kg m^{-2} s^{-1}$ | Calculate as the convective mass flux divided by the area of the whole grid cell (not just the area of the cloud). | mcu |
| 2 | Downdraught Convective Mass Flux | $kg m^{-2} s^{-1}$ | Calculate as the convective mass flux divided by the area of the whole grid cell (not just the area of the cloud). | mcd |
| 2 | Shallow Convective Mass Flux | $kg m^{-2} s^{-1}$ | For models with a distinct shallow convection scheme, calculate as the convective mass flux divided by the area of the whole grid cell (not just the area of the cloud). | smc |
| 2 | Deep Convective Mass Flux | $kg m^{-2} s^{-1}$ | Calculate as the convective mass flux divided by the area of the whole grid cell (not just the area of the cloud). | dmc |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Condensation and Evaporation | s^{-1} | | tnsclwce |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water Due Convective Detrainment | s^{-1} | | tnsclwcd |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Homogeneous Nucleation | s^{-1} | | tnsclwhon |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Heterogeneous Nucleation | s^{-1} | | tnsclwhen |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Riming | s^{-1} | | tnsclwri |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Accretion to Rain | s^{-1} | | tnsclwar |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Accretion to Snow | s^{-1} | | tnsclwas |

| | | | | |
|---|---|----------|---|-------------|
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Melting From Cloud Ice | s^{-1} | | tnsclwmi |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Autoconversion | s^{-1} | | tnsclwac |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Liquid Water due to Advection | s^{-1} | | tnsclwa |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice Due Convective Detrainment | s^{-1} | | tncliscd |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Homogeneous Nucleation | s^{-1} | | tnclishon |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Heterogeneous Nucleation From Cloud Liquid | s^{-1} | | tnclishencl |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Heterogeneous Nucleation From Water Vapor | s^{-1} | | tnclishenv |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Riming From Cloud Liquid | s^{-1} | | tnclisricl |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Riming From Rain | s^{-1} | | tnclisrir |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Deposition and Sublimation | s^{-1} | | tnclisds |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Aggregation | s^{-1} | | tnclisag |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Accretion to Snow | s^{-1} | | tnclisas |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Evaporation of Melting Ice | s^{-1} | | tnclisemi |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Melting to Rain | s^{-1} | | tnclismr |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Melting to Cloud Liquid | s^{-1} | | tnclismel |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Icefall | s^{-1} | | tnclisif |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Ice due to Advection | s^{-1} | | tnclisa |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Condensed Water due to Condensation and Evaporation | s^{-1} | condensed water includes both liquid and ice. | tnclscee |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Condensed Water due to Autoconversion to Rain | s^{-1} | condensed water includes both liquid and ice. | tnclscaer |

| | | | | |
|---|---|-----------------|---|-----------|
| 2 | Tendency of Mass Fraction of Stratiform Cloud Condensed Water due to Autoconversion to Snow | s ⁻¹ | condensed water includes both liquid and ice. | tnclscaes |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Condensed Water due to Icefall | s ⁻¹ | condensed water includes both liquid and ice. | tnclsCIF |
| 2 | Tendency of Mass Fraction of Stratiform Cloud Condensed Water due to Advection | s ⁻¹ | condensed water includes both liquid and ice. | tnclsca |

In CMOR Table **cfMon**: "*CFMIP monthly 4xCO2 2D*" -- *monthly mean 2D TOA radiative fluxes calculated by instantaneously quadrupling CO2.*

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|-------------------|---------|-----------|----------------------|---|
| 1 | TOA Outgoing Shortwave Radiation in 4XCO2 Atmosphere | W m ⁻² | | | rsut4co2 | |
| 1 | TOA Outgoing Longwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rlut4co2 | |
| 1 | TOA Outgoing Clear-Sky Shortwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rsutcs4co2 | |
| 1 | TOA Outgoing Clear-Sky Longwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rlutcs4co2 | |

In CMOR Table **cfMon**: "*CFMIP monthly 4xCO2 3D*" -- *monthly mean 3-D radiative fluxes calculated by instantaneously quadrupling CO2. On model half levels, including the surface and the Top of the Atmosphere.*

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|--|-------------------|---------|-----------|----------------------|---|
| 1 | Upwelling Longwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rlu4co2 | |
| 1 | Upwelling Shortwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rsu4co2 | |
| 1 | Downwelling Longwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rld4co2 | |
| 1 | Downwelling Shortwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rsd4co2 | |
| 1 | Upwelling Clear-Sky Longwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rlucs4co2 | |
| 1 | Upwelling Clear-Sky Shortwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rsucs4co2 | |
| 1 | Downwelling Clear-Sky Longwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rldcs4co2 | |
| 1 | Downwelling Clear-Sky Shortwave Radiation 4XCO2 Atmosphere | W m ⁻² | | | rsdcs4co2 | |

In CMOR Table cfMon: "CFMIP monthly inline" -- monthly mean in line ISCCP and CALIPSO/PARASOL simulator output

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|-----------------------------------|--------------|---|------------------|-----------------------------|--|
| 1 | ISSCP Total Cloud Fraction | % | | | cltisccp | cloud_area_fraction |
| 1 | ISSCP Mean Cloud Albedo | 1 | | | albisccp | cloud_albedo |
| 1 | ISSCP Mean Cloud Top Pressure | Pa | | | ctpisccp | air_pressure_at_cloud_top |
| 1 | ISSCP Cloud Area Fraction | % | 7 levels x 7 tau | | clisccp | isccp_cloud_area_fraction |
| 1 | CALIPSO Total Cloud Fraction | % | | | cltcalipso | cloud_area_fraction |
| 1 | CALIPSO Low Level Cloud Fraction | % | | | cllcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO Mid Level Cloud Fraction | % | | | clmcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO High Level Cloud Fraction | % | | | clhcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO Cloud Fraction | % | 40 height levels | | clcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | PARASOL Reflectance | 1 | 5 bins of solar zenith angle. This is reflectance as seen at the top of the atmosphere. | | parasolRefl | |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|------|----------------------------------|--------------------------|-------|
| | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rlu | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rsu | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rld | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rsd | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rlucs | atmos |
| | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rsucs | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rldcs | atmos |
| | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rsdcs | atmos |
| air_temperature | K | time: mean | | | | | | real | longitude latitude alevel time | ta | atmos |
| | K s-1 | time: mean | | | | | | real | longitude latitude alevel time | tnt | atmos |
| | K s-1 | time: mean | | | | | | real | longitude latitude alevel time | tnta | atmos |
| | K s-1 | time: mean | | | | | | real | longitude latitude alevel time | tntdp | atmos |
| tendency_of_air_temperature_due_to_stratiform_cloud_condensation_and_evaporation | K s-1 | time: mean | | | | | | real | longitude latitude alevel time | tntsce | atmos |
| | K s-1 | time: mean | | | | | | real | longitude latitude alevel time | tnttr | atmos |
| tendency_of_air_temperature_due_to_moist_convection | K s-1 | time: mean | | | | | | real | longitude latitude alevel time | tntmc | atmos |
| | 1 | time: mean | | | | | | real | longitude latitude alevel time | hus | atmos |
| | s-1 | time: mean | | | | | | real | longitude latitude alevel time | tnhus | atmos |
| | s-1 | time: mean | | | | | | real | longitude latitude alevel time | tnhusa | atmos |
| | s-1 | time: mean | | | | | | real | longitude latitude alevel time | tnhusc | atmos |
| tendency_of_specific_humidity_due_to_diffusion | s-1 | time: mean | | | | | | real | longitude latitude alevel time | tnhusd | atmos |

| | | | | | | |
|---|------------|------------|------|--------------------------------|-----------|-------|
| tendency_of_specific_humidity_due_to_stratiform_cloud_condensation_and_evaporation | s-1 | time: mean | real | longitude latitude alevel time | tnhussce | atmos |
| tendency_of_specific_humidity_due_to_model_physics | s-1 | time: mean | real | longitude latitude alevel time | tnhusmp | atmos |
| | | time: mean | | | | atmos |
| eddy_viscosity_coefficients_for_momentum_variables | m2 s-1 | time: mean | real | longitude latitude alevel time | eviscu | atmos |
| eddy_diffusivity_coefficients_for_temperature_variable | m2 s-1 | time: mean | real | longitude latitude alevel time | eviset | atmos |
| eddy_diffusivity_coefficients_for_water_variables | m2 s-1 | time: mean | real | longitude latitude alevel time | eviscw | atmos |
| | | | | | | |
| convective_cloud_area_fraction_in_atmosphere_layer | % | time: mean | real | longitude latitude alevel time | clc | atmos |
| mass_fraction_of_convective_cloud_liquid_water_in_air | 1 | time: mean | real | longitude latitude alevel time | clwc | atmos |
| mass_fraction_of_convective_cloud_ice_in_air | 1 | time: mean | real | longitude latitude alevel time | clic | atmos |
| stratiform_cloud_area_fraction_in_atmosphere_layer | % | time: mean | real | longitude latitude alevel time | cls | atmos |
| mass_fraction_of_stratiform_cloud_liquid_water_in_air | 1 | time: mean | real | longitude latitude alevel time | clws | atmos |
| mass_fraction_of_stratiform_cloud_ice_in_air | 1 | time: mean | real | longitude latitude alevel time | clis | atmos |
| | | | | | | |
| updraught_convective_mass_flux | kg m-2 s-1 | time: mean | real | longitude latitude alevel time | mcu | atmos |
| downdraught_convective_mass_flux | kg m-2 s-1 | time: mean | real | longitude latitude alevel time | mcd | atmos |
| | | | | | | |
| shallow_convective_mass_flux | kg m-2 s-1 | time: mean | real | longitude latitude alevel time | smc | atmos |
| deep_convective_mass_flux | kg m-2 s-1 | time: mean | real | longitude latitude alevel time | dmc | atmos |
| | | | | | | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_condensation_and_evaporation | s-1 | time: mean | real | longitude latitude alevel time | tnsclwce | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_convective_detrainment | s-1 | time: mean | real | longitude latitude alevel time | tnsclwcd | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_homogeneous_nucleation | s-1 | time: mean | real | longitude latitude alevel time | tnsclwhon | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_heterogeneous_nucleation | s-1 | time: mean | real | longitude latitude alevel time | tnsclwhen | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_riming | s-1 | time: mean | real | longitude latitude alevel time | tnsclwri | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_accretion_to_rain | s-1 | time: mean | real | longitude latitude alevel time | tnsclwar | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_accretion_to_snow | s-1 | time: mean | real | longitude latitude alevel time | tnsclwas | atmos |

| | | | | | | |
|--|-----|------------|------|--------------------------------|-------------|-------|
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_melting_from_cloud_ice | s-1 | time: mean | real | longitude latitude alevel time | tnsclwmi | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_autoconversion | s-1 | time: mean | real | longitude latitude alevel time | tnsclwac | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_liquid_water_in_air_due_to_advection | s-1 | time: mean | real | longitude latitude alevel time | tnsclwa | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_convective_detrainment | s-1 | time: mean | real | longitude latitude alevel time | tncliscd | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_homogeneous_nucleation | s-1 | time: mean | real | longitude latitude alevel time | tnclishon | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_heterogeneous_nucleation_from_cloud_liquid | s-1 | time: mean | real | longitude latitude alevel time | tnclishenc1 | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_heterogeneous_nucleation_from_water_vapor | s-1 | time: mean | real | longitude latitude alevel time | tnclishenv | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_riming_from_cloud_liquid | s-1 | time: mean | real | longitude latitude alevel time | tnclisric1 | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_riming_from_rain | s-1 | time: mean | real | longitude latitude alevel time | tnclisrir | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_deposition_and_sublimation | s-1 | time: mean | real | longitude latitude alevel time | tnclisds | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_aggregation | s-1 | time: mean | real | longitude latitude alevel time | tnclisag | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_accretion_to_snow | s-1 | time: mean | real | longitude latitude alevel time | tnclisas | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_evaporation_of_melting_ice | s-1 | time: mean | real | longitude latitude alevel time | tnclisemi | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_melting_to_rain | s-1 | time: mean | real | longitude latitude alevel time | tnclismr | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_melting_to_cloud_liquid | s-1 | time: mean | real | longitude latitude alevel time | tnclismcl | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_icefall | s-1 | time: mean | real | longitude latitude alevel time | tnclisif | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_ice_in_air_due_to_advection | s-1 | time: mean | real | longitude latitude alevel time | tnclisa | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_condensed_water_in_air_due_to_condensation_and_evaporation | s-1 | time: mean | real | longitude latitude alevel time | tnclsce | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_condensed_water_in_air_due_to_autoconversion_to_rain | s-1 | time: mean | real | longitude latitude alevel time | tnclsacr | atmos |

| | | | | | | | | | | | | |
|--|-----|------------|--|--|--|--|--|--|------|--------------------------------|----------|-------|
| tendency_of_mass_fraction_of_stratiform_cloud_condensed_water_in_air_due_to_autoconversion_to_snow | s-1 | time: mean | | | | | | | real | longitude latitude alevel time | tnlscacs | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_condensed_water_in_air_due_to_icefall | s-1 | time: mean | | | | | | | real | longitude latitude alevel time | tnlscif | atmos |
| tendency_of_mass_fraction_of_stratiform_cloud_condensed_water_in_air_due_to_advection | s-1 | time: mean | | | | | | | real | longitude latitude alevel time | tnlscsca | atmos |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|-------------------------|--------------------|-------|
| toa_outgoing_shortwave_flux_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsut4co2 | atmos |
| toa_outgoing_longwave_flux_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude time | rlut4co2 | atmos |
| toa_outgoing_shortwave_flux_assuming_clear_sky_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsutcs4co2 | atmos |
| toa_outgoing_longwave_flux_assuming_clear_sky_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude time | rlutcs4co2 | atmos |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|----------------------------------|--------------------|-------|
| upwelling_longwave_flux_in_air_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rlu4co2 | atmos |
| upwelling_shortwave_flux_in_air_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rsu4co2 | atmos |
| downwelling_longwave_flux_in_air_4co2 | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rlld4co2 | atmos |
| downwelling_shortwave_flux_in_air_4co2 | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rsd4co2 | atmos |
| upwelling_longwave_flux_in_air_assuming_clear_sky_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rlucs4co2 | atmos |
| upwelling_shortwave_flux_in_air_assuming_clear_sky_4co2 | W m-2 | time: mean | | | | | up | real | longitude latitude alevbnds time | rsucs4co2 | atmos |
| downwelling_longwave_flux_in_air_assuming_clear_sky_4co2 | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rlcds4co2 | atmos |
| downwelling_shortwave_flux_in_air_assuming_clear_sky_4co2 | W m-2 | time: mean | | | | | down | real | longitude latitude alevbnds time | rsdcs4co2 | atmos |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|------|--|--------------------------|-------|
| | % | time: mean | | | | | | real | longitude latitude time | cltisccp | atmos |
| | 1 | time: mean | | | | | | real | longitude latitude time | albisccp | atmos |
| | Pa | time: mean | | | | | | real | longitude latitude time | ctpiscpp | atmos |
| | % | time: mean | | | | | | real | longitude latitude plev7, tau, time | clisccp | atmos |
| | % | time: mean | | | | | | real | longitude latitude time | cltcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude time p840 | cllcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude time p560 | clmcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude time p220 | clhcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude height40 time | clcalipso | atmos |
| toa_bidirectional_reflectance | 1 | time: mean | | | | | | real | longitude latitude height40 time | parasolRefl | atmos |

CMOR Table cfOff: "CFMIP monthly offline" Cloud Diagnostic Fields

cfOff

(All Saved on the Atmospheric Grid)

For further guidance, please see <http://www.cfmip.net>

The spread sheet "CFMIP expts." specifies the simulations and time-periods for which the cloud diagnostic fields listed on this spread sheet should be saved.

CMOR Table cfOff: "CFMIP monthly offline" -- monthly mean CloudSat/CALIPSO/PARASOL simulator output

(Calculate monthly means by averaging the orbital curtain output from CFMIP_orbital_offline. The difference between similar variables appearing in this and the previous table is in the spatial sampling and time period requested. The previous table builds monthly means from global fields, whereas this table below uses only data along the satellite track for a short period of time (one year). This will enable studies of the impact of the satellite sampling in the comparisons)

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|-------|---|-----------|----------------------|---|
| 1 | CALIPSO Cloud Fraction | % | (40 height levels) | | clcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO Cloud Fraction Undetected by CloudSat | % | (40 height levels) Clouds detected by CALIPSO but below the detectability threshold of CloudSat | | clcalipso2 | cloud_area_fraction_in_atmosphere_layer |
| 1 | CloudSat Radar Reflectivity | 1 | CFADs (Cloud Frequency Altitude Diagrams) are joint height - radar reflectivity (or lidar scattering ratio) distributions (40 levelsx15 bins) . | | cfaddbze94 | |
| 1 | CALIPSO Scattering Ratio | 1 | CFADs (Cloud Frequency Altitude Diagrams) are joint height - radar reflectivity (or lidar scattering ratio) distributions (40 levelsx15 bins) . | | cfadLidarsr532 | |
| 1 | PARASOL Reflectance | 1 | 5 bins of solar zenith angle. This is reflectance as seen at the top of the atmosphere. | | parasolRefl | |
| 1 | CALIPSO Total Cloud Fraction | % | | | cltcalipso | cloud_area_fraction |
| 1 | CALIPSO Low Level Cloud Fraction | % | | | cllcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO Mid Level Cloud Fraction | % | | | clmcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO High Level Cloud Fraction | % | | | clhcalipso | cloud_area_fraction_in_atmosphere_layer |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|------|--|--------------------------|-------|
| | % | time: mean | | | | | | real | longitude latitude height40 time | clcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude height40 time | clcalipso2 | atmos |
| histogram_of_equivalent_reflectivity_factor_over_height_above_reference_ellipsoid | 1 | time: mean | | | | | | real | longitude latitude height40 dbze time | cfaddbze94 | atmos |
| histogram_of_backscattering_ratio_over_height_above_reference_ellipsoid | 1 | time: mean | | | | | | real | longitude latitude height40 scatratio time | cfadLidarsr532 | atmos |
| toa_bidirectional_reflectance | 1 | time: mean | | | | | | real | longitude latitude sza5 time | parasolRefl | atmos |
| | % | time: mean | | | | | | real | longitude latitude time | clcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude time p840 | clcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude time p560 | clmcalipso | atmos |
| | % | time: mean | | | | | | real | longitude latitude time p220 | clhcalipso | atmos |

CMOR Table cfDa: CFMIP Daily-Mean Cloud Diagnostic Fields

cfDa

(All Saved on the Atmospheric Grid)

For further guidance, please see <http://www.cfmip.net>

The spread sheet "CFMIP expts." specifies the simulations and time-periods for which the cloud diagnostic fields listed on this spread sheet should be saved.

In CMOR Table cfDa: "CFMIP daily 2D" -- daily mean 2-D fields including inline ISCCP/CloudSat/CALIPSO/PARASOL simulator output

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|------------------------------------|---|------------------|-----------------------------|--|
| 1 | Surface Air Pressure | Pa | | | ps | surface_air_pressure |
| 1 | TOA Incident Shortwave Radiation | W m ⁻² | | | rsdt | |
| 1 | TOA Outgoing Shortwave Radiation | W m ⁻² | | | rsut | |
| 1 | Surface Downwelling Clear-Sky Shortwave Radiation | W m ⁻² | | | rsdscs | |
| 1 | Surface Upwelling Clear-Sky Shortwave Radiation | W m ⁻² | | | rsuscs | |
| 1 | Surface Downwelling Clear-Sky Longwave Radiation | W m ⁻² | | | rldscs | |
| 1 | TOA Outgoing Clear-Sky Longwave Radiation | W m ⁻² | | | rlutes | |
| 1 | TOA Outgoing Clear-Sky Shortwave Radiation | W m ⁻² | | | rsutes | |
| 1 | Total Cloud Fraction | % | | | clt | |
| 1 | Column Integrated Cloud Water Content | kg m ⁻² | calculate mass of condensed water in the column divided by the area of the column (not just the area of the cloud-free portion of the column) | | clwvi | |
| 1 | Column Integrated Cloud Ice Content | kg m ⁻² | calculate mass of ice in the column divided by the area of the column (not just the area of the cloud-free portion of the column) | | clivi | |
| 1 | omega (=dp/dt) | Pa s ⁻¹ | at 500 hPa level; commonly referred to as "omega", this represents the vertical component of velocity in pressure coordinates (positive down) | | wap500 | |
| 1 | Air Temperature | K | at 700 hPa level | | ta700 | |
| 1 | Air Pressure at Convective Cloud Base | Pa | | | pccb | |
| 1 | Air Pressure at Convective Cloud Top | Pa | | | pcct | |
| 1 | Convective Precipitation | kg m ⁻² s ⁻¹ | | | prc | |
| 1 | Surface Upward Latent Heat Flux | W m ⁻² | | | hfls | |
| 1 | Surface Upward Sensible Heat Flux | W m ⁻² | | | hfss | |
| 1 | Surface Downwelling Longwave Radiation | W m ⁻² | | | rlds | |
| 1 | Surface Upwelling Longwave Radiation | W m ⁻² | | | rlus | |
| 1 | Surface Downwelling Shortwave Radiation | W m ⁻² | | | rsds | |
| 1 | Surface Upwelling Shortwave Radiation | W m ⁻² | | | rsus | |
| 1 | TOA Outgoing Longwave Radiation | W m ⁻² | | | rlut | |
| 1 | ISCCP Total Total Cloud Fraction | % | | | cltiscpp | |

| | | | | |
|---|-----------------------------------|----|---|------------|
| 1 | ISSCP Mean Cloud Albedo | 1 | | albisccp |
| 1 | ISSCP Mean Cloud Top Pressure | Pa | | ptisccp |
| 1 | PARASOL Reflectance | 1 | 5 bins of solar zenith angle. This is reflectance as seen at the top of the atmosphere. | parsolRefl |
| 1 | CALIPSO Total Cloud Fraction | % | | cltcalipso |
| 1 | CALIPSO Low Level Cloud Fraction | % | | cllcalipso |
| 1 | CALIPSO Mid Level Cloud Fraction | % | | clmcalipso |
| 1 | CALIPSO High Level Cloud Fraction | % | | clhcalipso |

In CMOR Table cfDa: "CFMIP daily 3D" --daily mean 3-D fields on model levels plus CALIPSO and ISCCP cloud fractions

| <i>priority</i> | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|-----------------|---|------------------------------------|--|-----------|----------------------|---|
| 1 | Eastward Wind | m s ⁻¹ | | | ua | eastward_wind |
| 1 | Northward Wind | m s ⁻¹ | | | va | northward_wind |
| 1 | Air Temperature | K | | | ta | air_temperature |
| 1 | Specific Humidity | 1 | | | hus | specific_humidity |
| 1 | omega (=dp/dt) | Pa s ⁻¹ | commonly referred to as "omega", this represents the vertical component of velocity in pressure coordinates (positive down) | | wap | lagrangian_tendency_of_air_pressure |
| 1 | Geopotential Height | m | | | zg | geopotential_height |
| 1 | Relative Humidity | % | This is the relative humidity with respect to liquid water for T> 0 C, and with respect to ice for T<0 C. | | hur | relative_humidity |
| 1 | Cloud Area Fraction in Atmosphere Layer | % | | | cl | |
| 1 | Mass Fraction of Cloud Liquid Water | 1 | Calculate as the mass of cloud liquid water in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | | clw | |
| 1 | Mass Fraction of Cloud Ice | 1 | Calculate as the mass of cloud ice in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | | cli | |
| 1 | Convective Mass Flux | kg m ⁻² s ⁻¹ | Calculate as the convective mass flux divided by the area of the whole grid cell (not just the area of the cloud). | | mc | |
| 1 | CALIPSO Cloud Fraction | % | 40 levels | | clcalipso | |
| 1 | ISSCP Cloud Area Fraction | % | 7 levels x 7 tau | | clisccp | |
| 1 | Pressure on Model Levels | Pa | provide this field for models in which the pressure can't be calculated from the vertical coordinate information stored already for each variable. Thus, the pressures are needed for height or theta-coordinate models, for example, but not sigma- or eta-coordinate models. | | pfull | air_pressure |
| 1 | Pressure on Model Half-Levels | Pa | provide this field for models in which the pressure can't be calculated from the vertical coordinate information stored already for each variable. Thus, the pressures are needed for height or theta-coordinate models, for example, but not sigma- or eta-coordinate models. | | phalf | air_pressure |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|------------------------------|--------------------|-------|
| | Pa | time: mean | | | | | | real | longitude latitude time | ps | atmos |
| toa_incoming_shortwave_flux | W m-2 | time: mean | | | | | down | real | longitude latitude time | rsdt | atmos |
| toa_outgoing_shortwave_flux | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsut | atmos |
| surface_downwelling_shortwave_flux_in_air_assuming_clear_sky | W m-2 | time: mean | | | | | down | real | longitude latitude time | rsdscs | atmos |
| surface_upwelling_shortwave_flux_in_air_assuming_clear_sky | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsuscs | atmos |
| surface_downwelling_longwave_flux_in_air_assuming_clear_sky | W m-2 | time: mean | | | | | down | real | longitude latitude time | rlsdscs | atmos |
| toa_outgoing_longwave_flux_assuming_clear_sky | W m-2 | time: mean | | | | | up | real | longitude latitude time | rlutcs | atmos |
| toa_outgoing_shortwave_flux_assuming_clear_sky | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsutcs | atmos |
| total_cloud_area_fraction | % | time: mean | | | | | | real | longitude latitude time | clt | atmos |
| atmosphere_cloud_condensed_water_content | kg m-2 | time: mean | | | | | | real | longitude latitude time | clwvi | atmos |
| atmosphere_cloud_ice_content | kg m-2 | time: mean | | | | | | real | longitude latitude time | clivi | atmos |
| lagrangian_tendency_of_air_pressure | Pa s-1 | time: mean | | | | | | real | longitude latitude time p500 | wap500 | atmos |
| air_temperature | K | time: mean | | | | | | real | longitude latitude time p700 | ta700 | atmos |
| air_pressure_at_convective_cloud_base | Pa | time: mean | | | | | | real | longitude latitude time | pccb | atmos |
| air_pressure_at_convective_cloud_top | Pa | time: mean | | | | | | real | longitude latitude time | pcct | atmos |
| convective_precipitation_flux | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude time | prc | atmos |
| surface_upward_latent_heat_flux | W m-2 | time: mean | | | | | up | real | longitude latitude time | hfls | atmos |
| surface_upward_sensible_heat_flux | W m-2 | time: mean | | | | | up | real | longitude latitude time | hfss | atmos |
| surface_downwelling_longwave_flux_in_air | W m-2 | time: mean | | | | | down | real | longitude latitude time | rls | atmos |
| surface_upwelling_longwave_flux_in_air | W m-2 | time: mean | | | | | up | real | longitude latitude time | rlus | atmos |
| surface_downwelling_shortwave_flux_in_air | W m-2 | time: mean | | | | | down | real | longitude latitude time | rsds | atmos |
| surface_upwelling_shortwave_flux_in_air | W m-2 | time: mean | | | | | up | real | longitude latitude time | rsus | atmos |
| toa_outgoing_longwave_flux | W m-2 | time: mean | | | | | up | real | longitude latitude time | rlut | atmos |
| isccp_total_cloud_area_fraction | % | time: mean | | | | | | real | longitude latitude time | cltscpp | atmos |

| | | | | | | | | |
|------------------------------------|----|------------|--|--|------|------------------------------|-------------|-------|
| isccp_mean_cloud_albedo | 1 | time: mean | | | real | longitude latitude time | albiscpp | atmos |
| isccp_mean_cloud_top_pressure | Pa | time: mean | | | real | longitude latitude time | pctisccp | atmos |
| parasol_reflectance | 1 | time: mean | | | real | longitude latitude sza5 time | parasolRefl | atmos |
| calipso_total_cloud_fraction_ | % | time: mean | | | real | longitude latitude time | cltcalipso | atmos |
| calipso_low_level_cloud_fraction_ | % | time: mean | | | real | longitude latitude time | cllcalipso | atmos |
| calipso_mid_level_cloud_fraction_ | % | time: mean | | | real | longitude latitude time | clmcalipso | atmos |
| calipso_high_level_cloud_fraction_ | % | time: mean | | | real | longitude latitude time | chlcalipso | atmos |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|------|-----------------------------------|--------------------------|-------|
| | m s-1 | time: mean | | | | | | real | longitude latitude alevel time | ua | atmos |
| | m s-1 | time: mean | | | | | | real | longitude latitude alevel time | va | atmos |
| | K | time: mean | | | | | | real | longitude latitude alevel time | ta | atmos |
| | 1 | time: mean | | | | | | real | longitude latitude alevel time | hus | atmos |
| | Pa s-1 | time: mean | | | | | | real | longitude latitude alevel time | wap | atmos |
| | m | time: mean | | | | | | real | longitude latitude alevel time | zg | atmos |
| | % | time: mean | | | | | | real | longitude latitude alevel time | hur | atmos |
| cloud_area_fraction_in_atmosphere_la yer | % | time: mean | | | | | | real | longitude latitude alevel time | cl | atmos |
| mass_fraction_of_cloud_liquid_water_ in_air | 1 | time: mean | | | | | | real | longitude latitude alevel time | clw | atmos |
| mass_fraction_of_cloud_ice_in_air | 1 | time: mean | | | | | | real | longitude latitude alevel time | cli | atmos |
| convective_mass_flux | kg m-2 s-1 | time: mean | | | | | | real | longitude latitude alevel time | mc | atmos |
| calipso_cloud_fraction | % | time: mean | | | | | | real | longitude latitude height40 time | clcalipso | atmos |
| isccp_cloud_area_fraction | % | time: mean | | | | | | real | longitude latitude tau plev7 time | clisccp | atmos |
| air_pressure_at_full_levels | Pa | time: mean | | | | | | real | longitude latitude alevel time | pfull | atmos |
| air_pressure_at_half_levels | Pa | time: mean | | | | | | real | longitude latitude levbnds time | phalf | atmos |

CMOR Table cf3hr: CFMIP 3-Hourly Cloud Diagnostic Fields

cf3hr

(All Saved on the Atmospheric Grid)

For further guidance, please see <http://www.cfmip.net>

The spread sheet "CFMIP expts." specifies the simulations and time-periods for which the cloud diagnostic fields listed on this spread sheet should be saved.

In CMOR Table cf3hr: "CFMIP 3-hourly orbital offline" -- CloudSat/CALIPSO/PARASOL simulator output in orbital curtain format

(For most of these variables, extract simulator input variables from models along A-train orbits, and run COSP on these in 'offline' mode.)

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|---------------|---|-----------|----------------------|---|
| 1 | CALIPSO Cloud Area Fraction | % | (40 height levels) | | clcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO Cloud Fraction Undetected by CloudSat | % | (40 height levels) Clouds detected by CALIPSO but below the detectability threshold of CloudSat | | clcalipso2 | cloud_area_fraction_in_atmosphere_layer |
| 1 | CloudSat Radar Reflectivity CFAD | 1 | CFADs (Cloud Frequency Altitude Diagrams) are joint height - radar reflectivity (or lidar scattering ratio) distributions (40 levelsx15 bins) . | | cfadbze94 | |
| 1 | CALIPSO Scattering Ratio CFAD | 1 | CFADs (Cloud Frequency Altitude Diagrams) are joint height - radar reflectivity (or lidar scattering ratio) distributions (40 levelsx15 bins) . | | cfadLidarsr532 | |
| 1 | PARASOL Reflectance | 1 | 5 bins of solar zenith angle. This is reflectance as seen at the top of the atmosphere. | | parasolRefl | |
| 1 | CALIPSO Total Cloud Fraction | % | | | cltcalipso | cloud_area_fraction |
| 1 | CALIPSO Low Level Cloud Fraction | % | | | cllcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO Mid Level Cloud Fraction | % | | | clmcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | CALIPSO High Level Cloud Fraction | % | | | clhcalipso | cloud_area_fraction_in_atmosphere_layer |
| 1 | Longitude | degrees_east | function of time | | lon | longitude |
| 1 | Latitude | degrees_north | function of time | | lat | latitude |
| 1 | Offset Time | day | this "offset time" should be added to the value stored in the "time dimension" to get the actual time | | toffset | ? |

In CMOR Table cf3hr: "CFMIP 3-hourly inline" -- 2-D and 3-D fields on model levels (or half levels, as indicated) sampled synoptically every 3 hours (i.e., not time-mean) at 0Z, 3Z, 6Z, 9Z, 12Z, 15Z, 18Z, and 21Z.

Except for the variables in the Amon table, are these all 3D fields?

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|-------|--|-----------|----------------------|---|
| 1 | see the "Amon" spreadsheet for list of quantities | | This table includes the 2-D variables listed in the "Amon" spreadsheet, omitting, however, the daily maximum and minimum temperatures. All variables should be reported as synoptic fields, not daily means. | | ? | |
| 2 | Altitude of Model Full-Levels | m | This is actual height above mean sea level, not geopotential height | | zfull | height_above_reference_ellipsoid |

| | | | | | |
|---|---|----------------------------------|--|-----------|----------------------------------|
| 2 | Altitude of Model Half-Levels | m | This is actual height above mean sea level, not geopotential height. This is actual height above mean sea level, not geopotential height. Include both the top of the model atmosphere and surface levels. | zhalf | height_above_reference_ellipsoid |
| 2 | Pressure at Model Full-Levels | Pa | provide this field for models in which the pressure can't be calculated from the vertical coordinate information stored already for each variable. Thus, the pressures are needed for height or theta-coordinate models, for example, but not sigma- or eta-coordinate models. | pfull | air_pressure |
| 2 | Pressure at Model Half-Levels | Pa | provide this field for models in which the pressure can't be calculated from the vertical coordinate information stored already for each variable. Thus, the pressures are needed for height or theta-coordinate models, for example, but not sigma- or eta-coordinate models. | phalf | air_pressure |
| 2 | Air Temperature | K | | ta | |
| 2 | Mass Fraction of Water | 1 | include all phases of water | h2o | |
| 2 | Mass Fraction of Stratiform Cloud Liquid Water | 1 | Calculate as the mass of stratiform cloud liquid water in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clws | |
| 2 | Mass Fraction of Stratiform Cloud Ice | 1 | Calculate as the mass of stratiform cloud ice in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clis | |
| 2 | Mass Fraction of Convective Cloud Liquid Water | 1 | Calculate as the mass of convective cloud liquid water in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clwc | |
| 2 | Mass Fraction of Convective Cloud Ice | 1 | Calculate as the mass of convective cloud ice in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | clic | |
| 2 | Hydrometeor Effective Radius of Stratiform Cloud Liquid Water | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. No time means are required as this is all snapshot data. | reffclws | |
| 2 | Hydrometeor Effective Radius of Stratiform Cloud Ice | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. No time means are required as this is all snapshot data. | reffclis | |
| 2 | Hydrometeor Effective Radius of Convective Cloud Liquid Water | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. No time means are required as this is all snapshot data. | reffclwc | |
| 2 | Hydrometeor Effective Radius of Convective Cloud Ice | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. No time means are required as this is all snapshot data. | reffclis | |
| 2 | Stratiform Graupel Flux | $\text{kg m}^{-2} \text{s}^{-1}$ | report on model half-levels | grplprof | |
| 2 | Convective Rainfall Flux | $\text{kg m}^{-2} \text{s}^{-1}$ | report on model half-levels | prcprof | convective_rainfall_flux |
| 2 | Stratiform Rainfall Flux | $\text{kg m}^{-2} \text{s}^{-1}$ | report on model half-levels | prsprof | stratiform_rainfall_flux |
| 2 | Convective Snowfall Flux | $\text{kg m}^{-2} \text{s}^{-1}$ | report on model half-levels | prsnv | convective_snowfall_flux |
| 2 | Stratiform Snowfall Flux | $\text{kg m}^{-2} \text{s}^{-1}$ | report on model half-levels | prsns | stratiform_snowfall_flux |
| 2 | Hydrometeor Effective Radius of Stratiform Graupel | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. | reffgrpls | |
| 2 | Hydrometeor Effective Radius of Convective Rainfall | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. | reffrainc | |
| 2 | Hydrometeor Effective Radius of Stratiform Rainfall | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. | reffrainf | |
| 2 | Hydrometeor Effective Radius of Convective Snowfall | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. | reffsnowc | |
| 2 | Hydrometeor Effective Radius of Stratiform Snowfall | m | This is defined as the ratio of the third moment over the second moment of the particle size distribution. | reffsnowf | |
| 2 | Stratiform Cloud Optical Depth | 1 | | dtaus | |
| 2 | Convective Cloud Optical Depth | 1 | | dtauc | |
| 2 | Stratiform Cloud Emissivity | 1 | | demf | |
| 2 | Convective Cloud Emissivity | 1 | | dcmc | |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|-------------------|---|-----------|-----------|-------------------|-------------------|----------|------|----------------------------------|--------------------|-------|
| | % | what is cell method for time here and in rest of this table? Is it "mean" or "point"? | | | | | | real | location height40 time | clcalipso | atmos |
| | % | | | | | | | real | location height40 time | clcalipso2 | atmos |
| histogram_of_equivalent_reflectivity_factor_over_height_above_reference_ellipsoid | 1 | | | | | | | real | location height40 dbze time | cfaddbze94 | atmos |
| histogram_of_backscattering_ratio_over_height_above_reference_ellipsoid | 1 | | | | | | | real | location height40 scatratio time | cfadLidarsr532 | atmos |
| toa_bidirectional_reflectance | 1 | | | | | | | real | location sza5 time | parasolRefl | atmos |
| | % | | | | | | | real | location time | cltcalipso | atmos |
| | % | | | | | | | real | location time p840 | cllcalipso | atmos |
| | % | | | | | | | real | location time p560 | clmcalipso | atmos |
| | % | | | | | | | real | location time p220 | clhcalipso | atmos |
| | degrees_east | | | | | | | real | location time | lon | atmos |
| | degrees_north | | | | | | | real | location time | lat | atmos |
| ? | day | | | | | | | real | location time | toffset | atmos |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|---|-------------------|--------------|-----------|-----------|-------------------|-------------------|----------|------|---------------------------------|--------------------|-------|
| | | time: point | | | | | | real | longitude latitude time1 | ? | atmos |
| height_of_full_levels_above_reference_ellipsoid | m | time: point | | | | | | real | longitude latitude alevel time1 | zfull | atmos |

| | | | | | | |
|--|------------|-------------|------|----------------------------------|-----------|-------|
| height_of_half_levels_above_reference_ellipsoid | m | time: point | real | longitude latitude levbnds time1 | zhalf | atmos |
| | Pa | time: point | real | longitude latitude alevel time1 | pfull | atmos |
| air_pressure_at_half_levels | Pa | time: point | real | longitude latitude levbnds time1 | phalf | atmos |
| temperature_in_air | K | time: point | real | longitude latitude alevel time1 | ta | atmos |
| mass_fraction_of_water_in_air | 1 | time: point | real | longitude latitude alevel time1 | h2o | atmos |
| mass_fraction_of_stratiform_cloud_liquid_water_in_air | 1 | time: point | real | longitude latitude alevel time1 | clws | atmos |
| mass_fraction_of_stratiform_cloud_ice_in_air | 1 | time: point | real | longitude latitude alevel time1 | #REF! | atmos |
| mass_fraction_of_convective_cloud_liquid_water_in_air | 1 | time: point | real | longitude latitude alevel time1 | clis | atmos |
| mass_fraction_of_convective_cloud_ice_in_air | 1 | time: point | real | longitude latitude alevel time1 | clic | atmos |
| effective_radius_of_stratiform_cloud_liquid_water_particle | m | | real | longitude latitude alevel time1 | reffclws | atmos |
| effective_radius_of_stratiform_cloud_ice_particle | m | | real | longitude latitude alevel time1 | reffclis | atmos |
| effective_radius_of_convective_cloud_liquid_water_particle | m | | real | longitude latitude alevel time1 | reffclwc | atmos |
| effective_radius_of_convective_cloud_ice_particle | m | | real | longitude latitude alevel time1 | reffclic | atmos |
| large_scale_graupel_flux | kg m-2 s-1 | | real | longitude latitude alevel time1 | grplprof | atmos |
| | kg m-2 s-1 | | real | longitude latitude alevel time1 | prcprof | atmos |
| | kg m-2 s-1 | | real | longitude latitude alevel time1 | prsprprof | atmos |
| | kg m-2 s-1 | | real | longitude latitude alevel time1 | prsn | atmos |
| | kg m-2 s-1 | | real | longitude latitude alevel time1 | prsns | atmos |
| hydrometeor_effective_radius_of_stratiform_graupel | m | | real | longitude latitude alevel time1 | reffgrpls | atmos |
| effective_radius_of_convective_cloud_rain_particle | m | | real | longitude latitude alevel time1 | reffrainc | atmos |
| effective_radius_of_stratiform_cloud_rain_particle | m | | real | longitude latitude alevel time1 | reffrain | atmos |
| effective_radius_of_convective_cloud_snow_particle | m | | real | longitude latitude alevel time1 | reffsnowc | atmos |
| effective_radius_of_stratiform_cloud_snow_particle | m | | real | longitude latitude alevel time1 | reffsnow | atmos |
| atmosphere_optical_thickness_due_to_stratiform_cloud | 1 | | real | longitude latitude alevel time1 | dtaus | atmos |
| atmosphere_optical_thickness_due_to_convective_cloud | 1 | | real | longitude latitude alevel time1 | dtauc | atmos |
| stratiform_cloud_longwave_emissivity | 1 | | real | longitude latitude alevel time1 | dems | atmos |
| convective_cloud_longwave_emissivity | 1 | | real | longitude latitude alevel time1 | demc | atmos |

CMOR Table cf30min: CFMIP 30-Minute Cloud Diagnostic Fields

cf30min

(All Saved on the Atmospheric Grid)

For further guidance, please see <http://www.cfmip.net>

The spread sheet "CFMIP expts." specifies the simulations and time-periods for which the cloud diagnostic fields listed on this spread sheet should be saved.

CMOR Table cf30Min: "CFMIP 30-min" -- 2-D and 3-D fields on model levels sampled approximately every half-hour at specified locations (about 115 stations)

The sampling interval must be the integer multiple of the model time-step that is nearest a half hour. Outputs should be instantaneous (not time mean) and from nearest gridbox (no spatial interpolation.) Note that except for the quantities appearing in the Amon spreadsheet (first line of table below), all other fields are 3-D.

| priority | long name | units | comment | questions | output variable name | confirmed or likely to be confirmed standard name |
|----------|---|------------------------------------|---|-----------|----------------------|--|
| 1 | see the "Amon" spreadsheet for list of quantities | | This table includes the 2-D variables listed in the "Amon" spreadsheet, omitting, however, the daily maximum and minimum temperatures. All variables should be reported as synoptic fields, not daily means. | | ? | |
| 1 | Cloud Area Fraction | % | Include both large-scale and convective cloud. | | cl | cloud_area_fraction_in_atmosphere_layer |
| 1 | Mass Fraction of Cloud Liquid Water | 1 | Include both large-scale and convective cloud. Calculate as the mass of cloud liquid water in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | | clw | mass_fraction_of_cloud_liquid_water_in_air |
| 1 | Mass Fraction of Cloud Ice | 1 | Include both large-scale and convective cloud. Calculate as the mass of cloud ice in the grid cell divided by the mass of air (including the water in all phases) in the grid cell. | | cli | mass_fraction_of_cloud_ice_in_air |
| 1 | Convective Mass Flux | kg m ⁻² s ⁻¹ | The atmosphere convective mass flux is the vertical transport of mass for a field of cumulus clouds or cloudless thermals, given by the product of air density and vertical velocity. Calculate as the convective mass flux divided by the area of the whole grid cell (not just the area of the updrafts). | | mc | convective_mass_flux |
| 1 | Air Temperature | K | | | ta | air_temperature |
| 1 | Eastward Wind | m s ⁻¹ | | | ua | eastward_wind |
| 1 | Northward Wind | m s ⁻¹ | | | va | northward_wind |
| 1 | Specific Humidity | 1 | | | hus | specific_humidity |
| 1 | Relative Humidity | % | This is the relative humidity with respect to liquid water for T>0 C, and with respect to ice for T<0 C. | | hur | relative_humidity |
| 1 | omega (=dp/dt) | Pa s ⁻¹ | commonly referred to as "omega", this represents the vertical component of velocity in pressure coordinates (positive down) | | wap | lagrangian_tendency_of_air_pressure |
| 1 | Geopotential Height | m | | | zg | geopotential_height |
| 1 | Upwelling Longwave Radiation | W m ⁻² | | | rlu | upwelling_longwave_flux_in_air |
| 1 | Upwelling Shortwave Radiation | W m ⁻² | | | rsu | upwelling_shortwave_flux_in_air |
| 1 | Downwelling Longwave Radiation | W m ⁻² | | | rld | downwelling_longwave_flux_in_air |
| 1 | Downwelling Shortwave Radiation | W m ⁻² | | | rsd | downwelling_shortwave_flux_in_air |
| 1 | Upwelling Clear-Sky Longwave Radiation | W m ⁻² | | | rucs | upwelling_longwave_flux_in_air_assuming_clear_sky |
| 1 | Upwelling Clear-Sky Shortwave Radiation | W m ⁻² | | | rsucs | upwelling_shortwave_flux_in_air_assuming_clear_sky |

| | | | | |
|---|--|----------------------------|-----------|--|
| 1 | Downwelling Clear-Sky Longwave Radiation | W m^{-2} | rldcs | downwelling_longwave_flux_in_air_assuming_clear_sky |
| 1 | Downwelling Clear-Sky Shortwave Radiation | W m^{-2} | rsdcs | downwelling_shortwave_flux_in_air_assuming_clear_sky |
| 1 | Tendency of Air Temperature | K s^{-1} | tnt | |
| 1 | Tendency of Air Temperature due to Advection | K s^{-1} | tnta | |
| 1 | Tendency of Air Temperature due to Diabatic Processes | K s^{-1} | tntdp | |
| 1 | Tendency of Air Temperature due to Stratiform Cloud Condensation and Evaporation | K s^{-1} | tntscce | |
| 1 | Tendency of Air Temperature due to Radiative Heating | K s^{-1} | tntr | |
| 1 | Tendency of Air Temperature due to Moist Convection | K s^{-1} | tntmc | |
| 1 | Tendency of Specific Humidity | s^{-1} | tnhus | |
| 1 | Tendency of Specific Humidity due to Advection | s^{-1} | tnhusa | |
| 1 | Tendency of Specific Humidity due to Convection | s^{-1} | tnhusc | |
| 1 | Tendency of Specific Humidity due to Diffusion | s^{-1} | tnhusd | |
| 1 | Tendency of Specific Humidity due to Stratiform Cloud Condensation and Evaporation | s^{-1} | tnhusscce | |
| 1 | Tendency of Specific Humidity due to Model Physics | s^{-1} | tnhusmp | |
| 1 | Eddy Viscosity Coefficient for Momentum Variables | $\text{m}^2 \text{s}^{-1}$ | evu | |
| 1 | Eddy Diffusivity Coefficient for Temperature Variable | $\text{m}^2 \text{s}^{-1}$ | edt | |
| 1 | Eddy Diffusivity Coefficient for Water Variables | $\text{m}^2 \text{s}^{-1}$ | edw | |

| unconfirmed or proposed standard name | unformatted units | cell_methods | valid min | valid max | mean absolute min | mean absolute max | positive | type | CMOR dimensions | CMOR variable name | realm |
|--|----------------------|--------------|-----------|-----------|-------------------------|-------------------------|----------|------|---------------------|--------------------------|-------|
| | | time: point | | | | | | real | site, time1 | | atmos |
| | % | time: point | | | | | | real | alevel, site, time1 | cl | atmos |
| | 1 | time: point | | | | | | real | alevel, site, time1 | clw | atmos |
| | 1 | time: point | | | | | | real | alevel, site, time1 | cli | atmos |
| | kg m-2 s-1 | time: point | | | | | | real | alevel, site, time1 | mc | atmos |
| | K | time: point | | | | | | real | alevel, site, time1 | ta | atmos |
| | m s-1 | time: point | | | | | | real | alevel, site, time1 | ua | atmos |
| | m s-1 | time: point | | | | | | real | alevel, site, time1 | va | atmos |
| | 1 | time: point | | | | | | real | alevel, site, time1 | hus | atmos |
| | % | time: point | | | | | | real | alevel, site, time1 | hur | atmos |
| | Pa s-1 | time: point | | | | | | real | alevel, site, time1 | wap | atmos |
| | m | time: point | | | | | | real | alevel, site, time1 | zg | atmos |
| | W m-2 | time: point | | | | | up | real | alevel, site, time1 | rlu | atmos |
| | W m-2 | time: point | | | | | up | real | alevel, site, time1 | rsu | atmos |
| | W m-2 | time: point | | | | | down | real | alevel, site, time1 | rld | atmos |
| | W m-2 | time: point | | | | | down | real | alevel, site, time1 | rsd | atmos |
| | W m-2 | time: point | | | | | up | real | alevel, site, time1 | rlucs | atmos |
| | W m-2 | time: point | | | | | up | real | alevel, site, time1 | rsucs | atmos |

| | | | | | | | | |
|--|--------|-------------|--|------|------|---------------------|-----------|-------|
| | W m-2 | time: point | | down | real | alevel, site, time1 | rlcds | atmos |
| | W m-2 | time: point | | down | real | alevel, site, time1 | rsdcs | atmos |
| tendency_of_air_temperature | K s-1 | time: point | | | real | alevel, site, time1 | tnt | atmos |
| tendency_of_air_temperature_due_to_advection | K s-1 | time: point | | | real | alevel, site, time1 | tnta | atmos |
| tendency_of_air_temperature_due_to_diabatic_processes | K s-1 | time: point | | | real | alevel, site, time1 | tntdp | atmos |
| tendency_of_air_temperature_due_to_stratiform_cloud_condensation_and_evaporation | K s-1 | time: point | | | real | alevel, site, time1 | tntscce | atmos |
| tendency_of_air_temperature_due_to_radiative_heating | K s-1 | time: point | | | real | alevel, site, time1 | tntr | atmos |
| tendency_of_air_temperature_due_to_moist_convection | K s-1 | time: point | | | real | alevel, site, time1 | tnmc | atmos |
| tendency_of_specific_humidity | s-1 | time: point | | | real | alevel, site, time1 | tnhus | atmos |
| tendency_of_specific_humidity_due_to_advection | s-1 | time: point | | | real | alevel, site, time1 | tnhusa | atmos |
| tendency_of_specific_humidity_due_to_convection | s-1 | time: point | | | real | alevel, site, time1 | tnhusc | atmos |
| tendency_of_specific_humidity_due_to_diffusion | s-1 | time: point | | | real | alevel, site, time1 | tnhusd | atmos |
| tendency_of_specific_humidity_due_to_stratiform_cloud_condensation_and_evaporation | s-1 | time: point | | | real | alevel, site, time1 | tnhusscce | atmos |
| tendency_of_specific_humidity_due_to_model_physics | s-1 | time: point | | | real | alevel, site, time1 | tnhusmp | atmos |
| eddy_viscosity_coefficients_for_momentum_variables | m2 s-1 | time: point | | | real | alevel, site, time1 | evu | atmos |
| eddy_diffusivity_coefficients_for_temperature_variable | m2 s-1 | time: point | | | real | alevel, site, time1 | edt | atmos |
| eddy_diffusivity_coefficients_for_water_variables | m2 s-1 | time: point | | | real | alevel, site, time1 | edw | atmos |

Requested periods for saving special CFMIP model output

| Experiment Name | Experiment Description | Experiment number | CFMIP monthly 3D (A1c_cfmip) | | CFMIP monthly 4xCO2.2D | | CFMIP monthly 4xCO2.3D | | CFMIP monthly inline (A1d.4g) | |
|-----------------------------|--|-------------------|------------------------------|------|------------------------|------|------------------------|------|-------------------------------|------|
| | | | 1979 | 2008 | 1979 | 2008 | 1979 | 2008 | 1979 | 2008 |
| pre-industrial control | coupled atmosphere/ocean control run | 3.1 | | | -20 | -1 | | | -20 | -1 |
| historical | simulation of recent past (1850-2005) | 3.2 | | | | | | | 1979 | 2005 |
| AMIP | AMIP (1979-2008) | 3.3 | 1979 | 2008 | 1979 | 2008 | 1979 | 2008 | 1979 | 2008 |
| RCP4.5 | future projection (2006-2100) forced by RCP4.5 | 4.1 | | | | | | | | |
| RCP8.5 | future projection (2006-2100) forced by RCP8.5 | 4.2 | | | | | | | | |
| ESM fixed climate 1 | radiation code "sees" control CO2, but carbon cycle sees 1%/yr rise | 5.4-1 | | | | | | | 121 | 140 |
| ESM fixed climate 2 | radiation code "sees" control CO2, but carbon cycle sees historical followed by RCP4.5 rise in CO2 | 5.4-2 | | | | | | | 232 | 251 |
| ESM feedback 1 | carbon cycle "sees" control CO2, but radiataion sees 1%/yr rise | 5.5-1 | | | | | | | 121 | 140 |
| ESM feedback 2 | carbon cycle "sees" control CO2, but radiataion sees historical followed by RCP4.5 rise in CO2 | 5.5-2 | | | | | | | 232 | 251 |
| 1 percent per year CO2 | impose a 1%/yr increase in CO2 to quadrupling | 6.1 | | | | | | | 121 | 140 |
| control SST climatology | AMIP-style experiment with control run climatological SSTs & sea ice | 6.2a | | | 1 | 30 | | | 1 | 30 |
| CO2 forcing | as in expt. 6.2a, but with 4XCO2 imposed | 6.2b | | | | | | | 1 | 30 |
| abrupt 4XCO2 | impose an instantaneous quadrupling of CO2, then hold fixed | 6.3 | | | | | | | 131 | 150 |
| abrupt 4XCO2 | generate an ensemble of runs like expt. 6.3, initialized in different months, and terminated after 5 years | 6.3-E | | | | | | | 1 | 5 |
| aerosol forcing | as in expt. 6.2a, but with aerosols from year 2000 of expt. 3.2 | 6.4 | | | | | | | 1 | 30 |
| 4xCO2 AMIP | AMIP (1979-2008) conditions (expt. 3.3) but with 4xCO2 | 6.5 | 1979 | 2008 | | | | | 1979 | 2008 |
| AMIP plus patterned anomaly | consistent with CFMIP, patterned SST anomalies added to AMIP conditions (expt. 3.3) | 6.6 | 1979 | 2008 | | | | | 1979 | 2008 |
| aqua planet control | consistent with CFMIP, zonally uniform SSTs for ocean-covered earth | 6.7a | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 |
| 4xCO2 aqua planet | as in expt. 6.7a, but with 4XCO2 | 6.7b | 1 | 5 | | | | | 1 | 5 |
| aqua planet plus 4K anomaly | as in expt. 6.7a, but with a uniform 4K increase in SST | 6.7c | 1 | 5 | | | | | 1 | 5 |
| AMIP plus 4K anomaly | as in expt. 3.3, but with a uniform 4K increase in SST | 6.8 | 1979 | 2008 | | | | | 1979 | 2008 |

| CFMIP monthly offline (A1e) | | CFMIP daily 2D (A2a-c,d) | | CFMIP daily 3D (A2b,d-g) | | Why shouldn't these 3-hourly columns be combined? | | | |
|-----------------------------|------|--------------------------|------|--------------------------|------|---|------|----------------------------|------|
| | | | | | | CFMIP 3-hourly orbital offline (A2e) | | CFMIP 3-hourly inline (A4) | |
| | | -20 | -1 | -5 | -1 | | | | |
| | | 1979 | 2005 | | | | | | |
| 2007 | 2007 | 1979 | 2008 | 1979 | 2008 | 2007 | 2007 | 2007 | 2007 |
| | | | | | | | | | |
| | | 121 | 140 | | | | | | |
| | | 232 | 251 | | | | | | |
| | | 121 | 140 | | | | | | |
| | | 232 | 251 | | | | | | |
| | | 121 | 140 | 136 | 140 | | | | |
| | | 1 | 30 | | | | | | |
| | | 1 | 30 | | | | | | |
| | | 131 | 150 | 146 | 150 | | | | |
| | | 1 | 5 | | | | | | |
| | | 1 | 30 | | | | | | |
| 2007 | 2007 | 1979 | 2008 | 1979 | 2008 | 2007 | 2007 | 2007 | 2007 |
| 2007 | 2007 | 1979 | 2008 | 1979 | 2008 | 2007 | 2007 | 2007 | 2007 |
| | | 1 | 5 | 1 | 5 | | | | |
| | | 1 | 5 | 1 | 5 | | | | |
| | | 1 | 5 | 1 | 5 | | | | |
| 2007 | 2007 | 1979 | 2008 | 1979 | 2008 | 2007 | 2007 | 2007 | 2007 |