AMIP NEWSLETTER

No. 7   WGNE Atmospheric Model Intercomparison Project   April 1996

An information summary and activities description for the Atmospheric Model Intercomparison Project (AMIP) of the Working Group on Numerical Experimentation (WGNE) in support of the World Climate Research Programme. Technical and computational support for AMIP is provided by the Environmental Sciences Division of the U.S. Department of Energy through the Program for Climate Model Diagnosis and Intercomparison (PCMDI) at the Lawrence Livermore National Laboratory (LLNL), where this newsletter is edited by Peter Gleckler (gleckler@pcmdi.llnl.gov), Chairman, WGNE AMIP Panel, PCMDI, L-264, LLNL, P.O. Box 808, Livermore, CA 94550, USA.

Contents

1.   Project Status Summary

1.1   First International AMIP Conference

The First International AMIP Scientific Conference was held in Monterey, CA, during the week of 15-19 May 1995. There were over 150 attendees, with 70 presentations, including reports from virtually all AMIP modeling groups and diagnostic subprojects. Conference sessions included: 1) an AMIP overview, 2) fluxes, clouds and radiation, 3) hydrology and land surface processes, 4) tropical variability, 5) extratropical variability, 6) systematic error reduction, 7) model sensitivity, 8) verification data, 9) the future of AMIP, 10) other model intercomparisons, and 11) a poster session. The Proceedings of the First International AMIP Scientific Conference (WCRP-92, WMO/TD-No. 732, December 1995) have

recently been mailed from Geneva to all AMIP participants. A limited number of additional copies may be ordered through Roger Newson at the Secretariat of the World Climate Research Programme at the World Meteorological Organization (41 Avenue Giuseppe Motta, C.P. 2300, CH-1211 Geneva 20, Switzerland; Phone: 41-22-730-8418, Fax: 41-22-734-0357).

1.2   Preparation for AMIP II

Before the Monterey conference, PCMDI distributed a draft proposal for an AMIP II to all AMIP participants. Responses reflected strong support for continuation of the project, and many provided valuable recommendations. Further support was offered at the 11th session of the WGNE, held at ECMWF in November 1995, where the concept of an AMIP II was endorsed by the WGNE members. Following the consideration of participant feedback, PCMDI revised the AMIP II proposal and in September 1995 redistributed it to the AMIP community for review and comment.

With the assistance of the AMIP Panel, PCMDI is working to finalize the AMIP II guidelines. Many aspects of the project design require difficult compromises, and PCMDI continues to rely on the expertise of participants from both the modeling and diagnostic communities to help make these decisions. Substantial effort is being devoted to improving the efficiency of the project's implementation. One of PCMDI's highest priorities is developing the capability to provide each modeling group with an evaluation of its simulation shortly after the data are supplied to PCMDI. This "quick-look" analysis will include extensive quality control, validation and some key diagnostics. In addition, periodic updates of model intercomparison will also be provided. To ensure rapid processing of model data, special attention is being given to establishing standards for the transmission of AMIP data.

Guidelines for AMIP II will be distributed upon their approval by the AMIP Panel. The project is expected to be launched in July 1996.

2.   AMIP I Data Availability Update

2.1   Monthly mean model output

The complete AMIP I monthly mean data set has been available to the diagnostic projects for one year. More than 95% of the standard output was supplied and problems (missing or questionable data) have been documented. All modeling groups have agreed to permit these data to become public domain.

2.2   Six-hourly model output

AMIP 6-hourly data for eleven models (BMRC, CSIRO, CSU, DERF, ECMWF, GFDL, GLA, GSFC, MRI, UKMO, UGAMP) have now been quality-controlled, archived and distributed to all diagnostic subprojects requesting the data. It is anticipated that the quality control of two additional models (CCC and COLA) will be completed and distributed in June 1996. The 6-hourly data remains available only to approved diagnostic subprojects, for which the AMIP Panel will continue to review new proposals.

2.3   Revised model simulations

Approximately half of the participating AMIP modeling groups have provided PCMDI with "revised model" AMIP simulations. The remaining modeling groups have chosen to wait until the launch of AMIP II to submit updated models. Within the next few months the diagnostic subprojects will be informed of the availability of the revised model simulations and encouraged to expand their analyses to

include the new simulations.

2.4 Ensembles

Multiple integrations are important for the statistical assessment of significance in some experiments. Currently there are two sets of ensembles archived at PCMDI that are available to all AMIP participants. The first collection comprises six AMIP I integrations with the ECMWF cycle 36 model. The second set consists of twenty AMIP runs with the LLNL/UCLA parallelized AGCM to be described in the updated AMIP model documentation (section 4.5).

2.5 Validation data

The big news in observational data is the completion of the AMIP II period 1979-1995 by the NCEP/NCAR reanalysis project. Thus, we are ready to generate the AMIP II sea ice concentration and SST fields that constitute the AMIP II boundary conditions. Perhaps more importantly, we now have a 4-D consistent set of validation data for the AMIP II standard output.

There are three ongoing validation data projects for AMIP II: 1) development of standard output observational data products from reanalysis (mostly from NCEP/NCAR and ECMWF) and other sources; 2) establishment of suitable media, formats and interfaces for the data products; and 3) preparation of a quick-look WWW-based atlas entitled "AMIP II -- The Answer from Reanalysis." Although not readily apparent, progress has been made on all three fronts, and when PCMDI completes a computer system upgrade (more on-line disk space), a variety of AMIP II observational data products will become available.

3.   AMIP I General Information

3.1 AMIP I model "vintage year" and version

To ensure that model simulations are properly referenced, PCMDI has begun to identify each simulation with a unique model version label and "vintage year" (representing the year that the model was last modified before the simulation was run).

The model version labels include the identification that each group has provided PCMDI, as well as their resolution specification. All models archived at PCMDI are identified in this manner, and additional labeling is used to document ensemble runs.

AMIP I Model/Version Designations

Group (Contact)	Model Version (Resolution)	vintage year
BMRC (McAvaney)	BMRC 2.3 (R31 L9)	1990
CCCMA (Boer)	GCM II (T32 L10)	1990
CNRM (Deque)	EMERAUDE(T42 L30)	1992
COLA (Straus)	COLA 1.1 (R40 L18)	1993
CSIRO (Hunt)	CSIRO 9 Mark 1 (R21 L9)	1992
CSU (Randall)	CSU 91 (4x5 L17)	1991
DERF (Miyakoda)	GFDL SM392.2 (T42 L18)	1993
DNM (Galin/Dymnikov)	A5407.VI (4x5 L7)	1991
ECMWF (Ferranti/Burridge)	ECMWF Cy36 (T42 L19)	1990

GFDL (Wetherald)	CDG1 (R30 L14)	1992
GISS (Lo/Del Genio)	MODEL II Prime (4x5 L9)	1994
GLA (Lau)	GCM-01.0 AMIP-01 (4x5 L17)	1992
GSFC (Park)	GEOS-1 (4x5 L20)	1993
IAP (Wang/Zeng)	IAP-2L (4x5 L2)	1993
JMA (Sato)	GSM8911 (T42 L21)	1993
LMD (Polcher)	LMD5 (3.6x5.6 L11)	1991
MGO (Meleshko)	AMIP92 (T30 L14)	1992
MPI (Dumenil/Schlese)	ECHAM3 (T42 L19)	1992
MRI (Kitoh/Tokioka)	GCM-II (4x5 L15)	1993
NCAR (Williamson)	CCM2 (T42 L18)	1992
NCEP (van den Dool/Kalnay)	MRF (T40 L18)	1992
NRL (Rosmond)	NOGAPS 3.2 (T42 L18)	1993
RPN (Ritchie)	NWP-D40P29 (T42 L21)	1993
SUNYA (Wang)	CCM1-TG (R15 L12)	1990
SUNYA/NCAR (Wang/Thompson)	GENESIS 1.5 (T31 L18)	1994
UCLA (Mechoso)	AGCM 6.4 (4x5 L15)	1992
UGAMP (Blackburn/Slingo)	UGCM 1.3 (T42 L19)	1993
UIUC (Schlesinger)	MLAM-AMIP (4x5 L7)	1993
UKMO (Pope)	UM-CLIMATE (2.5x3.75 L20)	1993
YONU (Oh)	TR 5.1 (4x5 L5)	1994

3.2 Continuation of AMIP I

With the analysis of the original AMIP I simulations well underway, the transition from AMIP I to AMIP II is soon to commence. Interest in the AMIP I simulations is anticipated for the next several years, and PCMDI will support AMIP I as long as necessary. Revised-model simulations are soon to be released to the diagnostic subprojects and there is still a great deal of work to be done with the 6-hourly output.

It is anticipated that modeling groups may begin to perform their AMIP II simulations within the next 6 months. Thus there will be some overlap between completing the analysis of all AMIP I simulations and the launching of AMIP II.

3.3 AMIP Atlas

Although a preliminary summary of AMIP I model performance (in terms of selected variables) was given at the First International AMIP Scientific Conference, both a hardcover and electronic AMIP Atlas will be published. This will contain a comprehensive summary of both the original and revised AMIP models' mean seasonal performance along with a variety of error statistics. This atlas will also serve to document the overall design and implementation of AMIP I as a successful collaborative international project.

3.4 AMIP research results

PCMDI regularly receives requests regarding the progress of the diagnostic subprojects and other research initiatives that utilize the AMIP database. To ensure that results are widely available, PCMDI is developing an AMIP research database that will include references and abstracts of all AMIP-related

studies.

3.5 1995 IPCC report

While AMIP had no official role in the preparation of the chapter "Climate models—evaluation" in the1995 IPCC Assessment, convening lead author Larry Gates took the occasion to introduce selected AMIP results. In particular, the distribution of the AMIP models' simulation of the mean DJF and JJA zonal averages of the 200 hPa zonal wind speed, total cloudiness, outgoing longwave radiation, and net cloud-radiative forcing were shown, along with the corresponding observational estimates furnished by Mike Fiorino. These data show the relative accuracy of the AMIP zonal wind and OLR simulations, while revealing the presence of apparently large systematic errors in the cloudiness and cloud-radiative forcing.

A statistical summary of the AMIP models' errors in the time mean and temporal variability of mean sea-level pressure was also shown (courtesy of Ben Santer), along with the distribution of the models' average error and inter-model standard deviation of the JJA-DJF difference of surface air temperature (courtesy of Mike Fiorino). The distribution of the models' average daily RMS variability of mean sea-level pressure for JJA and DJF (and the error of the modeled mean), and the distribution of the models' average interannual RMS variability of surface air temperature for JJA and DJF (and the error of the modeled mean) were also shown. The AMIP thus enabled the 1995 IPCC report to present an authoritative summary portrait of the performance of global atmospheric GCMs as of the early 1990s.

3.6 WGNE AMIP Panel

Anticipating that substantial planning for AMIP II would be required, the WGNE has reconstituted the AMIP Advisory Panel. The original AMIP Panel members (Chairman W.L. Gates, PCMDI; George Boer, CCCMA; Lennart Bengtsson, MPI; and David Burridge, ECMWF) successfully launched the project and served a productive term. Because of the need for increased panel duties, the WGNE chose to enlarge the panel. Seven scientists have been nominated to serve on the panel, and all have accepted. The new AMIP Panel members are listed below.

4.   Supporting Software/Documentation

4.1 Accessibility

PCMDI has put considerable effort into making AMIP software and documentation available electronically on the World Wide Web (WWW). Most AMIP participants have already utilized this resource. For some, however, the WWW is still too slow to be practical. Those having difficulty accessing the PCMDI's Web pages should contact Tom Phillips (phillips@pcmdi.llnl.gov) to make other arrangements for acquiring software and documentation. PCMDI HTML Web documentation (model description, VCS user guide, etc.) can be provided so that users can make use of it on their home Web sites.

4.2 Multi-data format read (cdunif/EzGet)

PCMDI has developed a library, cdunif, which provides uniform access to data and metadata stored in a variety of standard self-describing file formats, including: netCDF (UCAR), GRIB (WMO), DRS (PCMDI), and the format(s) supported by the GrADS Gridded Analysis Data System. The cdunif

interface is modeled closely on the netCDF interface, with extensions to support a somewhat wider variety of data models. In the logical model of data, a file contains a set of variables, dimensions, and attributes. Dimensions have associated coordinate vectors, and may be global, applying to all variables in a file, or local to a given variable. The cdunif library has been designed so that the addition of further formats is possible.

In addition to extending the range of formats that can be supported in CDMS (the PCMDI Climate Data Management System), cdunif has been integrated with the Visualization and Computation System (VCS) and the EzGet I/O library (see below).

A second data-access library, called EzGet, has also been developed. EzGet provides enhanced data retrieval capabilities that have been found especially useful for AMIP applications. EzGet reads files through the cdunif interface (described above), but use of EzGet does not require familiarity with cdunif. The main advantages of using this software instead of the lower level cdunif library include:

- Substantial error trapping capabilities and detailed error messages
- Versatile capability to select data from specified regions (e.g., oceans, North America, all land areas north of 45_N, etc.)
- Ability to map data to a new grid at the time it is retrieved by EzGet
- Automatic creation of weights for use in subsequent computation of statistics (e.g., area-weighted averages)
- Automatic retrieval of all dimension information
- Increased control in specifying the domain of the data to be retrieved

Contact Karl Taylor (ktaylor@pcmdi.llnl.gov) for additional information on EzGet.

4.3 Visualization

The PCMDI Visualization and Computation System (VCS) is computer software designed for the selection, manipulation and display of data. VCS is expressly designed with the needs of climate scientists in mind. By interactive "point-and-click" specification of the desired data and various attributes of the display template and the graphics method, the VCS user is able to gain complete control over the appearance of a graphical display and related text. Additionally, the novice user can easily browse large amounts of data by relying on default settings of display attributes.

VCS also supports a range of map projections (Cartesian, Mollweide, polar stereographic, etc.) and graphics methods (isoline and isofill, boxfill, Hovmoeller, x-y and scatter plotting, etc.), as well as the ability to overlay display fields. In addition, basic algebraic computations can be performed on one or more selected data sets and the resultant field(s) displayed, all within VCS.

VCS is presently designed to operate on data stored in the Data Retrieval and Storage (DRS) file format, the Network Common Data Form (netCDF) format, and the Grid Analysis and Display System (GrADS) format. Through GrADS, VCS also has the ability to read GRIB data. Other features include:

- The ability to save the state-of-the-system at any instant as a script, permitting effortless recovery of data displays from previous interactive sessions
- The option of batch-mode submission of a script that can be run in background mode without use of the interactive VCS interface

- Advanced data animation features, including the ability to dynamically change the colormap, position, speed, and mode of animation images

VCS represents the culmination of several years of work by PCMDI computer scientists, and the software will be further developed according to the needs of its users. Priorities for enhancements include upgrading computational capabilities, provision of the ability to operate on Hierarchical Data Format (HDF) data sets, and to output netCDF. VCS is copyright-protected, but software binaries are available free of charge. Source code can be obtained by nonprofit institutions that enter into a collaboration agreement with PCMDI. Contact Anna McCravy (mccravy@pcmdi.llnl.gov) for details.

cdunif/EzGet, VCS, DDI and DRS are currently available for the following computer/operating systems:

Cray Y-MP	UNICOS 8.0	IBM RISC/6000	AIX 3.2
DEC ALPHA	OSF/1 3.2	SGI R4 Systems	IRIX 5.3
HP 9000, series 700	HP-UX 9.01	Sun-4 series	SUN OS 4.1.x an Solaris 2.4 and 2.5

Plans are underway to make these software available for PC/LINUX systems.

VCS documentation

A hypertext (HTML) User's Guide containing detailed descriptions of the VCS interface and numerous examples of how to use the software is available on PCMDI's World Wide Web server. The title page is located at http://www-pcmdi.llnl.gov/software/vcs/vcshome.html

Users experiencing slow access to PCMDI's Web site may prefer to download HTML or Postscript versions of the VCS User's Guide (in the form of compressed Unix tar files) for local reading or printing. Contact Tom Phillips (phillips@pcmdi.llnl.gov) for more details.

4.4   Update on additional software

DDI - The Data and Dimensions Interface

A long-standing problem in the visualization of large climate (and other) datasets is the extraction of only relevant data and delivering them in the desired form in an efficient manner. DDI addresses this need by providing an interactive Motif interface that transfers data between files, formats and local or remote visualization systems. DDI has the capability to browse data files, randomly select variables, manipulate the data dimensions, and rearrange them in new files for input into visualization systems. Although undergoing further development, DDI can currently service a variety of visualization systems, including PCMDI's VCS, the Application Visualization System (AVS) from Advanced Visual Systems, Inc., IRIS Explorer from the Numerical Algorithms Group (NAG) Ltd., PV-WAVE from Visual Numerics, Inc., the Interactive Data Language (IDL) from Research Systems, Inc., and Collage and XImage from NCSA. The current version of DDI is available via anonymous FTP from asia.llnl.gov in the directory pub/ddi.

The "Introduction to DDI" and the "DDI Reference Manual" are at http://www-pcmdi.llnl.gov/software/ddi/ddi.html. See computer/operating system availability of DDI.

DRS - The Data Retrieval and Storage Library

The DRS library is a software library that defines a data format and access methods that are tailored for the data used in climate model diagnosis and intercomparison. DRS is well suited for research requiring the storage of very large multi-dimensional datasets on supercomputers, as well as in studies that access subsets of such data for analysis and display. DRS has been the format of choice at PCMDI for many years, but with the increased sophistication available with cdunif, PCMDI is no capable of handling a variety of popular formats.

Analysis software

PCMDI is committed to the development of state-of-the-art statistical and diagnostic software libraries. For the moment this software is primarily for internal use, but making it available in a user friendly framework for the AMIP community is an important objective of the PCMDI. For information on the status of these software contact Ben Santer (bsanter@pcmdi.llnl.gov) (statistics) or Jim Boyle (boyle@pcmdi.llnl.gov) (diagnostics).

4.5.   Ongoing AMIP model documentation

Version 1.3 of the hypertext (HTML) Summary Documentation of the AMIP Models is in preparation. In addition to numerous updates made since the appearance of edition 1.2 of this document in August 1995, Version 1.3 will describe the features of models used for revised AMIP I simulations (see section 2.3). The debut of Version 1.3 will coincide with the release of standard output from these models, which is anticipated in July 1996. The model documentation will continue to be accessible at PCMDI's World Wide Web server at address: http://www-pcmdi.llnl.gov/modeldoc/amip

5. AMIP Contacts

5.1   Participant update

Changes and additions to the addresses listed on pp. 10-14 of AMIP Newsletter No. 5 (January 1994) and page 4 of AMIP Newsletter No. 6 are given below.

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[1] New modeling group representative

[2] New modeling group; first AMIP simulation to be made available with AMIP I "revised-model" simulations.

5.2 AMIP coordination and support

Questions, comments and suggestions on AMIP are welcome, and may be directed to the following:

General

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Bryant McAvaney (BMRC, Melbourne)
Jan Polcher (LMD, Paris)
David Randall (CSU, Ft. Collins)
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