AMIP NEWSLETTER

No. 4 WGNE Atmospheric Model Intercomparison Project August 1993

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 being 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 Larry Gates. (Address: PCMDI, L-264, LLNL, P.O. Box 808, Livermore, CA 94550, USA)

The Bologna AMIP Meeting

A meeting of the AMIP modeling groups and diagnostic subprojects was held in Bologna, Italy, during 10–12 May 1993. Support for the meeting was provided by the WCRP/WMO and by the Environmental Sciences Division of the U.S. DOE through PCMDI, and was hosted by Stefano Tibaldi of the University of Bologna and Antonio Speranza of Demetra, whose staff served as a local secretariat. The purposes of the meeting were to review progress in the analysis and intercomparison of the AMIP simulations, and to discuss the plans and preliminary results of the diagnostic subprojects. A total of about 70 persons were in attendance, representing 20 of the current 31 participating modeling groups and 11 of the current 18 diagnostic subprojects. For the record, the technical program of the meeting is given on pages 2 and 3. It may be noted that the AMIP meeting was followed by a meeting of FANGIO under the chairmanship of Bob Cess of the State University of New York, Stony Brook, in which many of the AMIP modeling groups were also involved.

While analysis and intercomparison of the AMIP simulations is beginning to reveal large differences in the models' performance and to isolate features peculiar to individual atmospheric GCMs, the Bologna meeting served to identify a number of common systematic errors. Chief among these are an overall cold bias in the upper troposphere in higher latitudes, generally excessive precipitation in the middle and high latitudes, and excessively strong midlatitude zonal westerlies. Some of these errors are known to be sensitive to the treatment of surface interactions, convection and mixing processes, and ongoing analyses by PCMDI and by the AMIP GCM and diagnostic communities are expected to clarify the nature and model-dependence of these and other errors.

A highlight of the Bologna AMIP meeting was the recognition that independent realizations of the AMIP decade with different initial conditions provide a useful measure of the potential predictability of the climate as defined by various space-and time-averaged statistics. Several modeling groups have made such an ensemble of AMIP runs with their atmospheric GCMs, including 4 independent AMIP simulations at CCC, 3 at CNRM, 3 at CSIRO, 8 at GFDL/DERF, 7 at LMD, 2 at MPI, 2 at NCAR, and 5 at PCMDI on behalf of the ECMWF. In each model's ensemble the seasonal simulation of ENSO-related anomalies in the tropics is relatively robust, while the seasonal performance in higher latitudes exhibits considerable differences from one realization to another. In particular, there are large differences among ensemble members in the seasonal precipitation averaged over mid-latitude areas. This essentially unpredictable or internal variability is inherent in GCM climate simulations, and must be taken into account in model diagnosis, validation and intercomparison.

Next AMIP Meeting

Preliminary planning has begun for an AMIP Scientific Conference to be held during a week in late November or early December 1994 at a venue yet to be determined. This is seen as the primary opportunity for the presentation of comprehensive reports on the analysis and intercomparison of the AMIP simulations and reports on the results of the AMIP diagnostic subprojects. Although focussed on AMIP under the sponsorship of the WCRP and the U.S. DOE/PCMDI, it may be appropriate to broaden the focus of the conference to include other model intercomparisons that are relevant to AMIP. It is expected that an edited conference proceedings will be published in the WCRP report series or in book form. Comments and suggestions for the conference should be received by the AMIP Panel before November 1993.

Technical Program of the Bologna AMIP Meeting

Monday, 10 May 1993 (Reports on AMIP simulations)

Bryant McAvaney (BMRC):	Some aspects of the meridional energy and moisture transports in the BMRC AMIP simulation
George Boer (CCC):	First results from a multiple-AMIP simulation with the CCC GCM
Jean-Francois Mahfouf (CNRM):	Hydrologic processes simulated in the CNRM AMIP run
Andrea Molod (GSFC):	Hydrological cycle in the GEOS-1 AMIP run
Martin Dix (CSIRO):	Forced and natural atmospheric variability in the CSIRO AMIP simulations
Chung-Kyu Park (GSFC):	Overview of GEOS-1 GCM performance in the AMIP simulation
Laura Ferranti (ECMWF):	Preliminary results on the winter monsoon activity in a decadal simulation with the ECMWF GCM
Bill Stern (GFDL/DERF):	Results from an ensemble of decadal simulations with the GFDL/DERF GCM
Tony Del Genio (GISS):	AMIP simulation with the GISS GCM
Hui-Jun Wang (IAP):	Some preliminary analyses of the IAP AMIP simulation
Tadashi Tsuyuki (JMA):	Preliminary results from the JMA AMIP simulation
Jim Kao (LANL):	Results of multi-year simulations with the LANL GCM with prognostically determined cloud water
Hervé Le Treut (LMD):	Preliminary results from the LMD AMIP simulations
Harold Ritchie (RPN):	Preliminary results from the RPN AMIP simulation
Klaus Arpe (MPI):	Evaluation of simulations with the ECHAM 3 T42 model

Tuesday, 11 May 1993 (Reports on AMIP simulations, continued)

Akio Kitoh (MRI):	AMIP integrations with the 5L and 15L versions of the MRI GCM
Dave Williamson (NCAR):	Results of the AMIP simulation with the NCAR CCM2
Wesley Ebisuzaki (NMC):	The NMC AMIP simulation
X.Z. Liang (SUNYA):	Climate variability in the SUNYA AMIP simulation
Y.J. Kim (UCLA):	Preliminary analysis of the fluxes at the ocean-atmosphere interface in the UCLA AMIP simulation
Mike Blackburn (UGAMP):	Modulation of tropical synoptic variability by ENSO in the UGAMP AMIP integration
Dave Rowell (UKMO):	Using GCM ensembles to map atmospheric predictability
Howard Cattle (UKMO):	The high latitude simulation of the UKMO AMIP run

Technical Program of the Bologna AMIP Meeting (continued)

David Gregory (UKMO):	Low frequency variability and errors in the simulation of monsoon flow in the UKMO AMIP run
M. Webb (UKMO):	Radiation budget studies at the Hadley Centre relevant to AMIP
J.-F. Guérémy (CNRM):	African easterly waves in the CNRM AMIP simulation
D. Stephenson (CNRM):	Interannual variability in tropical regions in the CNRM AMIP simulations
J.F. Royer (CNRM):	Simulation of stratospheric behavior in the CNRM AMIP run

Wednesday, 12 May 1993 (Reports on AMIP diagnostic subprojects)

Julia Slingo (U. Reading, n°1):	Interannual and seasonal changes in synoptic and intraseasonal variability: Preliminary subproject results
Jean-Philippe Duvel and Frederique Cheruy (LMD, n°4):	Origin of the relation between the SST, the water vapor and the greenhouse effect in different GCMs
Peter Gleckler (PCMDI, n°5):	Analysis of surface energy budgets and implied ocean energy transports
Tim Palmer (ECMWF, n°6)	The monsoon diagnostic subproject
Mike Fiorino (GLA, n°7):	Preliminary results from the hydrologic processes intercomparison subproject
John Walsh (UILL, n°8):	AMIP simulations of the polar atmosphere and sea-ice forcing fields
Karl Taylor (PCMDI):	The Paleoclimate Modeling Intercomparison Project (PMIP)
Stefano Tibaldi (U. Bologna, n°10):	Objective diagnosis of blocking in numerical models of atmospheric flow
Alan Robock (U. Maryland, n°11):	Validation of humidity, moisture fluxes and soil moisture in GCMs
Ann Henderson-Sellers (Macquarie U., n°12):	PILPS: A diagnostic subproject of AMIP
Brian Weare (U.C. Davis, n°13)	The diagnosis of cloudiness
Jerry Potter (PCMDI, n°14):	The diagnosis of cloud-radiative forcing
Raymond Hide (Oxford U., n°15):	Atmospheric angular momentum

AMIP Simulation Update

The current status of the 31 atmospheric modeling groups participating in AMIP is given in the table on page 5. As may be noted, there are now 26 groups that have completed the 1979–1988 integration, while 2 groups have the simulation "in progress" and arrangements are being made to begin the simulations by the 3 remaining groups. This represents considerable progress since the previous *Newsletter* of October 1992, and it is now expected that all groups will have completed the AMIP run (at least once) before the end of 1993.

As also shown in the table, the monthly-averaged AMIP standard output has been received and is undergoing quality control at PCMDI for 20 models; these results are now available to the AMIP modeling groups, and either have been or shortly will be distributed to the AMIP diagnostic subprojects. Assembly of the AMIP simulations' history is proceeding more slowly; the history for 10 AMIP models is currently undergoing quality control in accordance with PCMDI's agreement to develop an AMIP history archive of selected variables as described below. It is expected that these data will be progressively available in late 1993 and early 1994.

The PCMDI AMIP History Archive

While PCMDI is committed to facilitating the analysis and diagnosis of the AMIP history data, the volume of these data is such that in terms of practical resources the acquisition of the complete time history for all models cannot be undertaken. Instead, the PCMDI will acquire from the AMIP modeling groups a selected subset of AMIP histories in order to enable as many of the diagnostic subprojects as possible to perform scientifically useful analyses in a timely fashion. The following procedures constrain the work to a practical scope and offer the promise of a well-defined deliverable product in 1994.

1. The variables listed below will constitute the PCMDI AMIP history archive. While the results of all AMIP post-processing will be archived at PCMDI, they will only be released with the specific permission of each modeling group. It is recognized that not all modeling groups will be able to produce all of the variables in this selected history list, and that some models have history at intervals longer than 6 hours.

- Wind components, temperature and geopotential at 850, 500, 300, 200, 100, 50, 10, 2 hPa
- Surface (2m) wind components, temperature elative and specific humidity
- Sea-level pressure and surface pressure
- Vertical motion at 500 hPa (Pa s^{-1} or m s^{-1})
- Surface evaporation, precipitation (convective and large scale), sensible heat flux, surface wind stress components, runoff and soil moisture
- Upward and downward long- and short-wave radiation at surface and top of model atmosphere in clear and cloudy skies
- Total cloud amount and precipitable water

[Unless otherwise stated, the units of these data are those of the AMIP standard output]

2(a). Modeling groups who choose to perform the necessary post-processing at sites other than LLNL should arrange to send the above variables to PCMDI. A list of storage media that can be read at LLNL can be provided upon request, and PCMDI can provide some assistance in getting the data on an appropriate medium.

2(b). For groups who choose to do the post-processing at LLNL, the AMIP histories should be received in readable form by the end of 1993 to be considered for inclusion in the PCMDI AMIP history archive. As stated above, PCMDI can provide assistance in transferring the data to LLNL. After the time history is in hand, each modeling group should install the necessary post-processing code at LLNL and run this code either in person or remotely. PCMDI will host a representative from each participating modeling group to install the necessary code.

3. The AMIP history post-processing should be completed and the data sent to PCMDI before 1 April 1994.

These procedures are intended to provide a common data base for AMIP researchers and to preserve as complete an AMIP time history dataset as feasible. This does not prevent individual diagnostic subprojects that require data other than those listed here from making separate arrangements with participating modeling groups to perform the necessary calculations. In the spirit of the AMIP, however, it is expected that any such additional data will be contributed to the PCMDI AMIP data archives.

AMIP Simulation Status

Group	Contact(s)	Model	Computing @LLNL	Computing Elsewhere
BMRC	McAvaney	R31 L9		completed*†
CCC	Boer	T32 L10		completed*†
CNRM	Mahfouf/Cariolle	T42 L30		completed*
COLA	Straus	R40 L18		completed
CSIRO	Hunt	R21 L9		completed*
CSU	Randall	4°x5° L17	completed*†	
DNM	Galin/Dymnikov	4°x5° L7	completed*†	
ECMWF	Ferranti/Burridge	T42 L19	completed*†	
GFDL	Wetherald	R30 L145		completed*
GFDL/DERF	Miyakoda	T42 L18		completed*†
GISS	Lo/Del Genio	8°x10° L9		completed
GLA	Lau/Fiorino	4°x5° L17	completed*†	
GSFC	Park	4°x5° L20		completed*
HMC	Trosnikov	T21 L15	- - -	
IAP	Wang/Zeng	4°x5° L2		in progress
JMA	Sato	T42 L21		completed*
LANL	Kao	R15 L20		completed
LMD	Le Treut	3.6°x5.6° L11		completed
MGO	Meleshko	T30 L14	completed*†	
MPI	Dümenil/Schlese	T42 L19	completed*	
MRI	Kitoh/Tokioka	4°x5° L15		completed*
NCAR	Williamson	T42 L18	completed*†	
NMC	van den Dool/Kalnay	T40 L18		completed*†
NRL	Rosmond	T42 L18		completed*
RPN	Ritchie	T42 L21		in progress
SUNYA	Wang/Liang	R15 L12	completed*	
UCLA	Mechoso	4°x5° L15	completed	
UGAMP	Blackburn/Slingo	T42 L19	completed	
UILL	Schlesinger	4°x5° L7	- - -	
UKMO	Rowell	2.5°x3.75° L20		completed*
YONU	Oh	4°x5° L5	- - -	

* denotes standard output undergoing quality control at PCMDI

† denotes history undergoing quality control at PCMDI

AMIP Diagnostic Subprojects

A total of eighteen diagnostic subprojects have now been approved (see table below), and the needed standard output data have been distributed to each of them. As noted above, access to the history data needed by many of the subprojects is more limited, although it is hoped to have at least a subset of the history data in a PCMDI AMIP history archive early in 1994 (see page 4). While each subproject is reminded of their obligation to prepare in due course a report for inclusion in the WCRP/WGNE report series and to submit their results to PCMDI for archival storage, the submission of informal notes on a subproject's progress from time-to-time would be appreciated by the AMIP Panel.

Several additional diagnostic subprojects are under review, including one on MSU validation, one on model validation in southern Africa, one on regional surface climate anomalies, and one on global energetics. Upon approval by the WGNE AMIP Panel, descriptions of these subprojects will be sent to the AMIP modeling groups for an expression of their interest in actively participating in them. The AMIP modeling groups' participation in the current diagnostic subprojects is shown in the table on page 7. The full addresses of the organizers and a documentation for each diagnostic subproject are available upon request.

Proposals for additional diagnostic subprojects are welcome from either the modeling or diagnostics community. For maximum effectiveness these should be submitted as soon as possible and will be coordinated to the extent possible and appropriate with existing subprojects.

Number	Lead Organizer(s)	Short Title	Data Needs	
			Std. Output	History
1	J. Slingo (UGAMP)	Synoptic variability	--	6 hr
2	Zwiers (CCC)	Low frequency variability	--	24 hr
3	Lambert (CCC)	Cyclone frequency	--	12 hr
4	Duvel (LMD)/Cheruy (LMD)	Greenhouse sensitivity	x	6 hr
5	Randall (CSU)	Surface ocean fluxes	x	--
6	Palmer (ECMWF)	Monsoon [1]	x	6 hr
7	Lau (GLA)	Hydrologic processes	x	6 hr
8	Walsh (UILL)	Polar processes [2]	x	24 hr
9	McAvaney (BMRC)	S.H. circulation	x	6 hr
10	Tibaldi (ADGB)	Blocking	--	24 hr
11	Robock (UMD)	Soil moisture	x	6 hr
12	Henderson-Sellers (MACU)	Land surface processes [3]	x	6 hr
13	Weare (UCD)/Mokhov (RAS)	Cloudiness	x	--
14	Potter (PCMDI)	Cloud-radiative forcing	x	6 hr
15	Hide (UKMO)	Angular momentum	--	6 hr
16	Mechoso (UCLA)	Stratospheric circulation	--	24 hr
17	Robertson (MSFC)	Water, energy balances [4]	x	6 hr
18	Meleshko (MGO)/Trosnikov (HMC)	Extreme events	x	--

(1) coordinated with MONEG/TOGA, WGNE

(2) coordinated with SIOMP/ACSYS

(3) coordinated with PILPS/GCIP/GEWEX, WGNE

(4) coordinated with GCIP/GEWEX

AMIP Diagnostic Subproject Participation

	Slingo	Zwiers	Lambert	Duvel / Cheruy	Randall	Palmer	Lau	Walsh	McAvaney	Tibaldi	Robock	Henderson-Sellers	Weare/Mokhov	Potter	Hide	Mechoso	Robertson	Meleshko/Trosnikov
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
†* BMRC	+	–	–	+	+	+	+	+	+	+	+	+	–	+	+	–	–	–
†* CCC	+	+	+	+	+	+	+	+	–	–	–	–	–	–	+	–	–	–
* CNRM	+	+	–	–	+	–	+	–	+	–	+	+	–	–	–	+	–	–
COLA	–	+	–	–	–	+	–	–	–	+	–	–	–	–	–	–	–	+
* CSIRO	+	+	–	+	+	+	+	–	–	–	+	+	+	+	+	–	+	+
†* CSU	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	–	+	+
†* DNM	–	–	–	–	+	+	–	–	–	+	–	–	+	+	–	–	–	+
†* ECMWF	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
* GFDL	–	–	–	–	–	–	+	–	–	–	+	–	–	+	–	–	–	–
†* GFDL/DERF	–	–	–	–	+	+	–	–	–	–	–	–	–	+	–	–	–	–
GISS	–	+	+	+	+	+	+	–	–	–	+	+	–	+	–	+	+	–
†* GLA	+	+	–	+	+	+	+	–	–	+	+	+	–	–	–	–	+	–
* GSFC	+	+	+	–	+	+	+	+	+	+	+	–	+	+	+	–	+	+
HMC	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+
IAP	–	+	–	–	+	–	–	+	–	–	–	+	–	+	–	–	–	+
* JMA	–	+	+	+	+	+	–	+	+	+	–	+	+	+	+	+	–	+
LANL	+	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–
LMD	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	–	+	+
†* MGO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	–	+	+
* MPI	–	–	–	–	–	+	+	–	–	–	–	+	–	–	–	–	–	–
* MRI	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	–	+
†* NCAR	+	+	+	+	+	+	+	–	–	+	+	+	–	+	+	+	–	–
†* NMC	+	+	–	+	–	+	+	+	–	+	+	+	+	+	+	–	–	–
* NRL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
RPN	+	+	+	–	–	+	–	+	+	+	–	–	–	–	+	–	–	–
* SUNYA	–	–	–	+	+	–	+	+	+	+	–	–	–	+	–	–	–	–
UCLA	–	+	+	+	+	–	–	+	+	+	–	–	–	+	+	+	–	+
UGAMP	+	+	+	+	+	+	+	+	+	+	–	–	+	+	+	–	–	+
UILL	–	+	–	+	–	+	+	+	–	–	+	+	+	+	–	+	–	+
* UKMO	+	+	+	+	+	+	+	+	–	+	+	+	–	+	–	+	+	+
YONU	–	+	–	+	+	+	+	–	–	+	+	+	+	+	+	+	+	–
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

*/† denote standard output/history undergoing quality control at PCMDI

PCMDI Software and Model Documentation

The DRS and PCMDI graphics software that are being used for the storage and display of AMIP results at PCMDI are available (with documentation) to all participating modeling and diagnostic groups upon request. A revised version of DRS is now available which includes a merged source that may be built fot Sun, SGI, HP or Cray systems. The new version of PCMDI graphics that is ecpected to be released before the end of 1993 will use Motif and XIIR5, and will be more versatile and user-friendly than the original version.

With the assistance of the AMIP modeling groups, PCMDI is preparing an extended summary of the major numerical, dynamical and parameterization features of each AMIP GCM, together with appropriate references. It is planned to issue this documentation in report form in the autumn of 1993 and as a software package early in 1994.

AMIP Contacts

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

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