Prospectus for CLIVAR
Asian-Australian Monsoon Panel

The Asian-Australian Monsoon affect more than one half od the world population.
Monsoon prediction remains a major challenge for the scientific community for the 21st century

Panel: Co-Chair: Bin Wang and Harry Hendon
Cobin Fu, In-Sik Kang, Jay McCreary, Holger Meinke, Gary Meyers, Rajeevan, Takehiko Satomura, Andrews Schiller, Julia Slingo, Ken Sperber, Peter Webster

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Key questions AAMP is addressing
--Defining AAMP activity

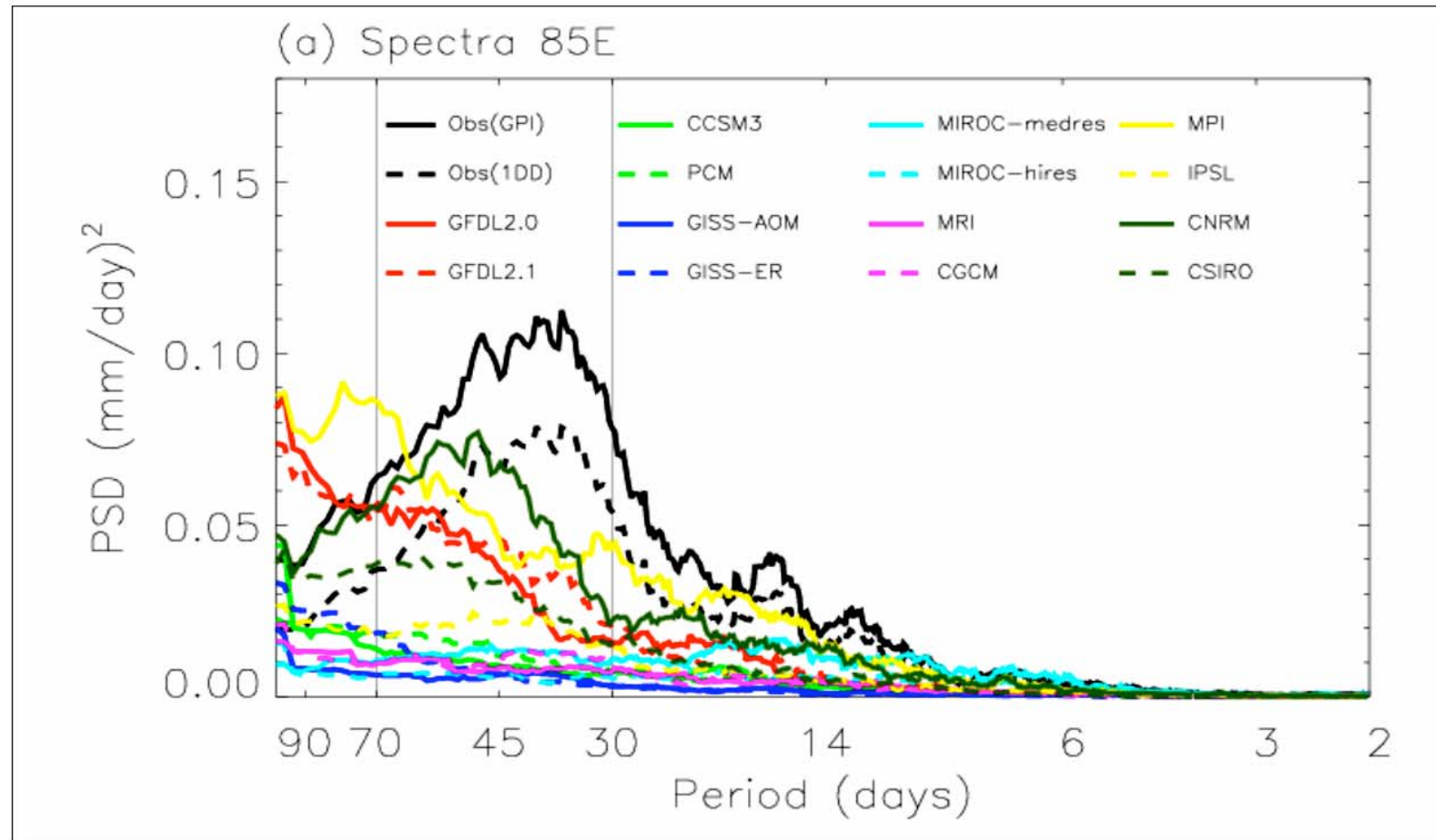- What are the critical processes causing monsoon Intraseasonal Variability? What are the major challenges to modeling and predict MJO and monsoon ISV? To what extent the monsoon ISV is predictable? What roles does Maritime continent AOL interaction?

- What is the current state of knowledge and predictive skill of AAM IAV? How to advance monsoon seasonal predictions? How predictable is the IAV? What roles does atmosphere-land interaction play? How IOD affect A-AM?

- Does AAM system have a coherent structure of interdecadal variation? How does the decadal variability couple to ocean?

- How will AA-M system change in a global warming environment? What are sub-seasonal to interannual factors that influence extreme events? What is the sensitivity of the monsoon to external and anthropogenic climate forcing?

- What are the structure and dynamics of the annual cycle of the coupled atmosphere-ocean-land system? What are the major weaknesses of the climate models in simulation of the annual cycle? Do models getting diurnal cycle right will improve the modeling of the annual cycle and low-frequency variability?

1. ISV and Predictability

What are the **critical processes causing monsoon Intraseasonal Variability**? What are the major challenges to **modeling and predict MJO and monsoon ISV**? To what extent the monsoon ISV is predictable? How does A-O-L interaction over the maritime continent affect MJO?

- The panel promoted **THORPEX/WCRP/ICTP Workshop**

    Organisation and Maintenance of Tropical Convection and the Madden Julian Oscillation.

- Collaborate with **US CLIVAR/MJOWG** on designing Metrics for evaluating Model simulation and MJO prediction.

- Asked CLIVAR SSG endorsement on Sieg Shubert's proposal on an coordinated experiment on high resolution climate model simulation of hurricane/Typhoon activity.

- Encouraging study of strategies, such as slow manifold approach, for improving dynamical model's capacity of MJO prediction.

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IPCC AR4 Models: Spectrum of the eastward wavenumber 1-6 component of equatorial precipitation (5N-5S) at 85E

(a) Spectra 85E

Legend:
- Obs(GPI)
- Obs(1DD)
- GFDL2.0
- GFDL2.1
- CCSM3
- PCM
- GISS-AOM
- GISS-ER
- MIROC-medres
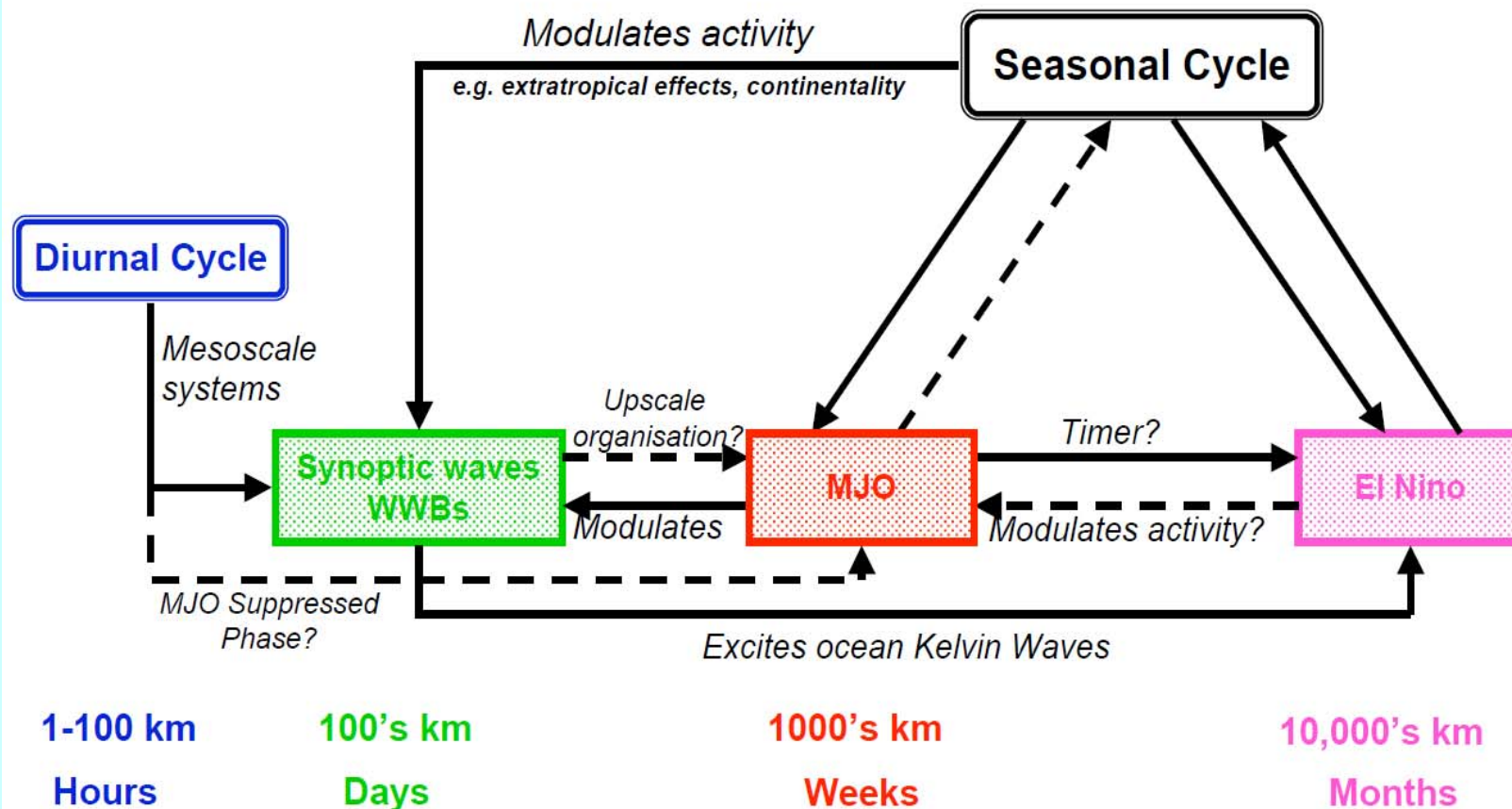- MIROC-hires
- MRI
- CGCM
- MPI
- IPSL
- CNRM
- CSIRO

Lin et al., J. Clim.

- ISV Variance is too small
- MJO variance does not come from pronounced spectral peak but from over reddened spectrum: too strong persistence of equatorial precipitation (13/14)

Need to understand Monsoon ISO: Multi-Scale Interrelation

Interactions between space and time scales of tropical convection

Slingo 2006: THORPEX/WCRP Workshop report

2. IAV and predictability

What is the **current state of knowledge and predictive skill** of **AAM IAV**? How to **advance monsoon seasonal predictions**? How predictable is the IAV? What roles does **atmosphere-land** interaction play? How IOD affect A-AM?

- promoting Asian-Pacific Economic Cooperation Climate Center (**APCC) Climate Prediction and its Societal Application** (**CliPAS**) project.

- Seek for collaboration with GEWEX/MAHASRI, and CEOP to attach the roles of land surface processes and atmosphere-land interaction.

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Multi-Model Ensemble Historical Prediction (1981-2001) Faithfully Replicate the 3 leading modes of A-AM Interannual Variability

**Observation**   **CliPAS MME**   **DEMETER**
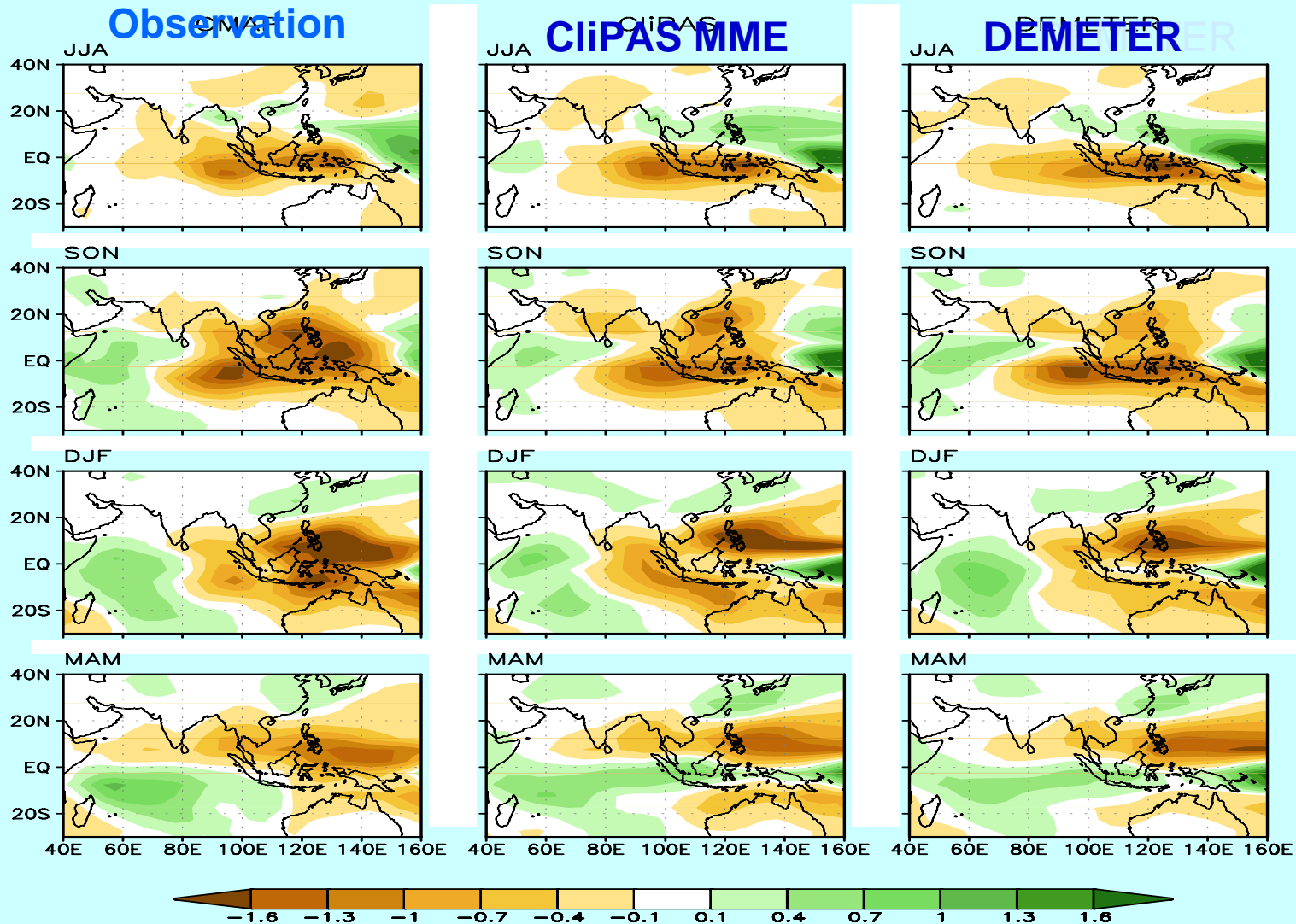
Shown is the First leading mode, which accounts for 30% of the total variance

Pattern Correlation Coefficients for the first 3 modes are about 0.8, 0.7, and 0.6

Temporal correlation coefficients for the first three PCs are 0.95, 0.9, and 0.8

3. IDV and Coupling to Ocean

Does AAM system have a coherent structure of **interdecadal variation**? How does the decadal variability couple to ocean?

- Organized Jointly with WCRP China Committee **Decadal-to-Centennial Variability of East Asian monsoon workshop**, July 7-9 2006, Qingdao, China.
- Diagnostic studies focusing on the observed long-term changes of the monsoon precipitation and circulation in the past
- Need collaboration with **CLIVAR/POP and IOP** to attack the role of ocean in A-AM IDV.

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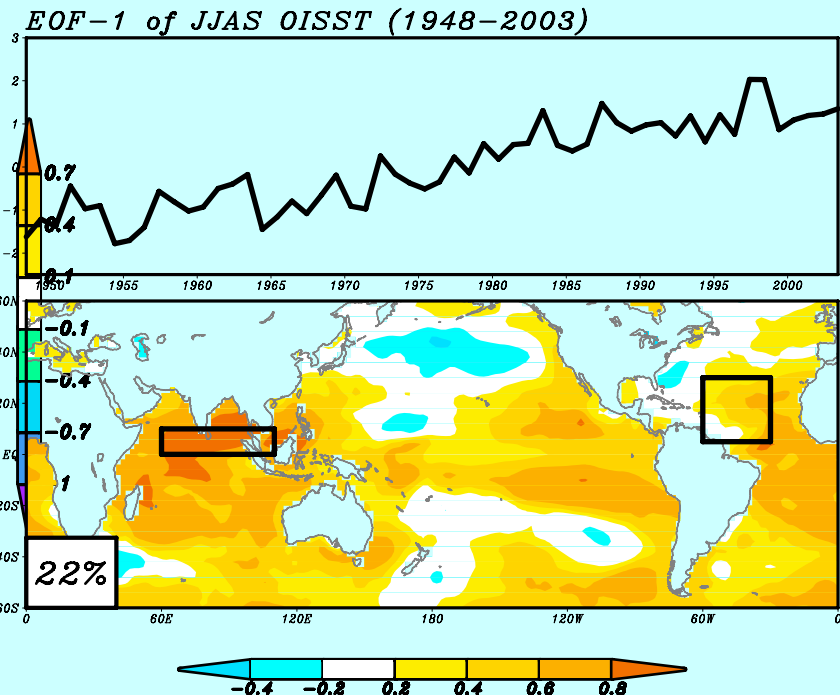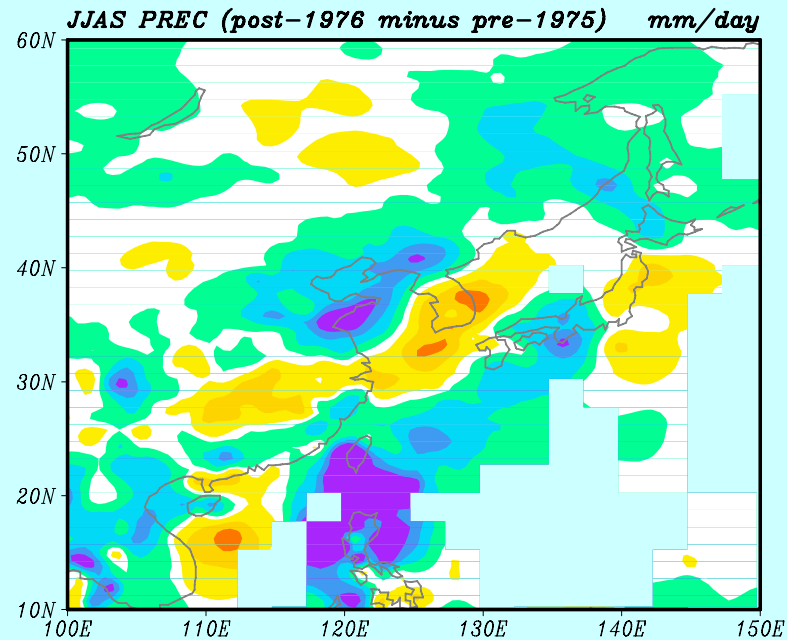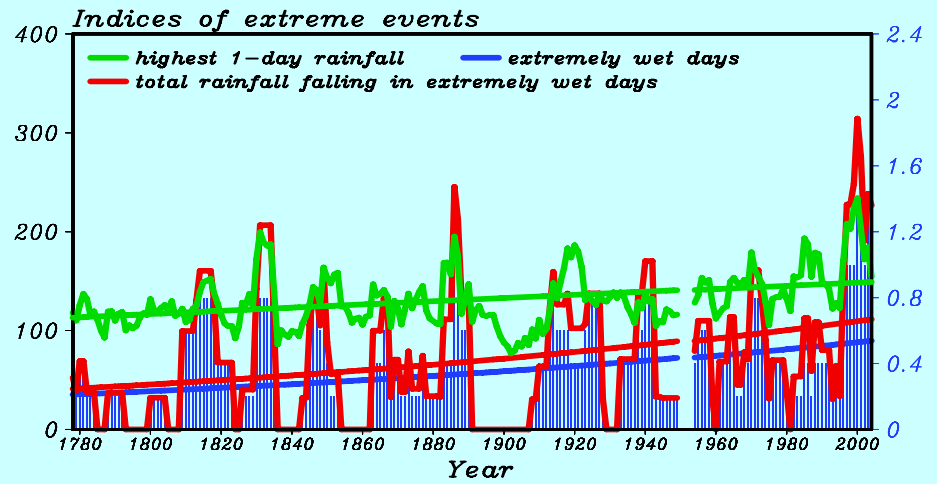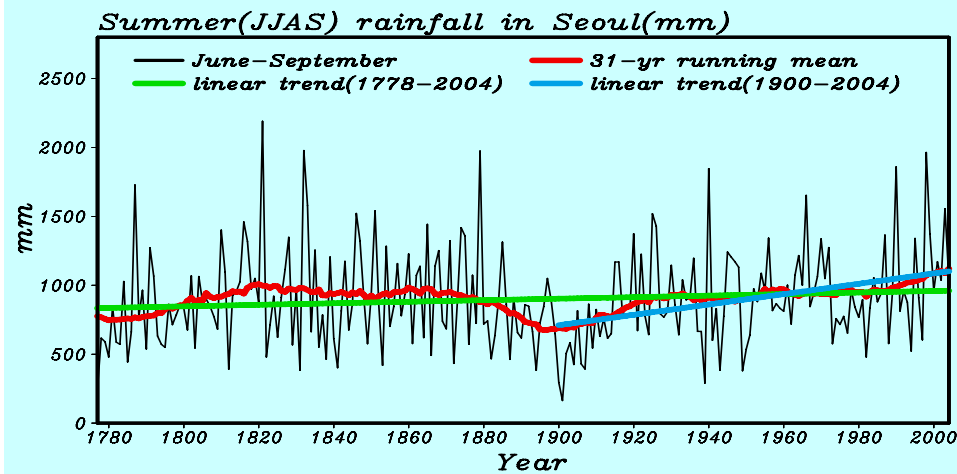
The increasing trend in Seoul JJAS precipitation and extreme venets reflect a trend in large scale East Asian monsoon rain belt, which appears to be related to strong trends in northern Indian ocean SST.

4. Future Changes

How will AA-M system change in a global warming environment? What are sub-seasonal to interannual factors that influence extreme events? What is the sensitivity of the monsoon to external and anthropogenic climate forcing?

- Diagnosis of IPCC AR4 model projection for future change of AA-monsoon. In particular, how will the leading modes of AAM system change and Monsoon-ENSO relationship changes?

- Need coordinated effort to look at specific issues though some of our colleagues are involved in the climate change projections for the AAM region.

- Collaboration with CEOP-II Aerosol-monsoon

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Future Scenarios for Summer Monsoon Rainfall and Annual Temperature over South Asia under A2 Scenario

- The general conclusion that emerges of the diagnostics of the IPCC AR4 simulations: Asian summer monsoon rainfall is likely to be enhanced.
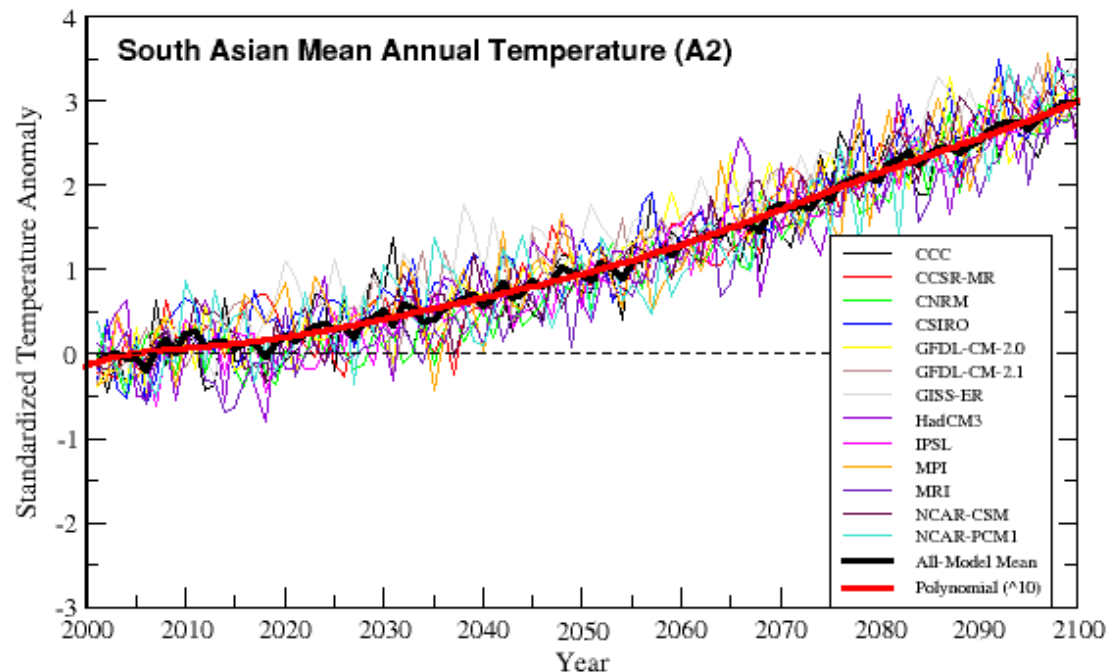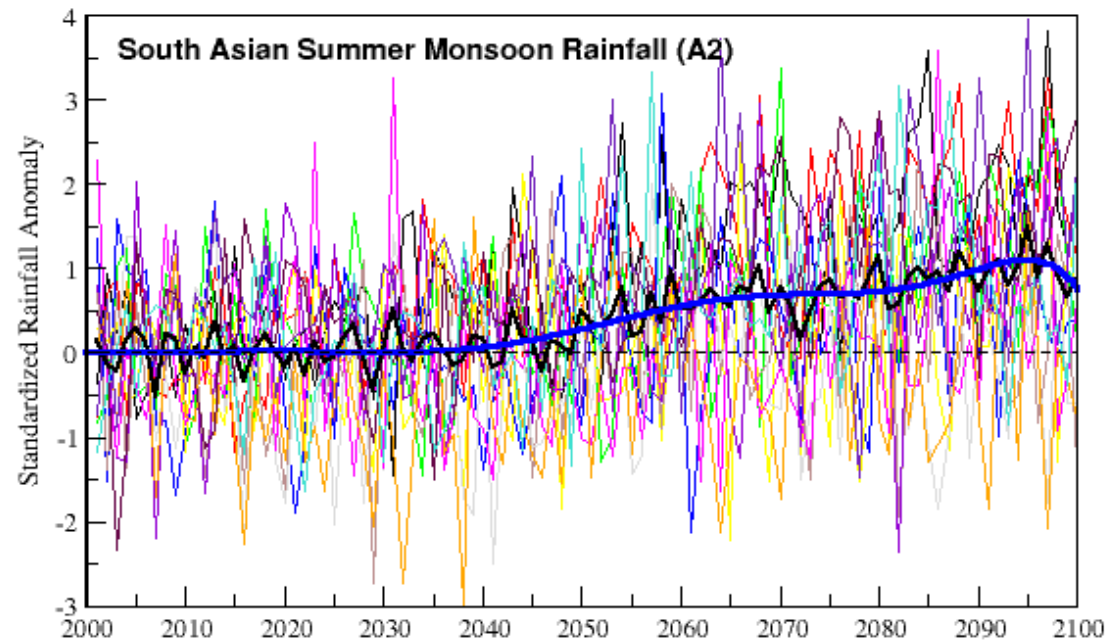
5. Modeling of AAM

What are the structure and dynamics of the annual cycle of the coupled atmosphere-ocean-land system? What are the major weaknesses of the climate models in simulation of the annual cycle?

Do models getting diurnal cycle right will improve the modeling of the annual cycle and low-frequency variability?

- Endorsed the approach identified at the 1st pan-- WCRP Monsoon Modeling Workshop (Irvine California, 15-17 June 2005) for key studies of the diurnal cycle over both land and ocean. Develops monsoon metrics

- Support the Model systematic Error Workshop, Feb 2007 by focusing on AAM region.

- Designed a Monsoon Metrics for validation of the model (in collaboration with CLIVAR/**WGSIP**)
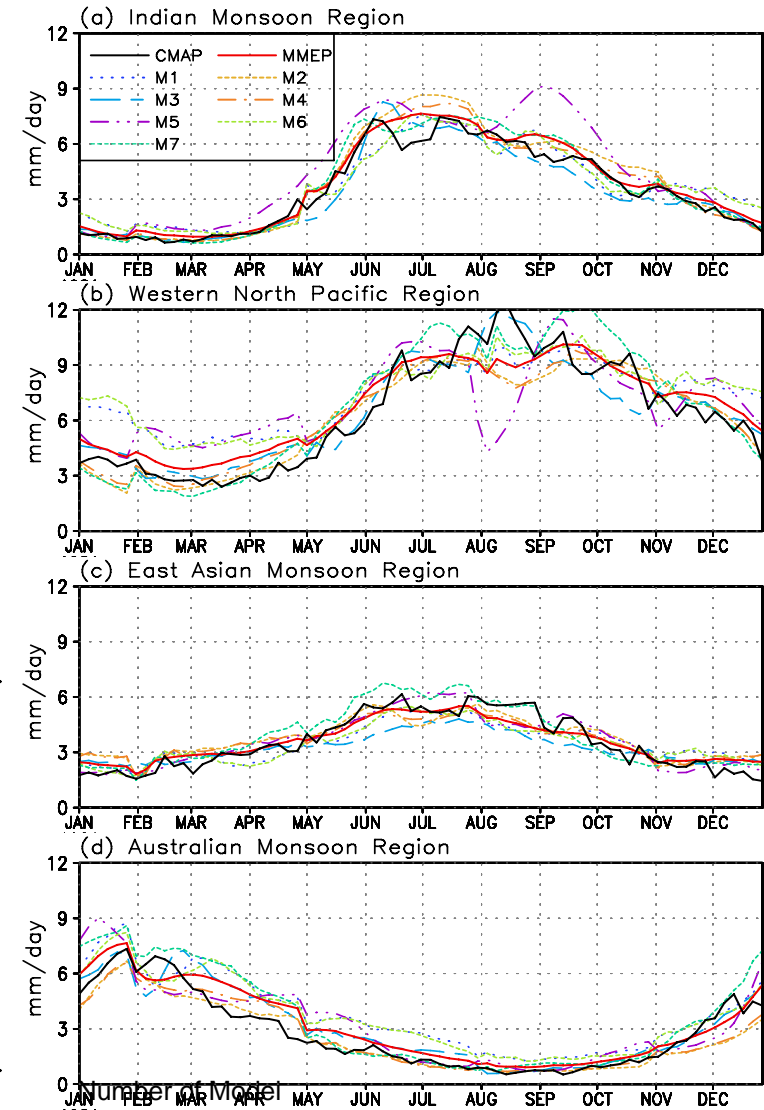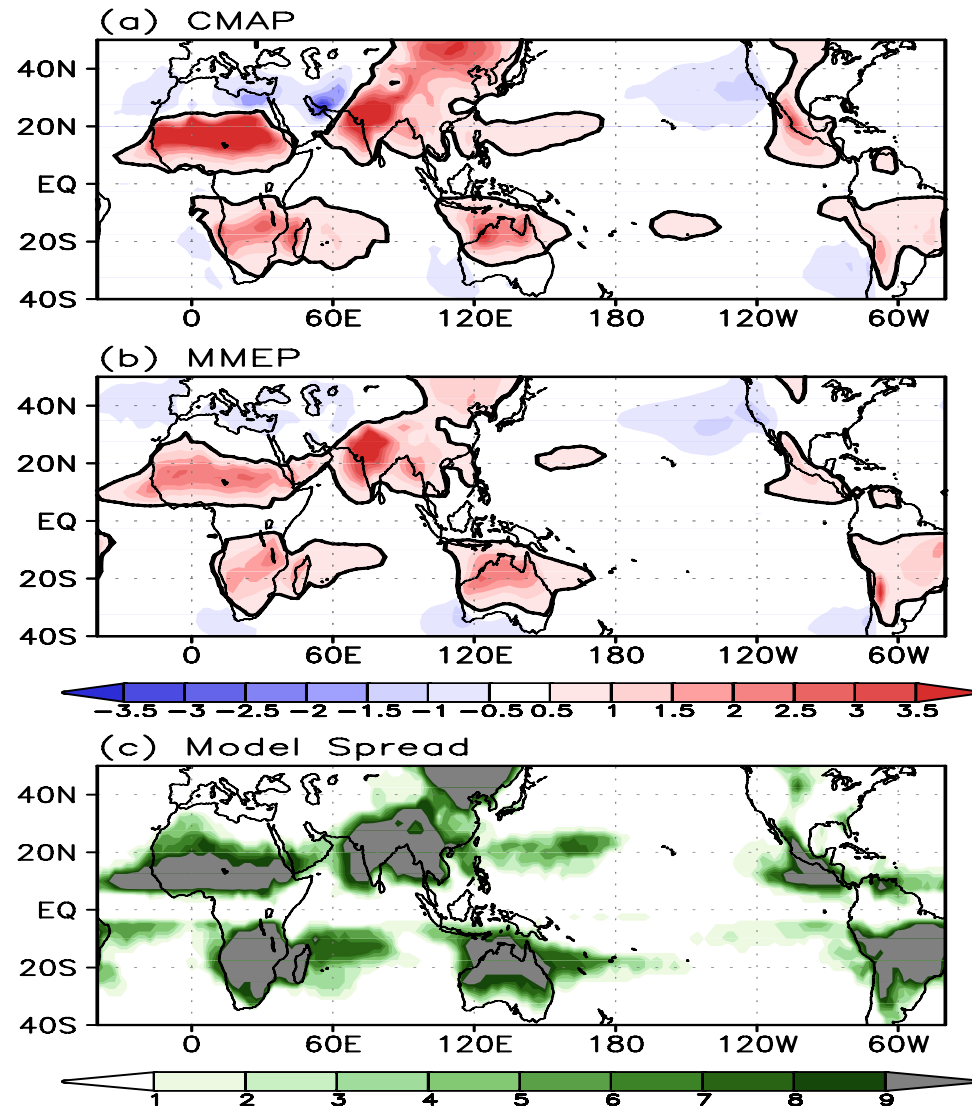
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Fig. 6. The monsoon precipitation index (shaded) and monsoon domain (contoured) captured by (a) CMAP and (b) the one-month lead MME prediction. (c) The number of model which simulates MPI over than 0.5 at each grid point.

Collaborated Activities

CLIVAR/WGSIP: Develop Monsoon Metrics and

Pan-WCRP Monsoon/ CLIVAR-GEWEX: Assessed systematic errors of CGCMs in Diurnal cycle and MJO, Systematic error workshop San Francisco Feb 12-16, 2007

THORPEX/WCRP workshop on Tropical Convection/MJO, Trieste March 2006.

MAHASRI: Supported Endorsement, Planned collaboration in regional modeling of coupled atmosphere-land-ocean system and regional season prediction (proposal)

MAIRS/START: Training workshop, February 2007, Honolulu (proposal)

CLIVAR/IOP: MJO (MISMO) and IOD studies

CLIVAR/POP: MJO-ENSO, Monsoon-ENSO Interaction (Proposal)

CLIVAR/WGSIP and APCC/CliPAS: MME development

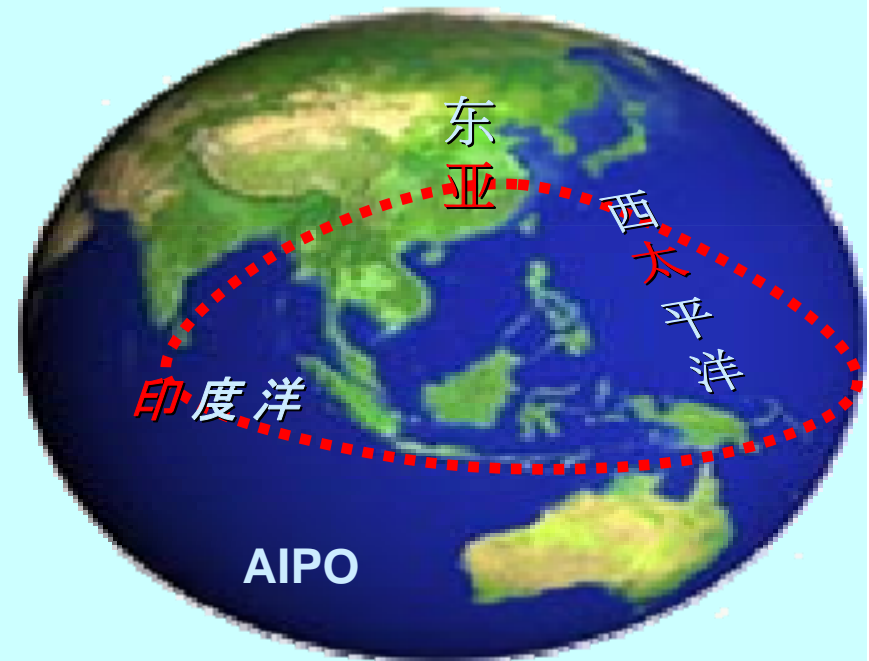WMO/CAS/TMP March 2007

IPCC AR4: Climate change assessments

Activity in Planning

Promote and Coordinate AMY'08 and

Joint WCRP/THOPEX proposal: 2008 Year of Coordinated Observation, Modeling and Forecasting (organized tropical convection)

Coordinate RCM process study and doan scaling prediction with MAHASRI, APCC, MAIRS,...

Joint workshop on dynamical prediction of MJO/MISO with US CliVAR Sub-seasonal WG. (Simmer 2007)

Organize special sessions for IPCC AR4 assessment of AAM changes.

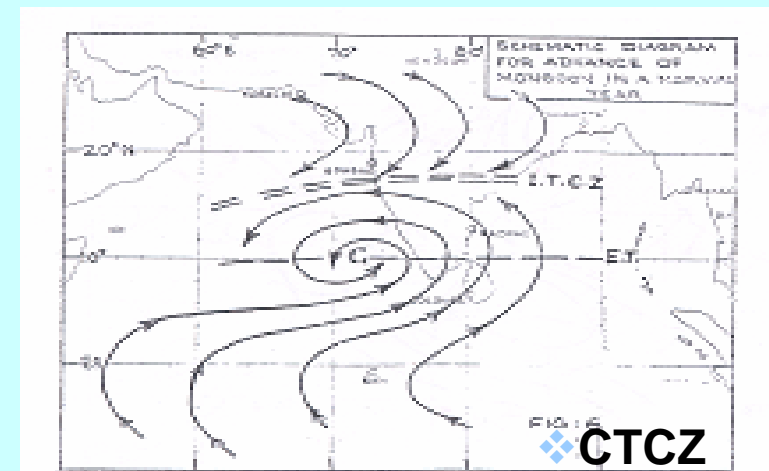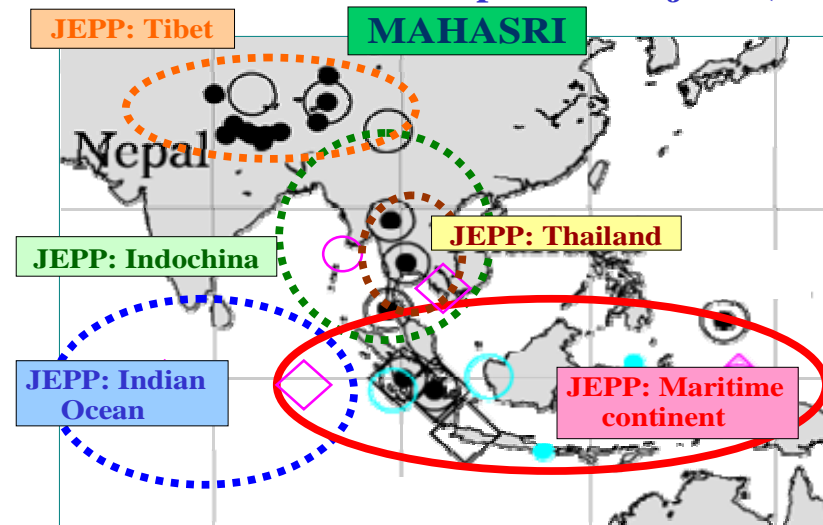NASA/GMAO Proposal: Typhoon, MJO modeling

Asian Monsoon Year in 2008--AMY08

Coordination of A-O-L Interaction study

- Japan-JEPP
- China- AIPO,
- India- CTCZ, STORM
- MAHASRI/GEWEX, IORGC
- CEOP/Tibet/Aerosol
- AAMP/IOP/POP/CLIVAR--

东亚　西太平洋　印度洋

AIPO

MAHASRI and related Japanese Projects (JEPP)

JEPP: Tibet
MAHASRI
Nepal
JEPP: Indochina
JEPP: Thailand
JEPP: Indian Ocean
JEPP: Maritime continent

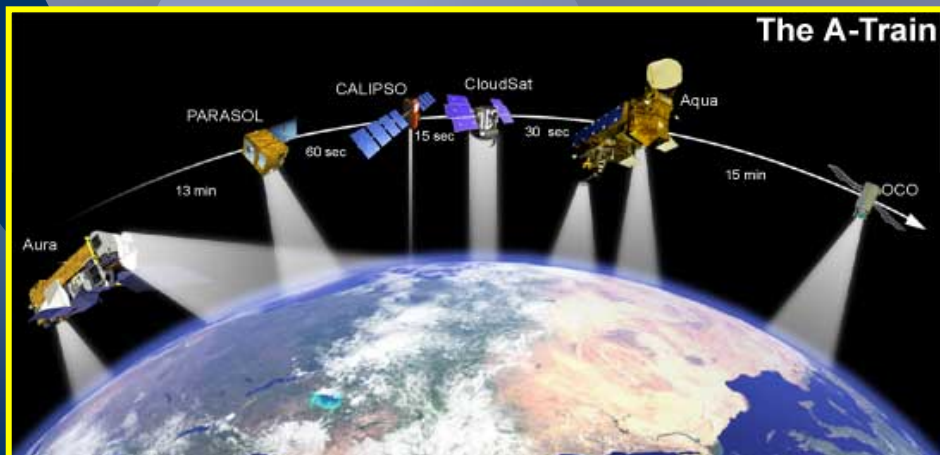❖MAHASRI

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CTCZ

Year of coordinated Observing, modeling and Forecasting:
Addressing the Challenge of Organized Tropical Convection

The A-Train
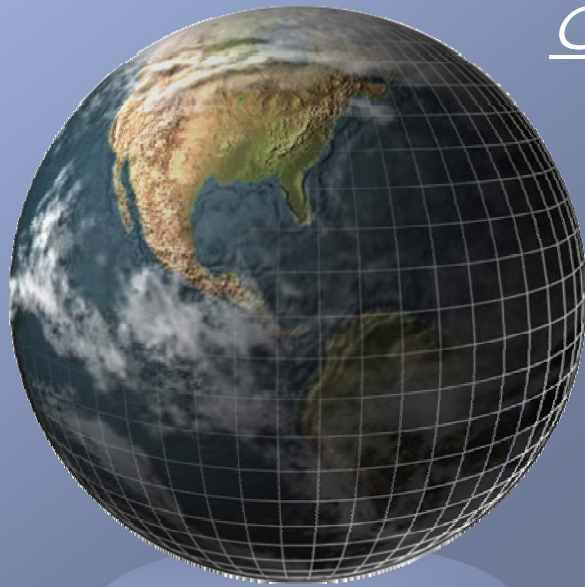
This proposed activity arose out of a recommendation by the THORPEX/WCRP/ICTP Workshop on Organisation and Maintenance of Tropical Convection and the MJO, held in Trieste in March 2006. It was presented at the WCRP/CLIVAR SSG Meeting in Buenos Aires in April 2006.

Based on positive feedback from the WCRP Director and the SSG, the SSG asked that the proposal be developed in cooperation with THORPEX, GEWEX, CEOP, AAMP, WOAP, WMP, etc.

If implemented in 2008, this initiative could be a WCRP contribution to the UN Year of Planet Earth* and compliment IPY.

Coordination of monsoon modeling with MAHASRI/ CEOPII

- 1st pan--WCRP Monsoon Modelling Workshop for key studies of the diurnal cycle over both land and ocean.

- Coordinated GCM/RCM Process study on MJO/ MISO and monsoon onset of SEASM.

- Develop Multi-model ensemble Regional Climate prediction (Downscaling system) experiment in collaboration with MAHASRI and APCC.

- Develop land surface data base for GCM MME hindcast Experimenst (CEOPII)

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AAMP-MAHASRI : Coordinated RCM Process study

- Integration of observation and modelling, Meteorology and Hydrology
- Domain: MAHASRI tropics (70-150, 15S-20N)—a critical region for monsoon ISO influence
- Phenomenon and Issues: ISO, and its interaction with diurnal cycle, meso-scale and synoptic scale regulation. Onset of monsoon (summer and winter)
- Design: Driving field, Output, validation strategy and Data,...
- Participating model groups: both AGCM and RCM, each minimum 5

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MME Downscaling Seasonal Prediction Experiment

Develop effective strategy and methodology for downscaling

Assess the added value of MME downscaling

Determine the predictability of monsoon precipitation

Large scale driving: 10 CGCM from DEMETER and APCC/CliPAS models

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Diamond Head

Thanks