

Over view of MAHASRI, and the role and structure of IMASSC

Jun Matsumoto

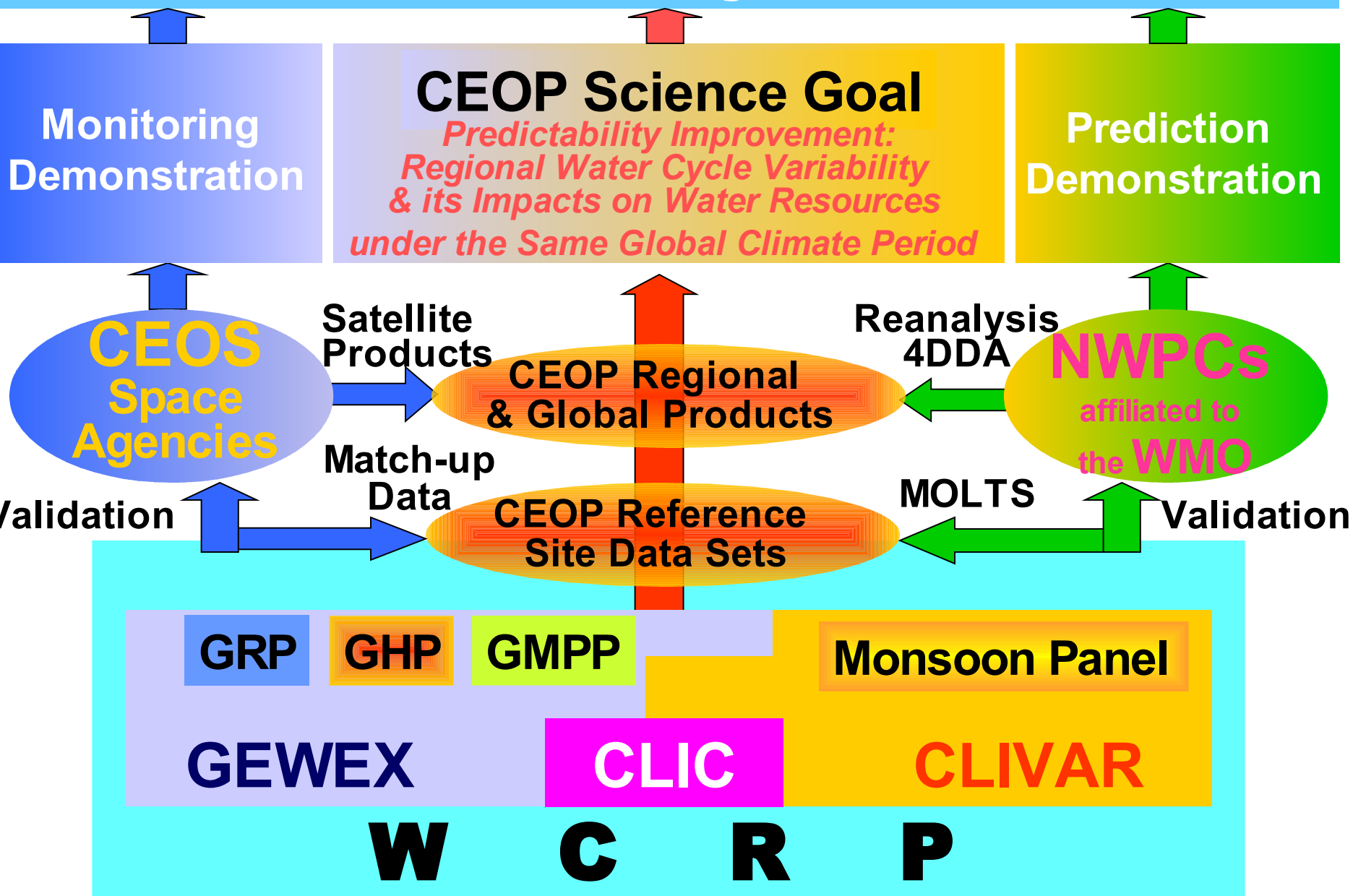
Department of Geography, Tokyo Metropolitan University
Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Institute of Observational Research for Global Change (IORGC)

The 1st International MAHASRI Science Steering Committee Meeting
Bangkok, Thailand

October 19, 2006

A stylized silhouette of a mountain range in shades of brown, spanning the width of the slide at the bottom.

IGOS Water Cycle Theme





Mackenzie GEWEX Study (MAGS)



Baltic Sea Experiment (BALTEX)



GEWEX Americas Prediction Project (GAPP)

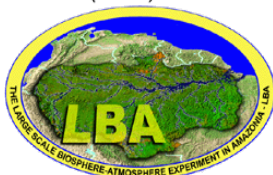
Northeast Asia

MAHASRI

East Asia

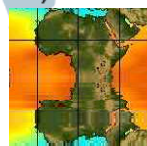
Tibet/Himalaya

Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA)



African Monsoon Multidisciplinary Analysis (AMMA)

La Plata Basin (LPB)



Tropics

Murray-Darling Basin (MDB)



Data Management

Water and Energy Budget Studies

Worldwide Integrated Study Extremes

Stable Water Isotope Intercomparison Group

Transferability

Water Resource Applications Project





C

- Cont
- CEC
- Wat
- S
- CEC

n



MAHASRI



GEWEX
CGES



MODEL OUTPUT

Global
Regional
Local

**REFERENCE SITES
REFERENCE BASINS**

SATELLITES

Diurnal
Intra-seasonal
Seasonal

DATA INTEGRATION & DISSEMINATION

**WATER & ENERGY
SIMULATION & PREDICTION
(WESP)**

Water and Energy Budget
Studies

Global Land Data
Assimilation Systems

Regional Climate Models

Semi-arid Region Study

Cold Region Study

**CEOP INTER-MONSOON
STUDY (CIMS)_**

Coordinated Model
Integration Process

Monsoon System Inter
Comparison

**Aerosol - Monsoon Water
Cycle Interaction**

CEOP Analyses
Intercomparison
Project_

Extreme Events
Impact Analysis
Project_

H A P

MAHASRI Monsoon Asian Hydro- Atmosphere Scientific Research and Prediction Initiative

(Cf. MAHA=Great, Sri=Saint in Sanskrit)

<http://mahasri.cr.chiba-u.ac.jp/>



Objective

"To establish hydro-meteorological prediction system, particularly up to seasonal time-scale, through better scientific understanding of Asian monsoon variability".

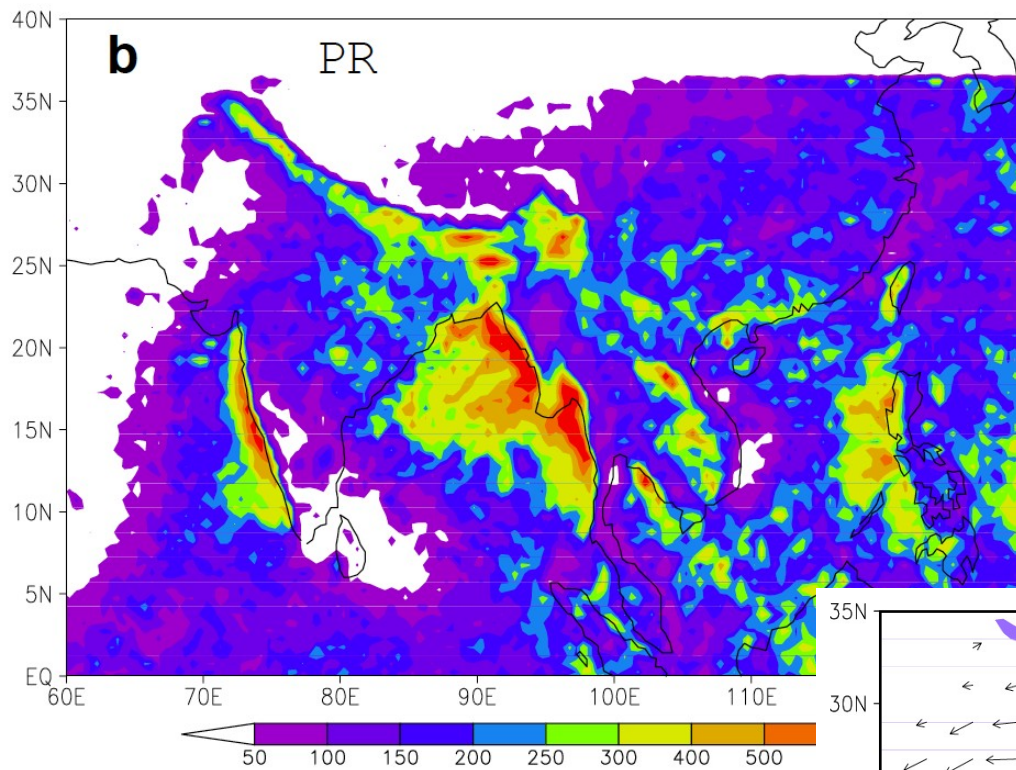


Key Science Issues (1)

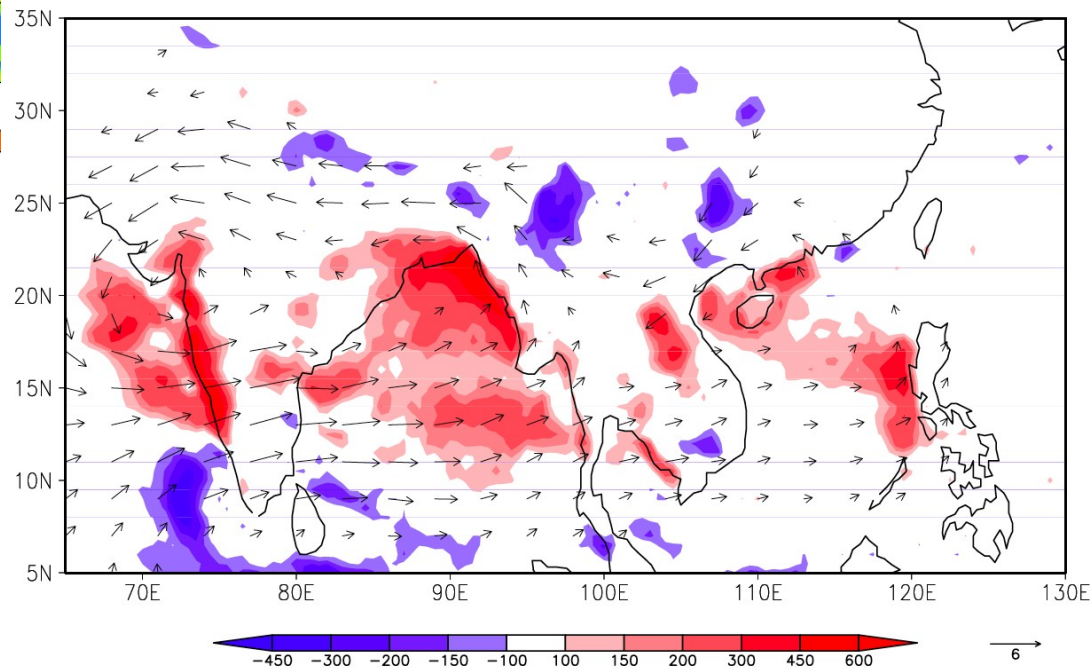
- Atmosphere-ocean-land interactions in the Asian monsoon system
- Effect of various-scale orography on monsoon rainfall
- Scale-interactions among diurnal, synoptic, intraseasonal and seasonal variability of Asian monsoon rainfall



Effect of topography by high-resolution regional modeling

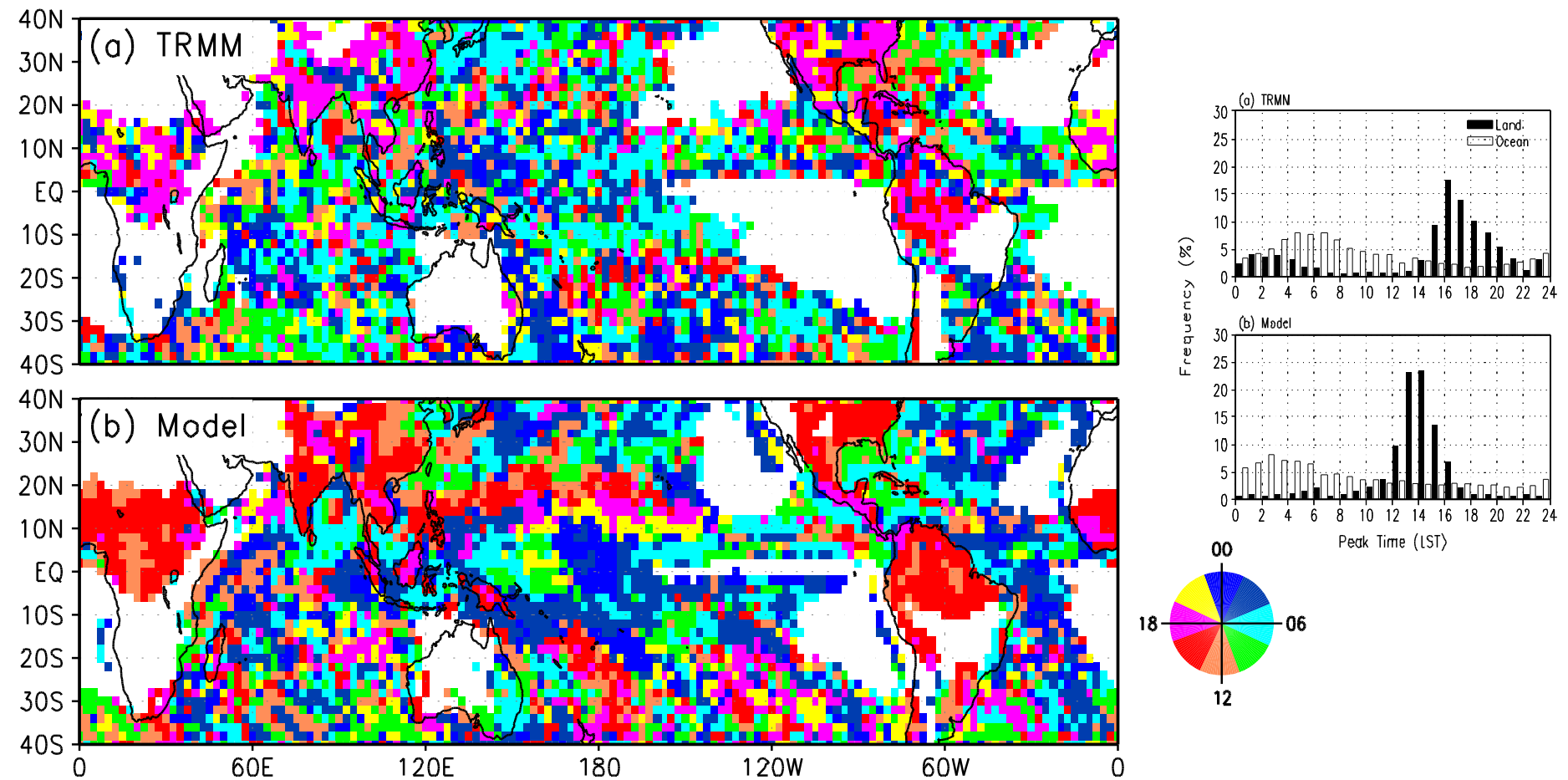


Jun-Aug



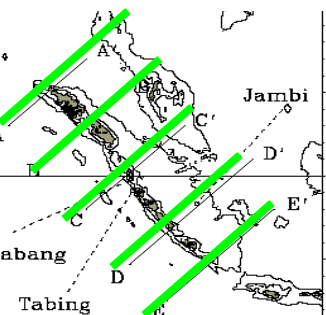
(Xie et al., 2006 J. Climate)

Global distribution of diurnal rainfall peak

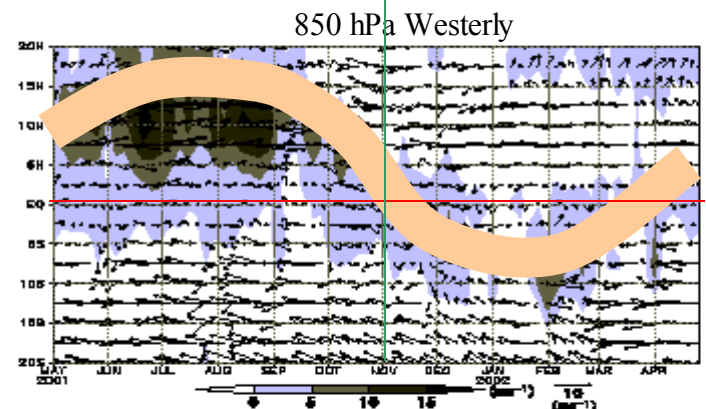
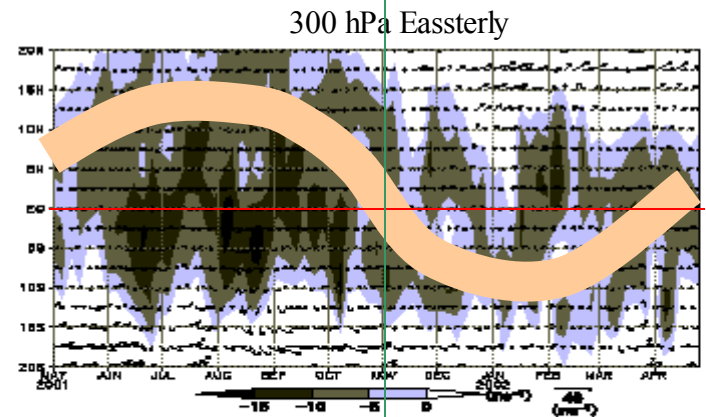


Model produces diurnal rainfall peak 2-3 hour too early

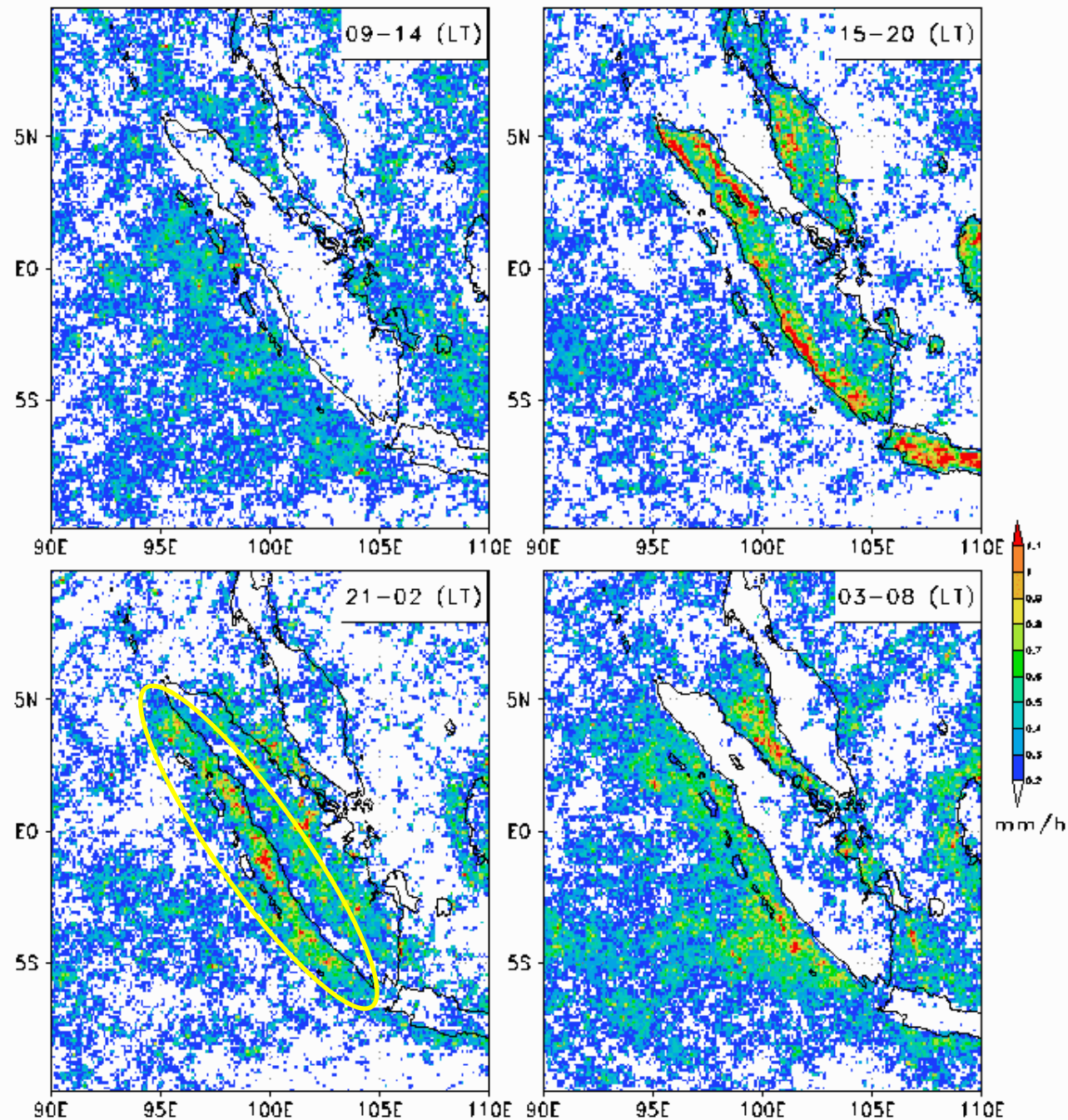
(Sakurai et al., 2004; *JMSJ*)



		Westward migration												Eastward migration											
		01								02				01								02			
		M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A
N	AA'	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
↑	BB'	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
EQ	CC'	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
↓	DD'	○	○	○		○	○	○	○	○	○	○	○					○	○	○	○			△	△
S	EE'	○	○	○		○	○	○		○	○	○	○	○					○	○	○	○	○	○	○

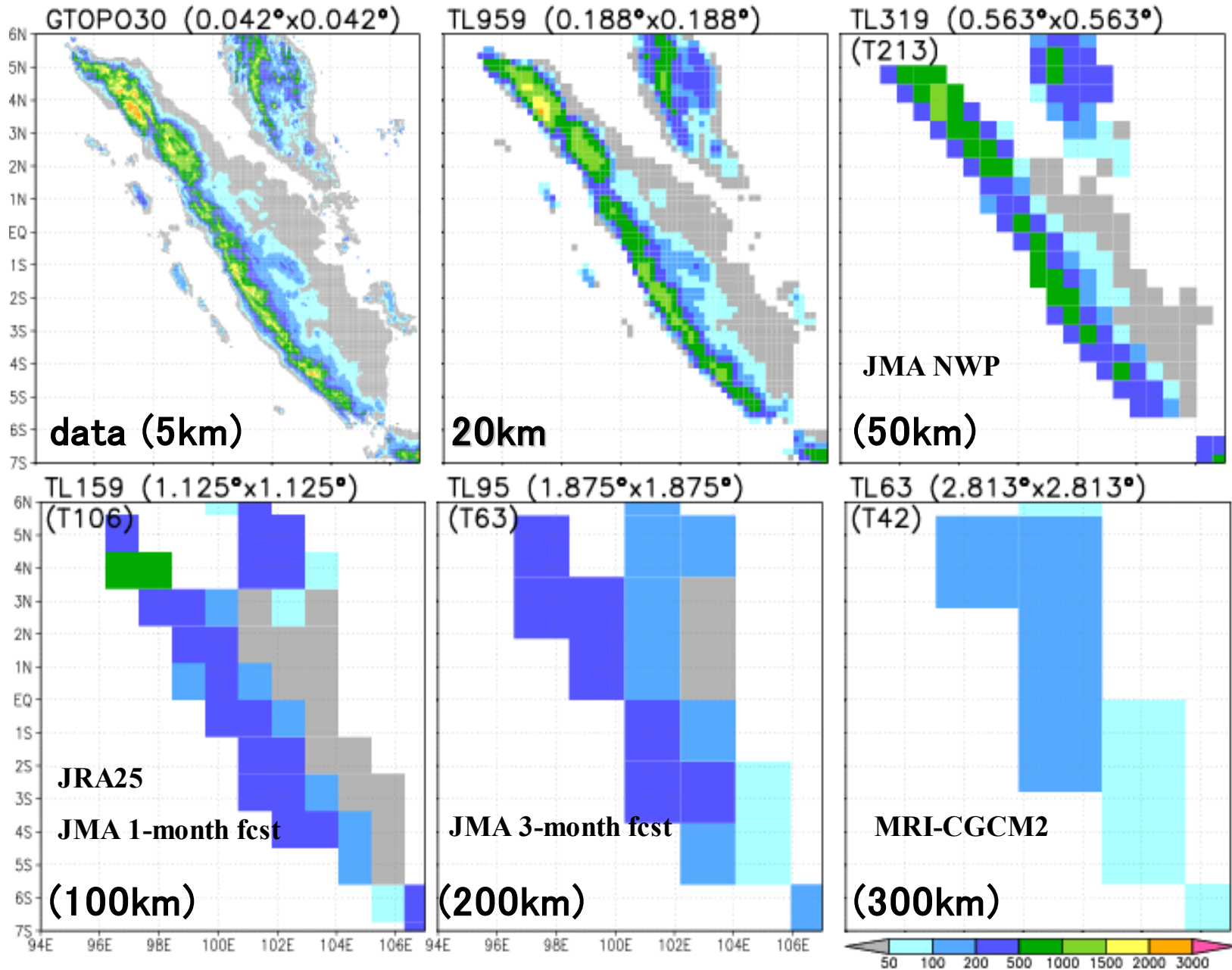


Diurnal variation of rainfall (TRMM 2A25, 1998-2003 Average)

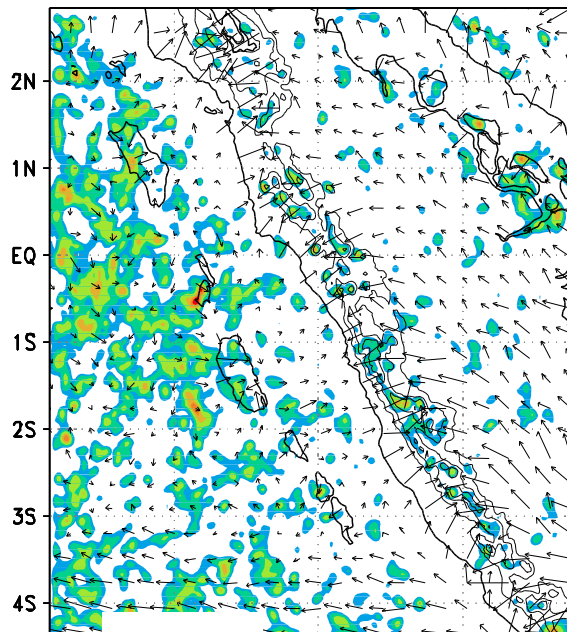


Resolution dependence of topography

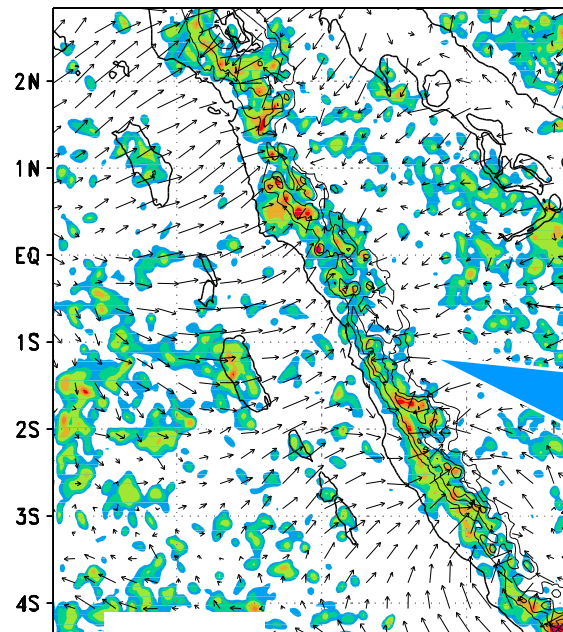
Topography around Sumatra Island



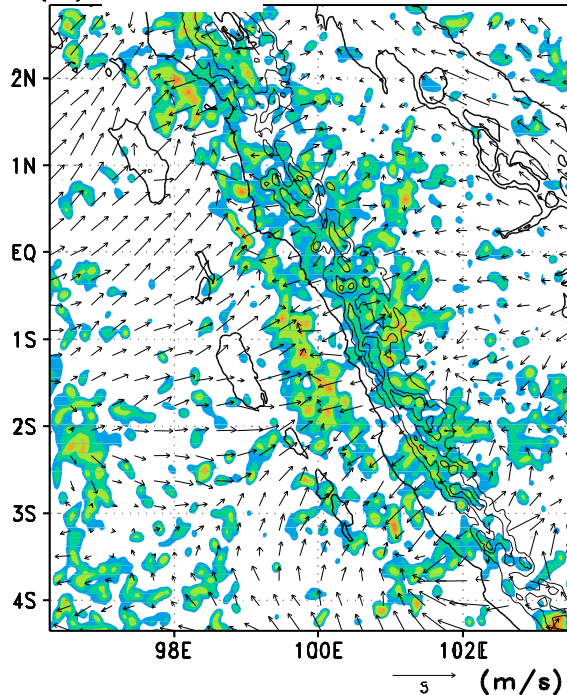
(a) 13 LT



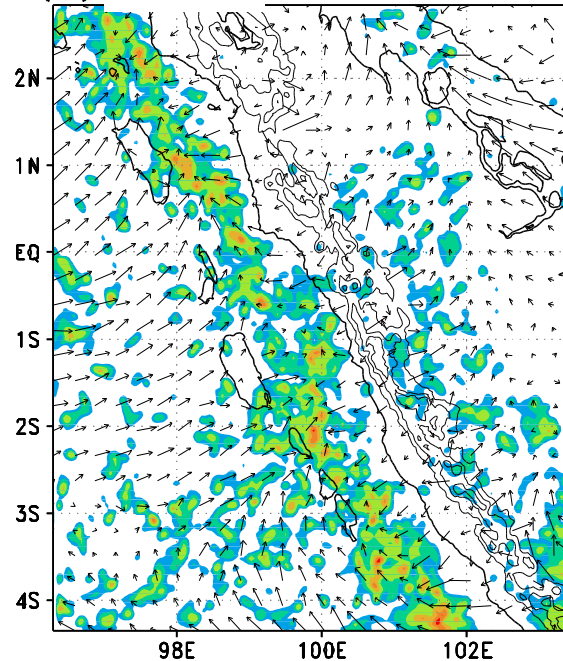
(b) 17 LT



(c) 21 LT



(d) 01 LT



The 1-month simulation for April 2004 (rain season) successfully replicates the TRMM observed aspects of the regional distribution and diurnal variations of precipitation.

In the daytime, convergence by the upslope wind led to an enhancement of moisture and deep convections over the mountainous areas.

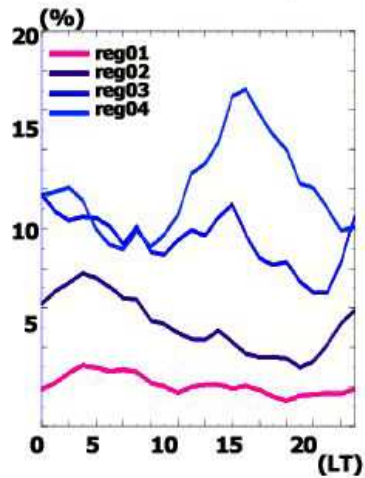
From 19-21 LT, offshore wind blows along the coast.

At night, heavy rainfall occurs over the sea, and migrates westward with time.

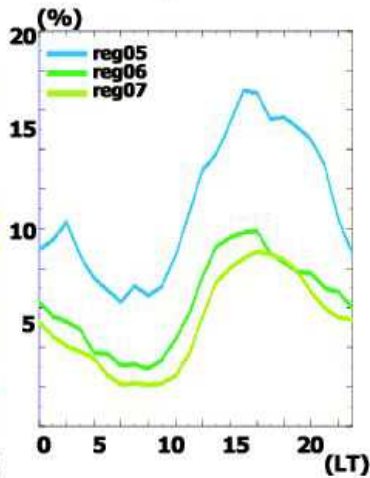
The coast area has low rainfall.

(Wu et al., submitted)

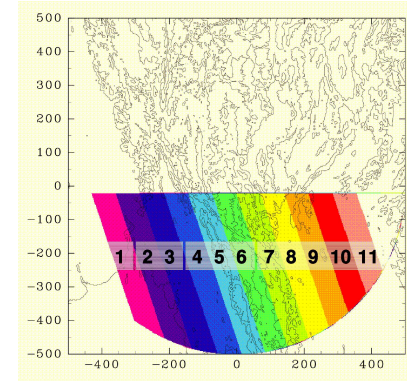
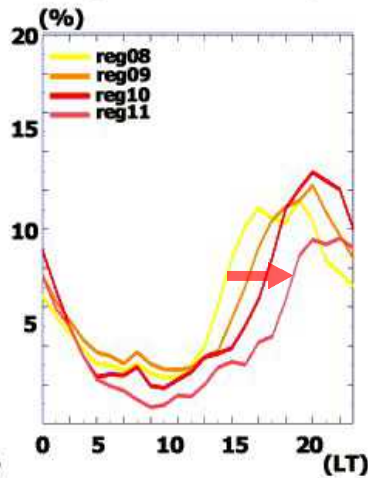
Windward side
(western area)



Mountainous
region

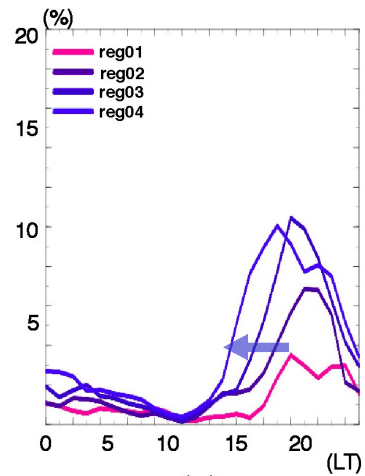


Lee side
(eastern area)



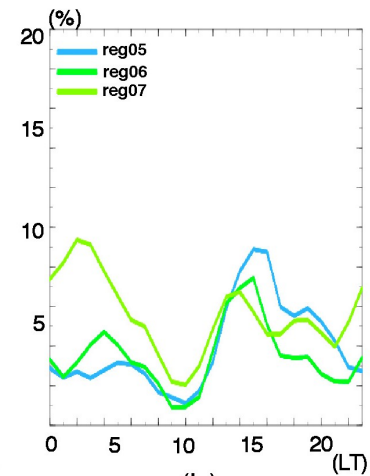
Shift of Echo Area Max
Time by CAPPI data of
Om Koi radar (Okumura
et al., GRL)

Lee side
(western area)



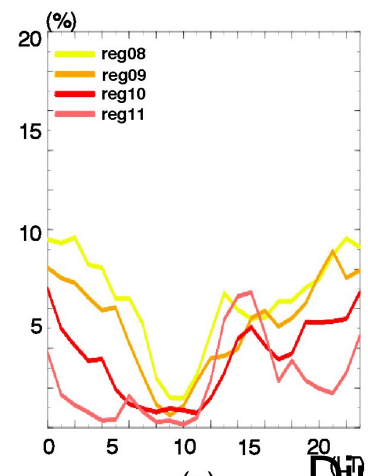
(a)

Mountainous
region



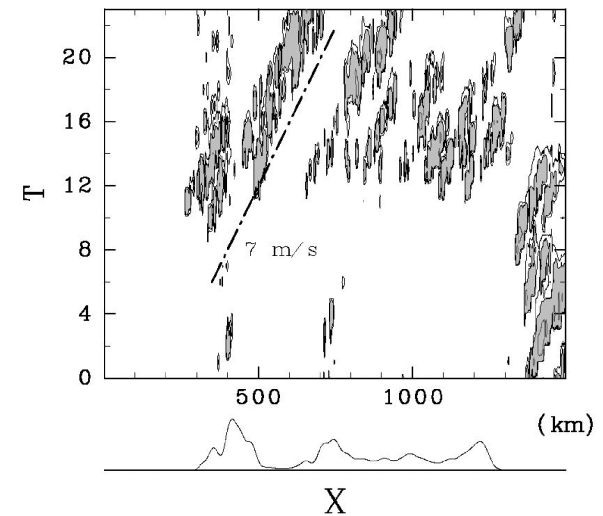
(b)

Windward side
(eastern area)



(c)

(hour) Ave Prec Rate



Diurnal Variation of Precipitation
Simulated by Cloud Resolving Model
(Satomura, 2000: JMSJ)

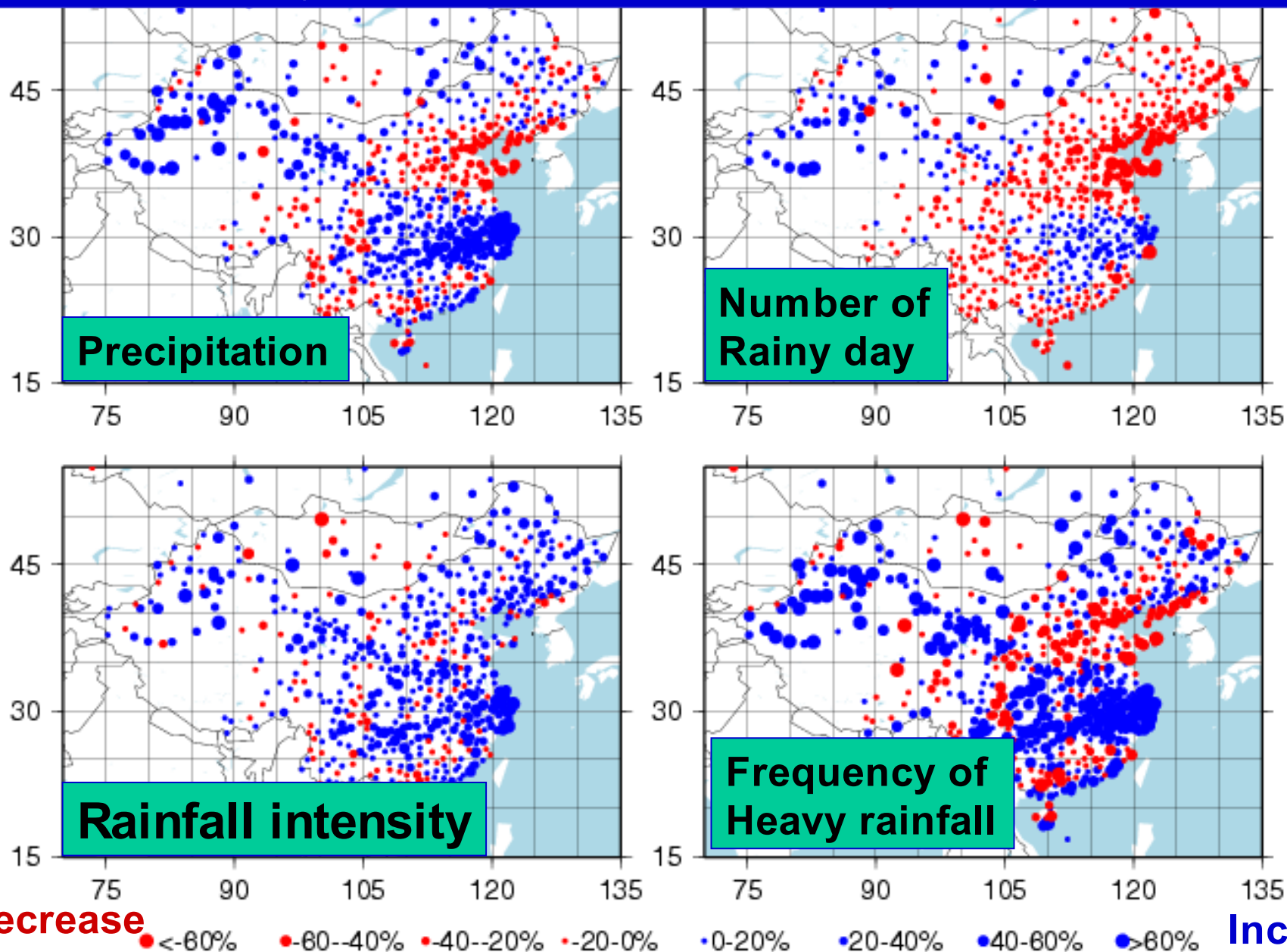
Key Science Issues (2)

- Effect of human influences (i.e., aerosols, land-use change, and greenhouse-gas increase) on hydro-meteorological variations in Asian monsoon regions – Collaboration with MAIRS

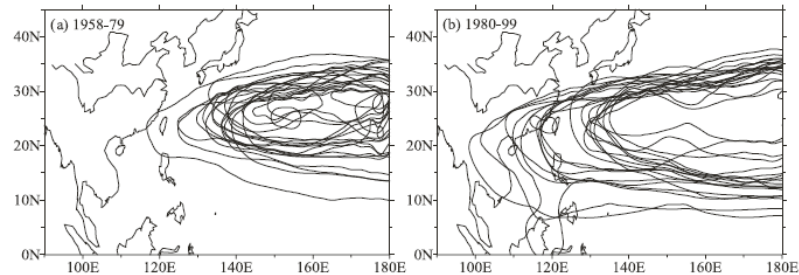


Trend of summer precipitation in China and Mongolia (1960-2000)

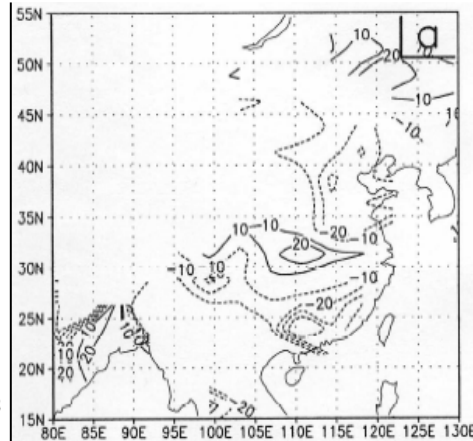
(Endo, Yasunari and Ailikun, 2005 JMSJ)



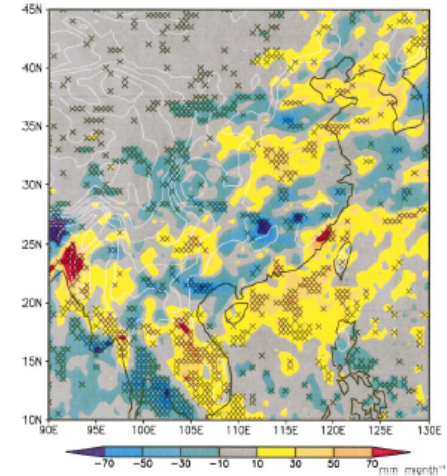
What causes monsoon change in East Asia ?



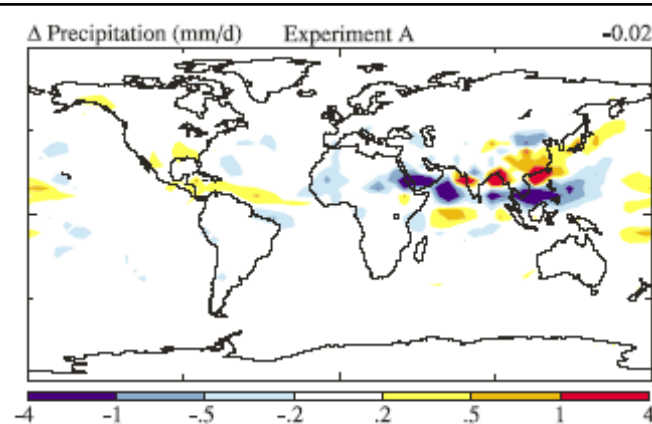
**Change of North Pacific High
(Gong and Ho 2002)**



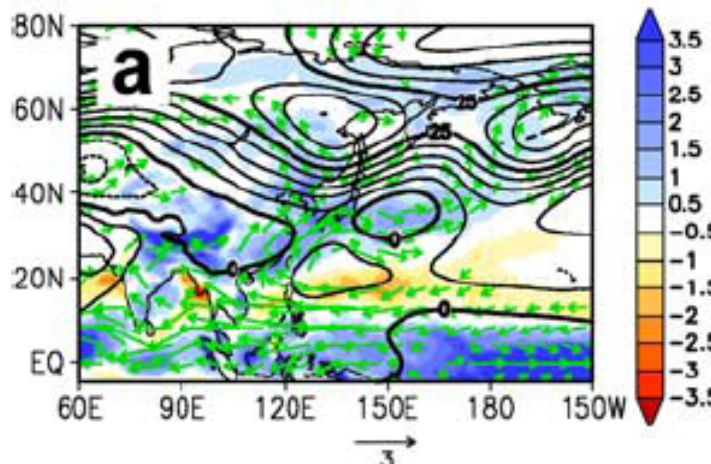
**Inner-Mongolia
Desertification
(Xue 1996)**



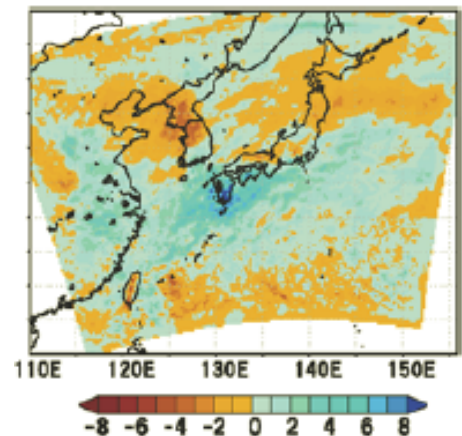
**Indochina Deforestation
(Sen et al. 2004)**




**Black Carbon Increase
(Menon et al. 2002)**



Global Warming (Kimoto 2005; Yoshizaki et al. 2005)



Differences from GAME ?

- More concrete collaboration with Asian hydrometeorological agencies and research institutes
→ Present proto-type model for the hydrometeorological prediction system
 - Expansion the target field not only air-land interaction but also air-land-sea interaction, thus closer collaboration with CLIVAR community
 - Expansion of the target area over the Maritime Continent, Western Pacific, and India, while retreat from Siberia
 - Targeting also winter monsoon
 - Main time-scale: weekly to seasonal for prediction, year-to-year variability for research including long-term data rescue
- 

Major MAHASRI activities in 2005

- August 28, 2005: 1st International Post-GAME Planning Workshop at Kyoto, Japan
- November 1, 2005: 2nd International Post-GAME (MAHASRI) Planning Workshop at Tokyo, Japan
- November 2-4, 2005: 1st Asian Water Cycle Symposium, Tokyo, Japan
- November 4-6, 2005: Workshop on Hydroinformatics and atmospheric sciences, Kanchanaburi, Thailand
- Early December, 2005: Submit MAHASRI Science Plan draft (Ver. 1) to the GEWEX SSG members



Major MAHASRI activities- Sept., 2006

- Mid-January, 2006: Proposal in the GEWEX-SSG, Dakar, Senegal. Conditionally approved as Post-GAME CSE in Asia (Also by JSC in March).
- April, 2006: Meeting in the Symposium on Asian Winter Monsoon, Kuala Lumpur, Malaysia
- August 18-20, 2006: The 1st Vietnam-Japan Joint Workshop on Asian monsoon, Halong, Vietnam
- July, 2006: Review from the CLIVAR community
- August 7-8, 2006: Informal meeting with IAP etc., Beijing, China.
- September 15, 2006: APCC SAC meeting, Busan Korea
- September 26-28, 2006: Capacity building in Asia, Bangkok, Thailand.
- September 29-30, 2006: Workshop on East Asian Monsoon Experiment (EAMEX), Chung-Li

Major MAHASRI activities- Oct., 2006

- October 9-13, 2006: Pan-GEWEX meeting, Frascati, Italy. Submit revised version of the MAHASRI Science Plan (Ver. 4.1)
- October 18, 2006: Asia Pacific Association of Hydrology and Water Resources Meeting (APHW) at Bangkok, Thailand. Special session on “GEOSS and MAHASRI” is organized.
- October 19-20, 2006: The 1-st International MAHASRI Science Steering Committee Meeting, Bangkok, Thailand. Start drafting of Implementation Plan.



New field observation plan

- Asian Monsoon Year (AMY)-2008
in collaboration with MAHASRI

Japan- JEPP

China- 973AIPO

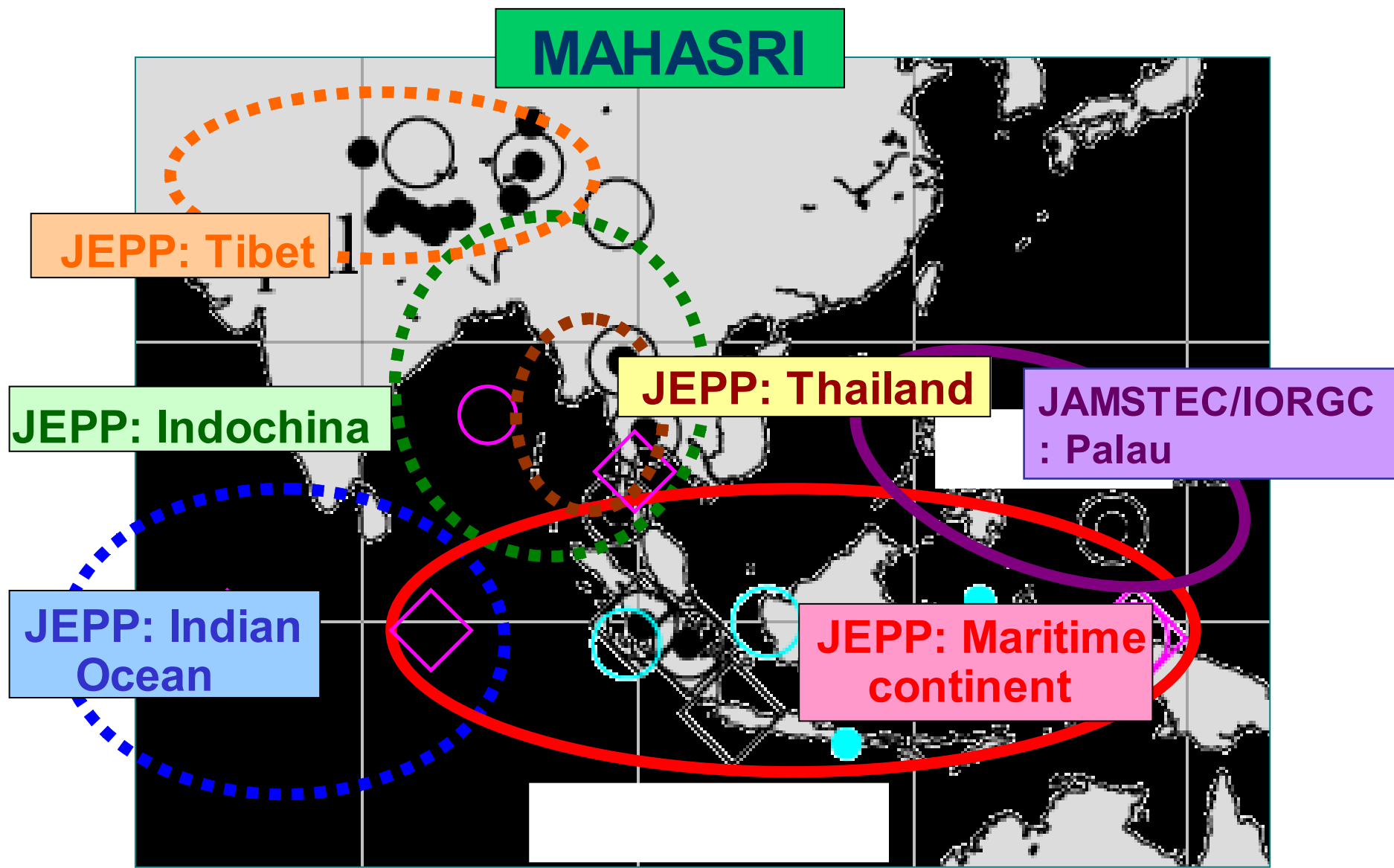
India- CTCZ

Australia (Planned)

AAMP/CLIVAR



MAHASRI and related Japanese Projects (JEPP)

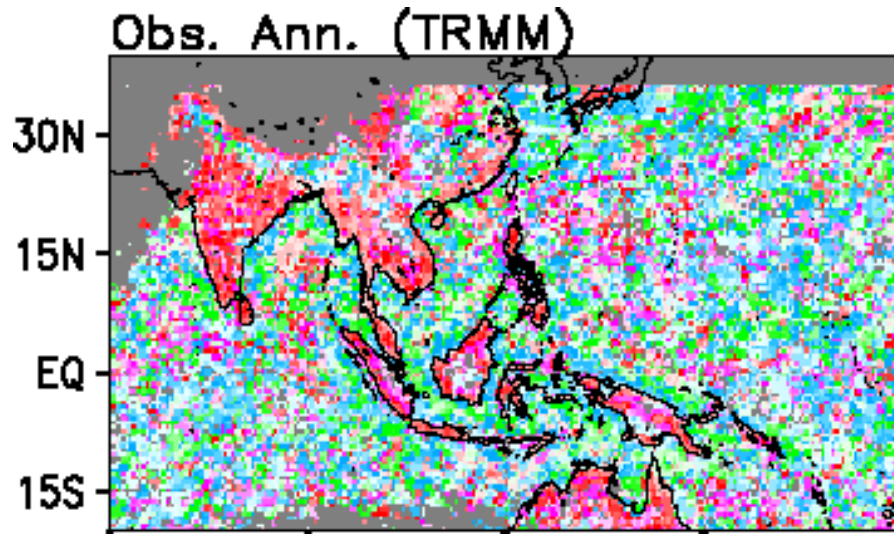


Modeling Activity (planned)

- Objective
 - To evaluate topographic forcing on atmospheric phenomena and interactions among atmosphere, land and ocean.
 - To reduce bias of diurnal variation of cloudiness and rainfall.
- Method
 - Global models
 - Regional models including cloud-system resolving models
 - Maximum use of the AMY-2008 data

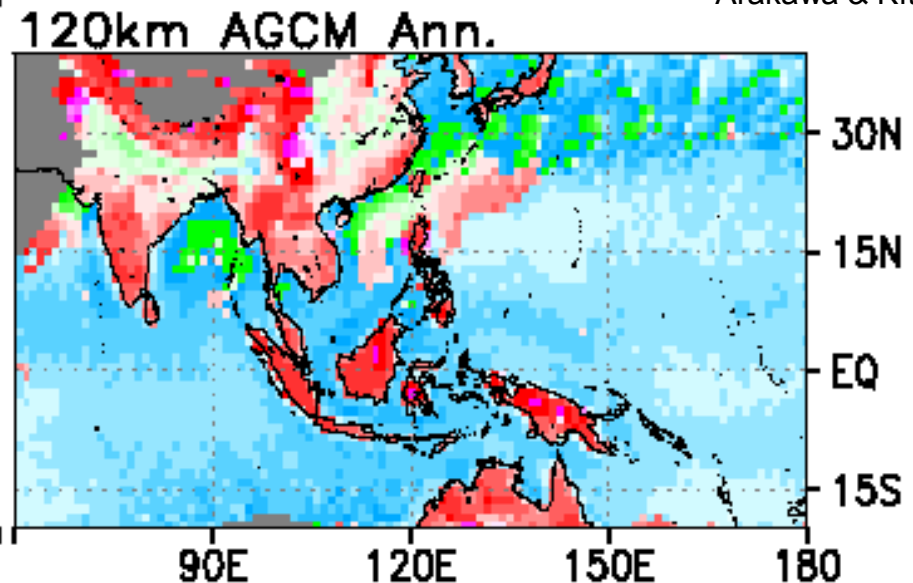
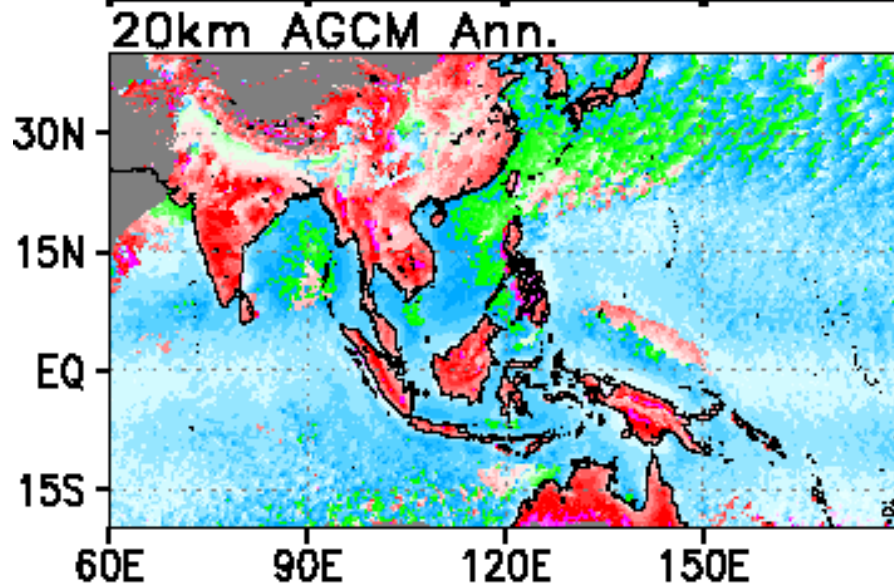


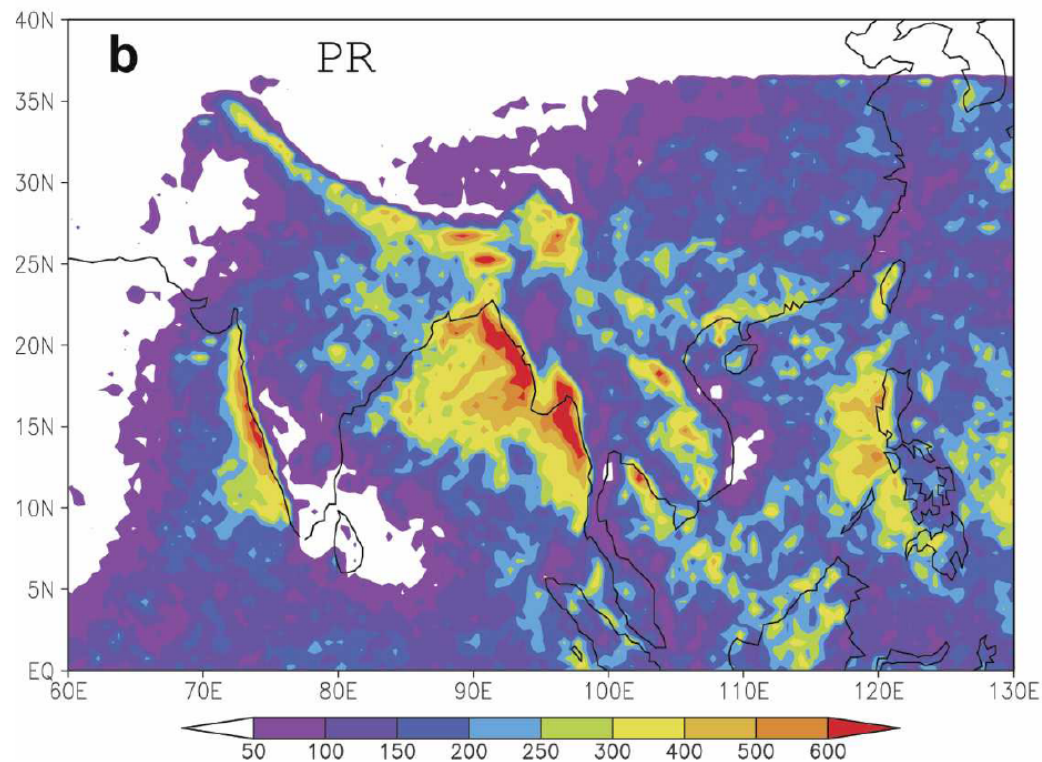
Spatial distribution of peak localtime of annual mean rainfall diurnal variation by MRI-AGCM



- 20km AGCM captures spatial distribution of diurnal rainfall peak time over both land and the ocean within a few hours
- Few difference between 20km and 120km AGCMs

Arakawa & Kitoh





TRMM
(rainy season average)

Xie et al. 2006

Exp006
Fcst: 720.00 h
Terrain height AMSL
Total precip. since h 0

Valid: 0000 UTC Sun 01 Jul 01 (0700 LST Sun 01 Jul 01)

June 2001

Exp006
Fcst: 768.00 h
Terrain height AMSL
Total precip. since h 0

Valid: 0000 UTC Wed 01 Aug 01 (0700 LST Wed 01 Aug 01)

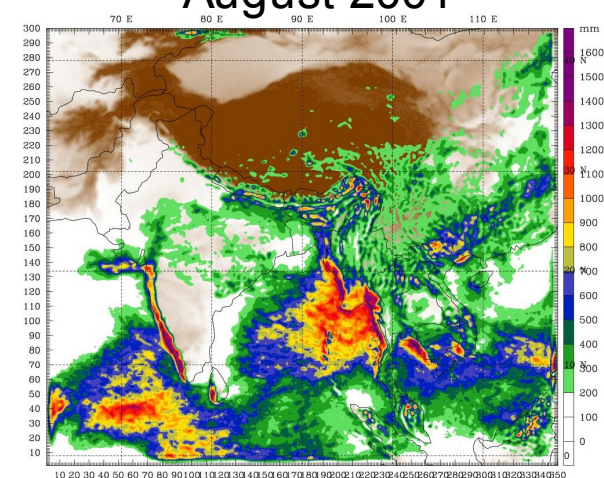
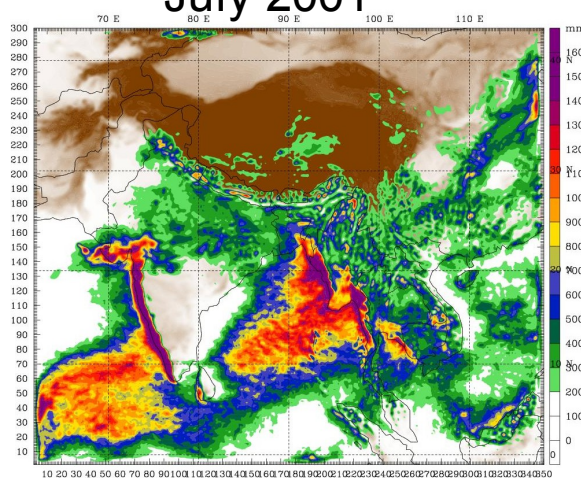
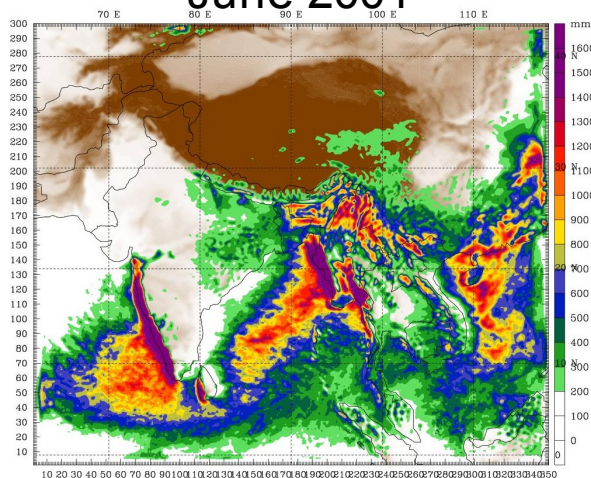
July 2001

Exp006
Fcst: 768.00 h
Terrain height AMSL
Total precip. since h 0

Valid: 0000 UTC Sat 01 Sep 01 (0700 LST Sat 01 Sep 01)

August 2001

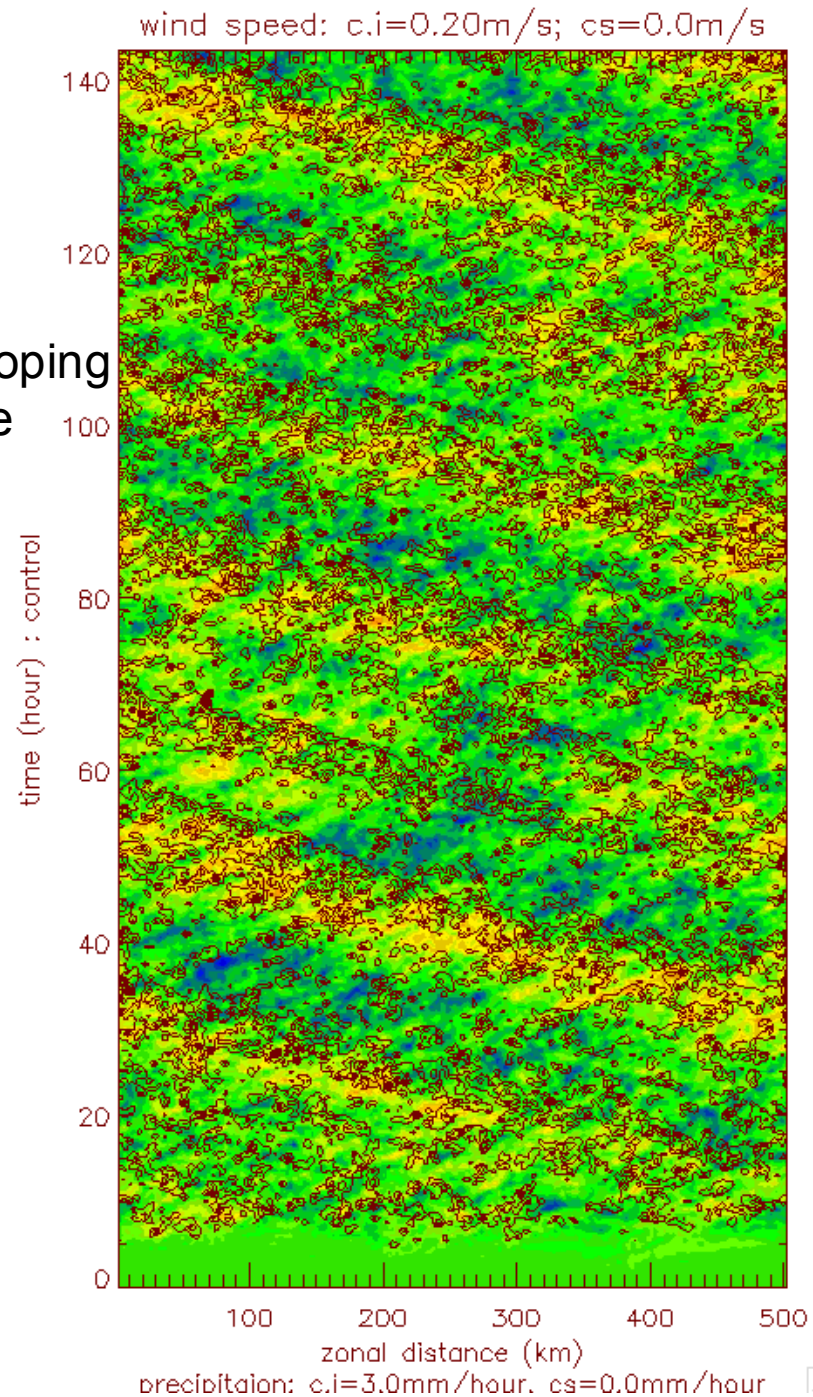
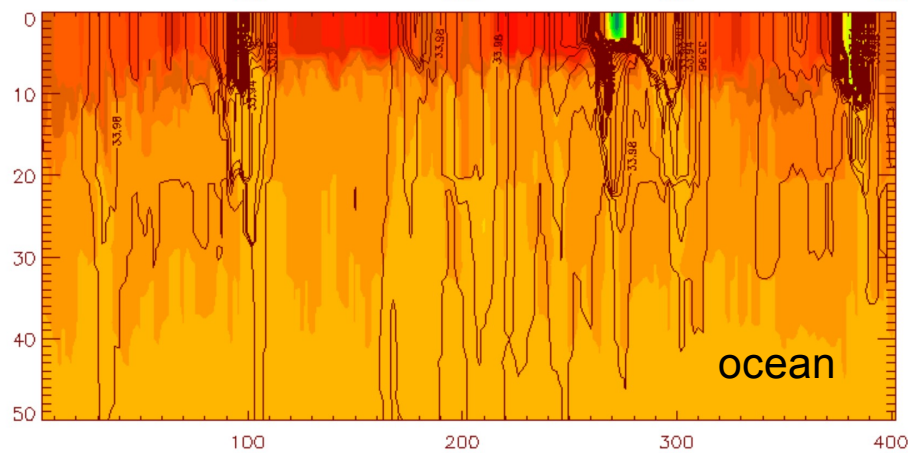
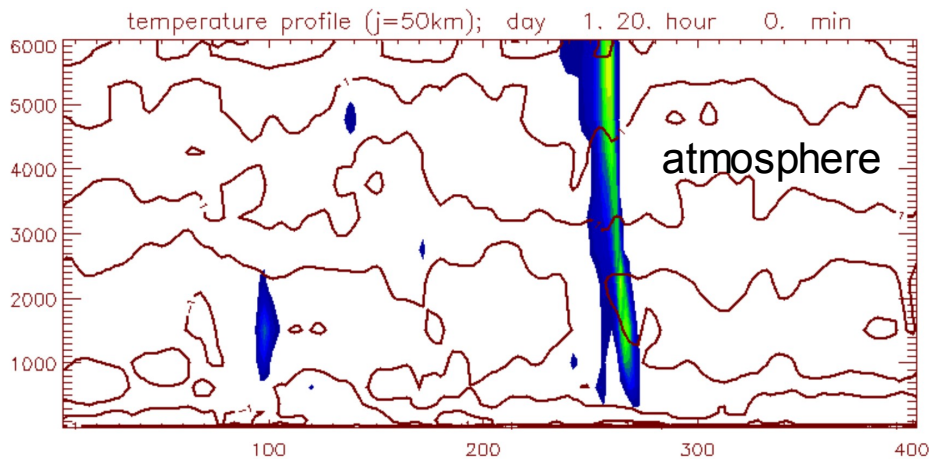
Regional model

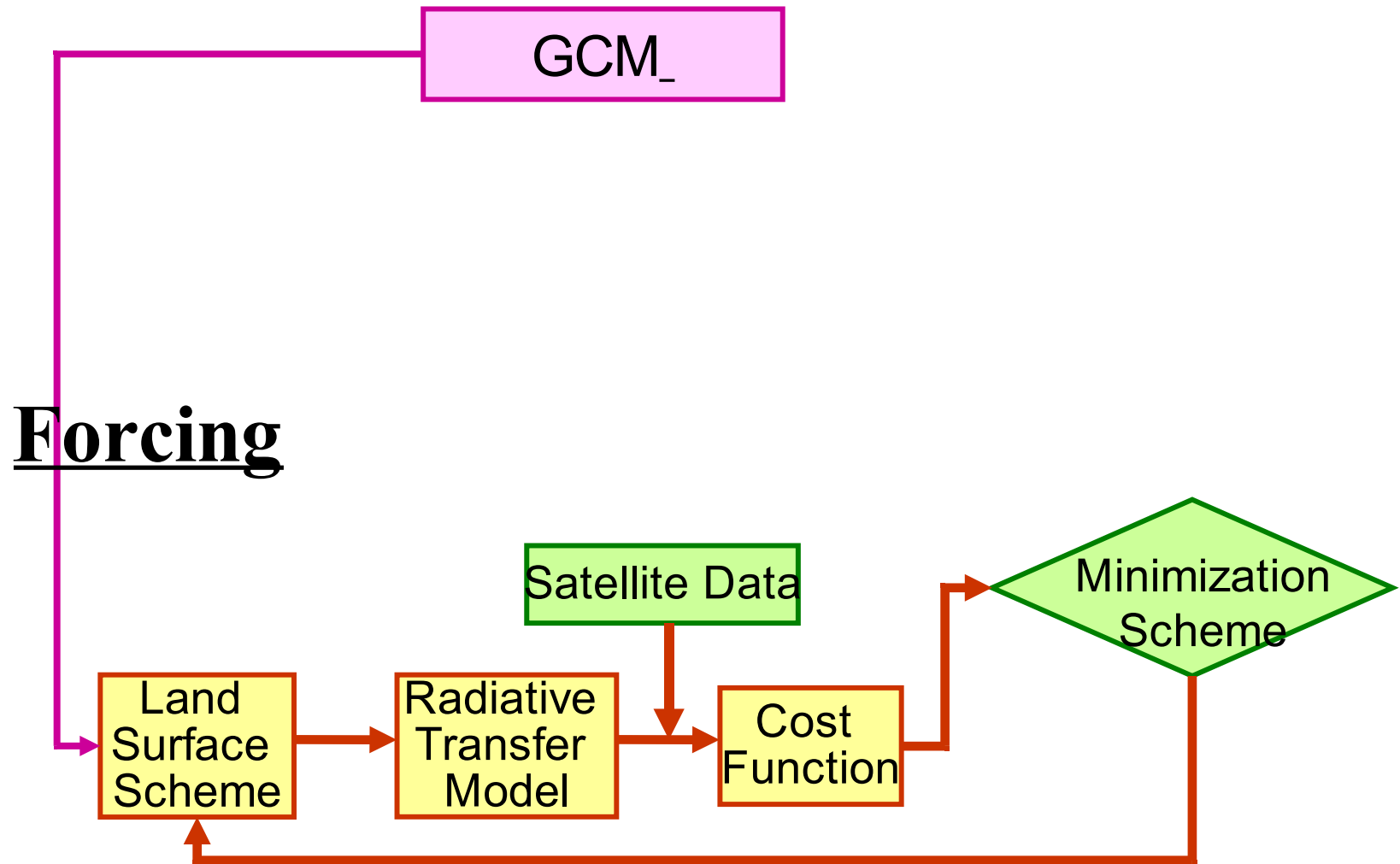


3D coupled non-hydrostatic model (under developing)

Ishikawa & Satomura

Self-developing
large scale
structure



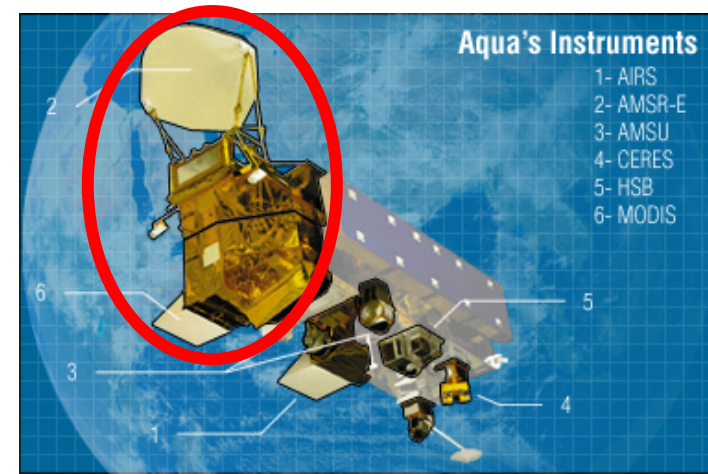


LDAS

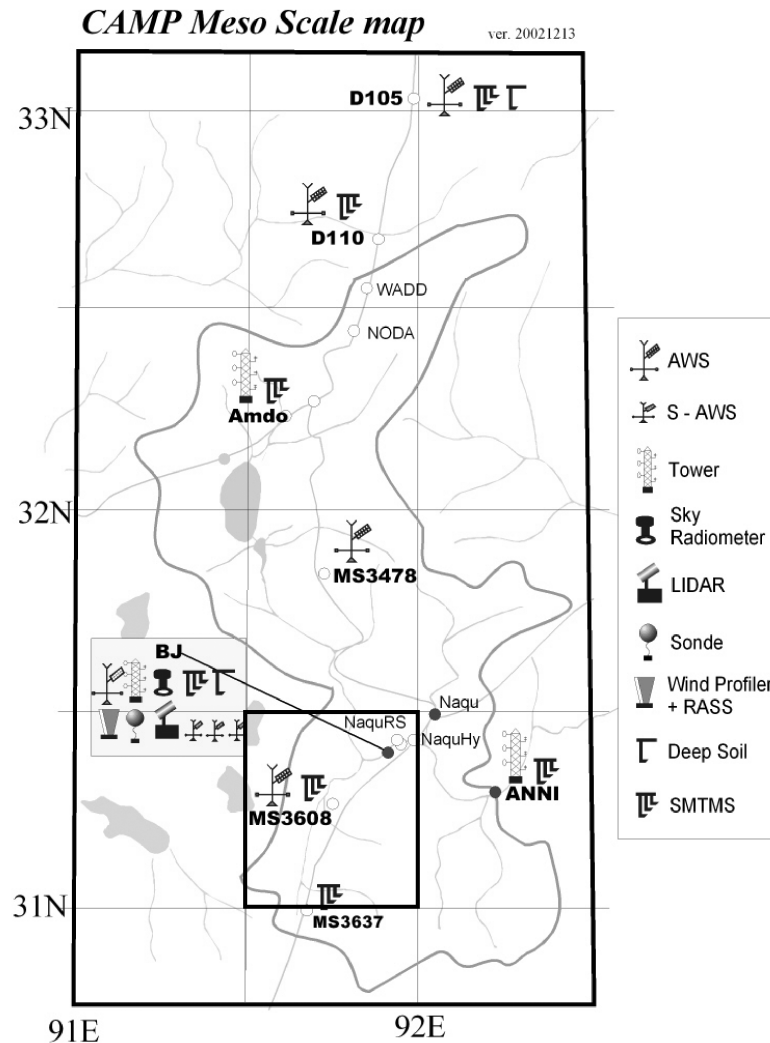
Improvement of Land surface assimilation (T. Koike)

Input Data → High Applicability in Any Region

- LDAS-UT grid size: 0.5 degree
- Forcing
 - GPCP precipitation: 1 degree
 - ISCCP radiation: 2.5 degree
 - NCEP reanalysis: 1.5 degree
- Leaf area index: MODIS
- Microwave Tb: AMSR-E



First application: A case at CEOP Tibet site



Items	Station (depth)
Precipitation	BJ
Radiation	BJ
Surface	BJ, MS3608
temperature	S-AWS1, S-AWS3
Near-surface	BJ, MS3608 (4cm)
soil moisture	S-AWS1, S-AWS3 (0-5 cm) SSMTMS (0-3 cm)
Turbulent fluxes	BJ (3m, 20m)

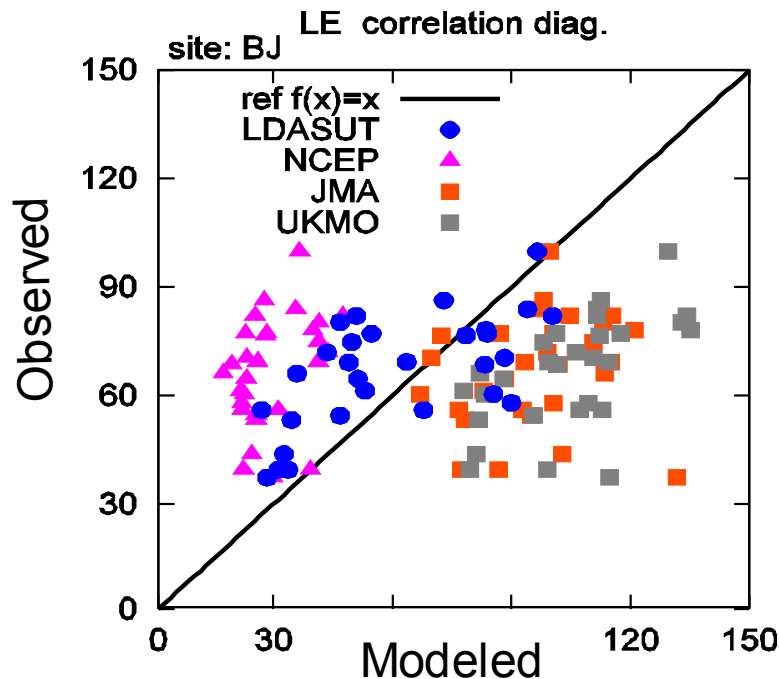
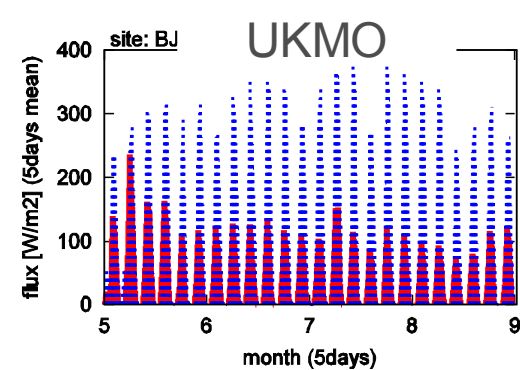
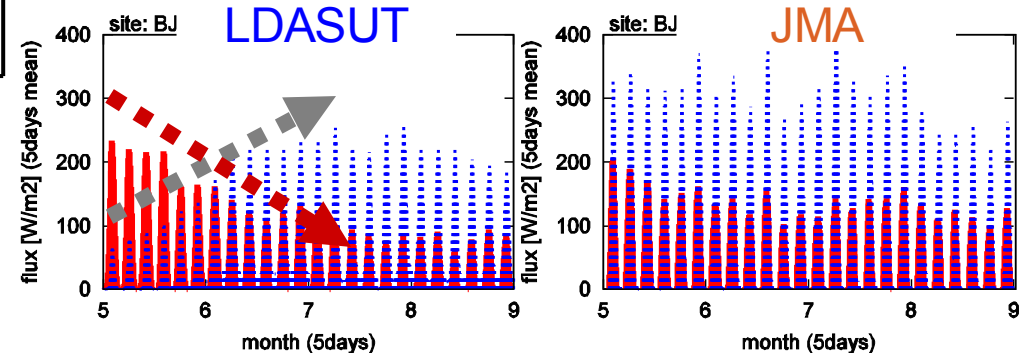
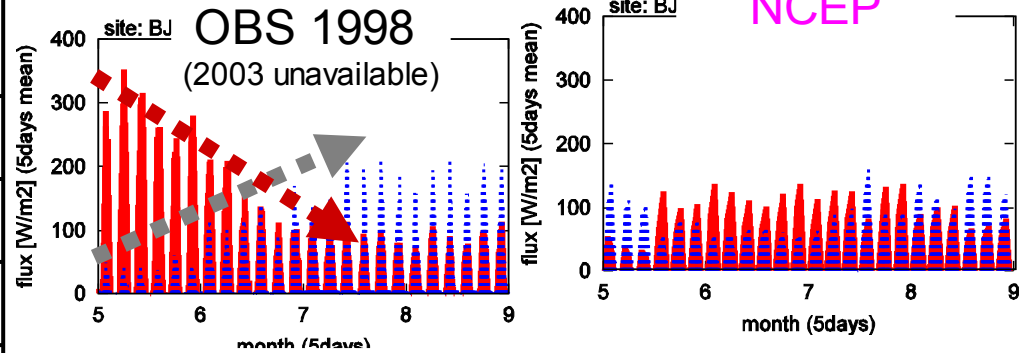
LDASUT- GCMs

LE daily-mean (June)

	H RMSE [W/m ²]	RMSE [W/m ²]
LDASUT	32.0	42.5
NCEP	40.2	68.4
JMA	32.3	79.8
UKMO	35.3	80.1

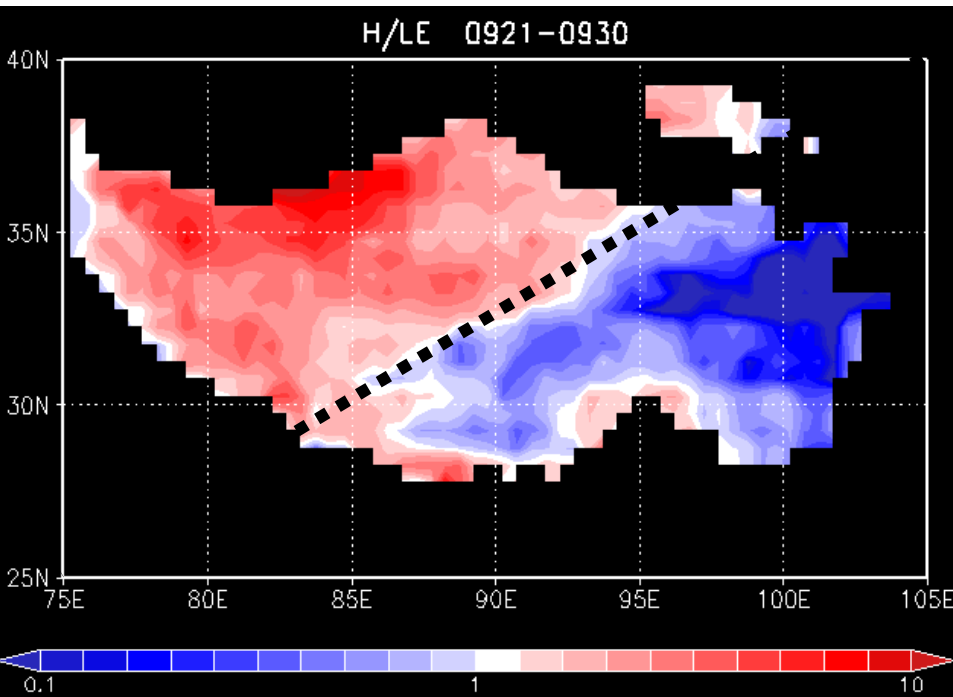
Seasonal variation
(May - September)

Sensible (H)
Latent (LE)

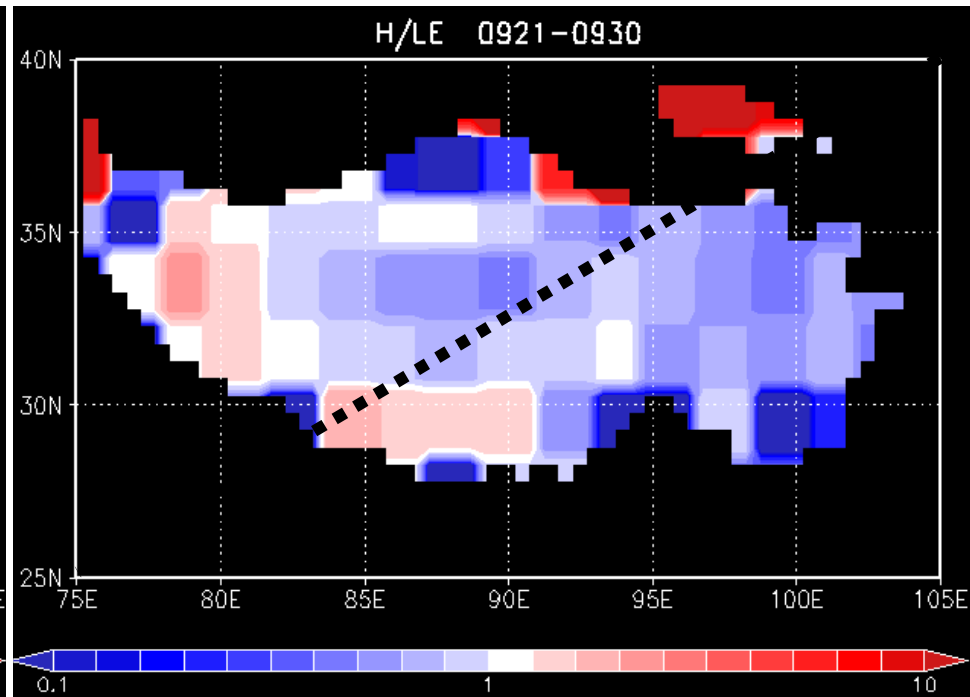


Seasonality of distributed Bowen Ratio: Sensible Heat Flux/Latent Heat Flux

LDASUT

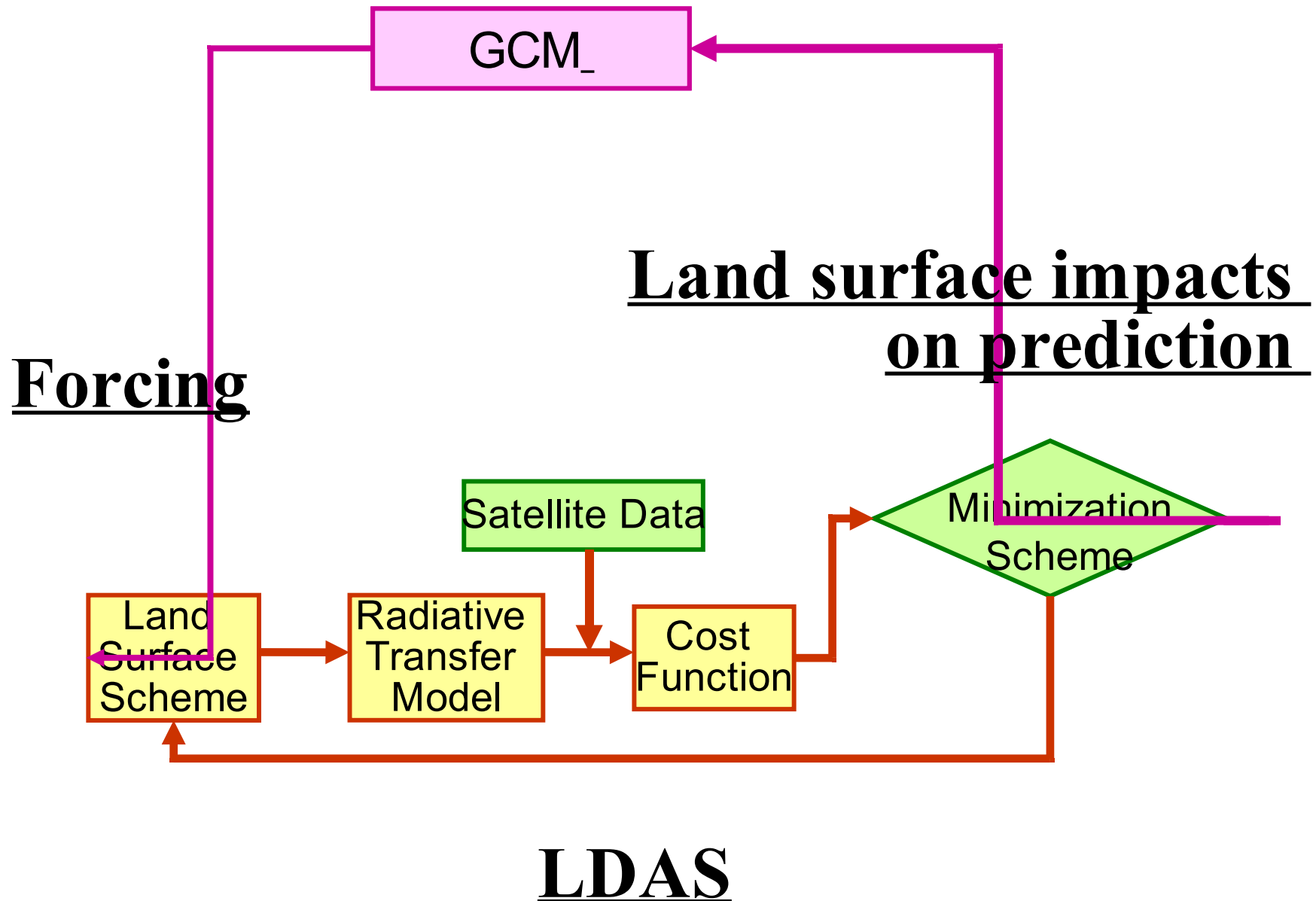


NCEP



LDAS Seasonality: May~Mid June, $H > LE$; Mid June~Aug, $LE > H$

LDAS Regionality: H is dominant in N.W. TP, LE is dominant in S.E. TP



Impacts of the Tibet surface conditions on the GCM prediction (UT-JMA Cooperative Research)

sensible
heat flux

latent
heat flux

surface
temperature

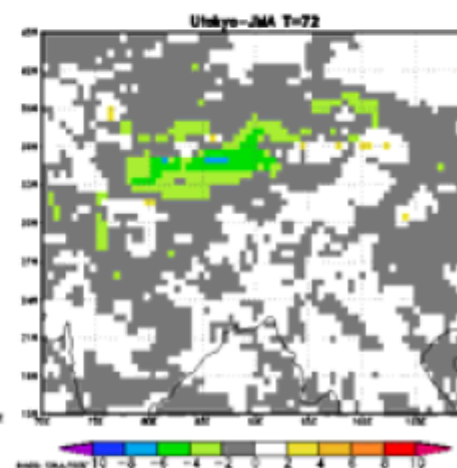
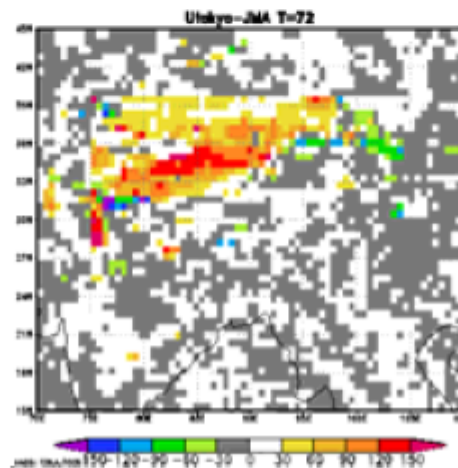
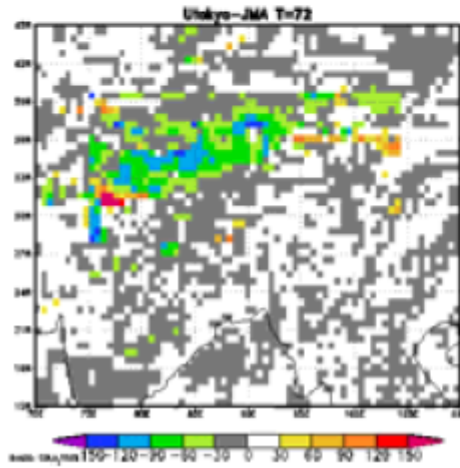
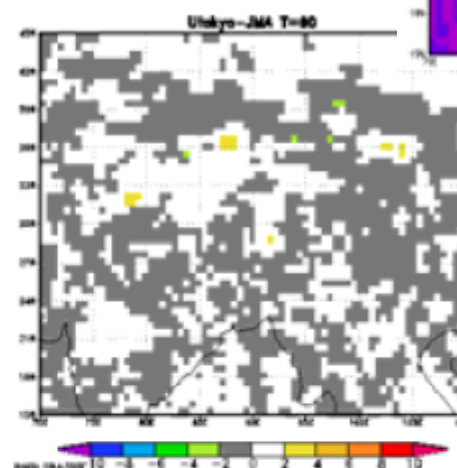
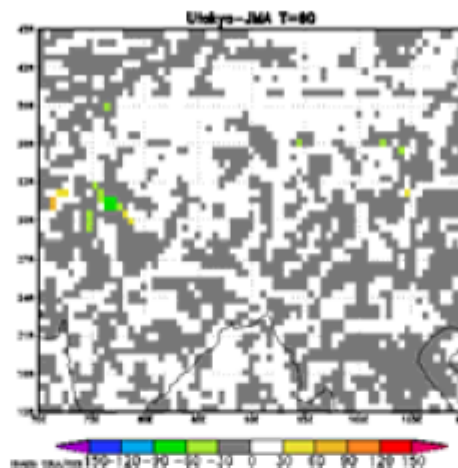
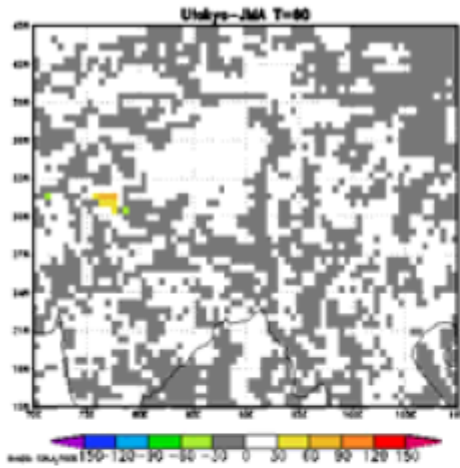
Tibetan Plateau

Use the assimilation
product as the initial
condition

Nighttime

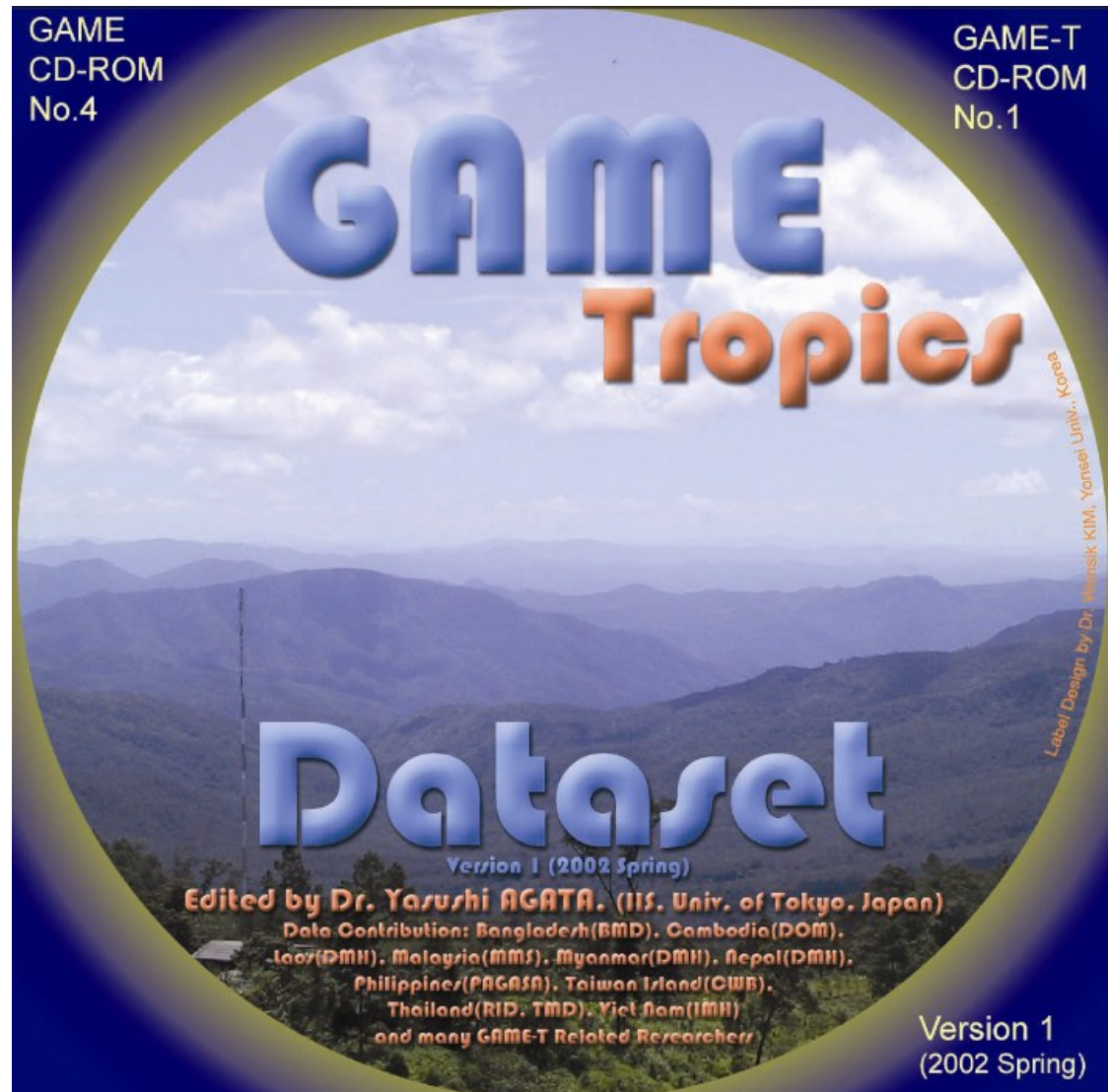
Three days later

Daytime



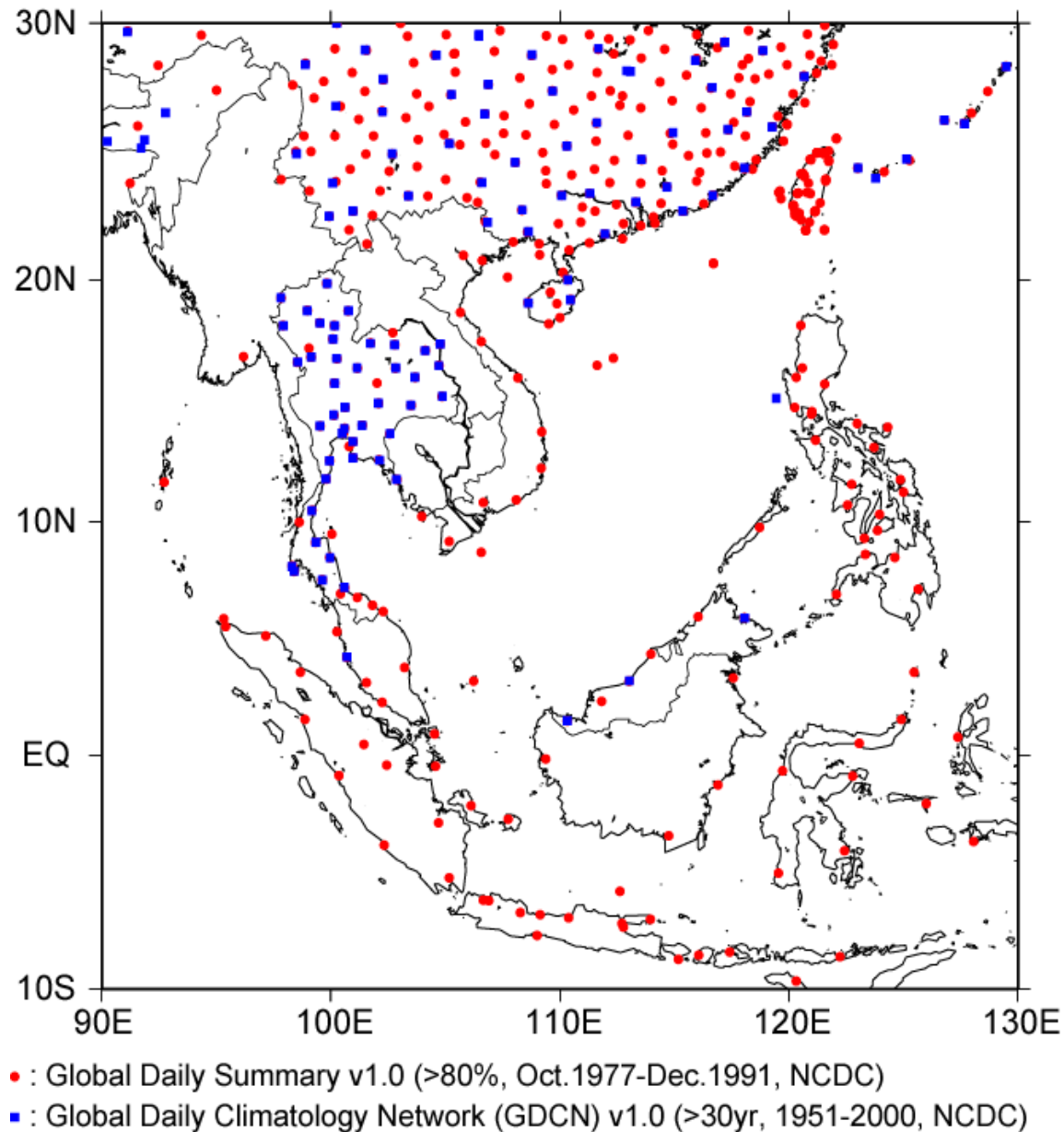
Recent Archiving and management

- CD-ROM published
 - Complete ‘Snapshot’ of GAME-T database in June 2002.
 - Contains more than 8000 files (620MB)

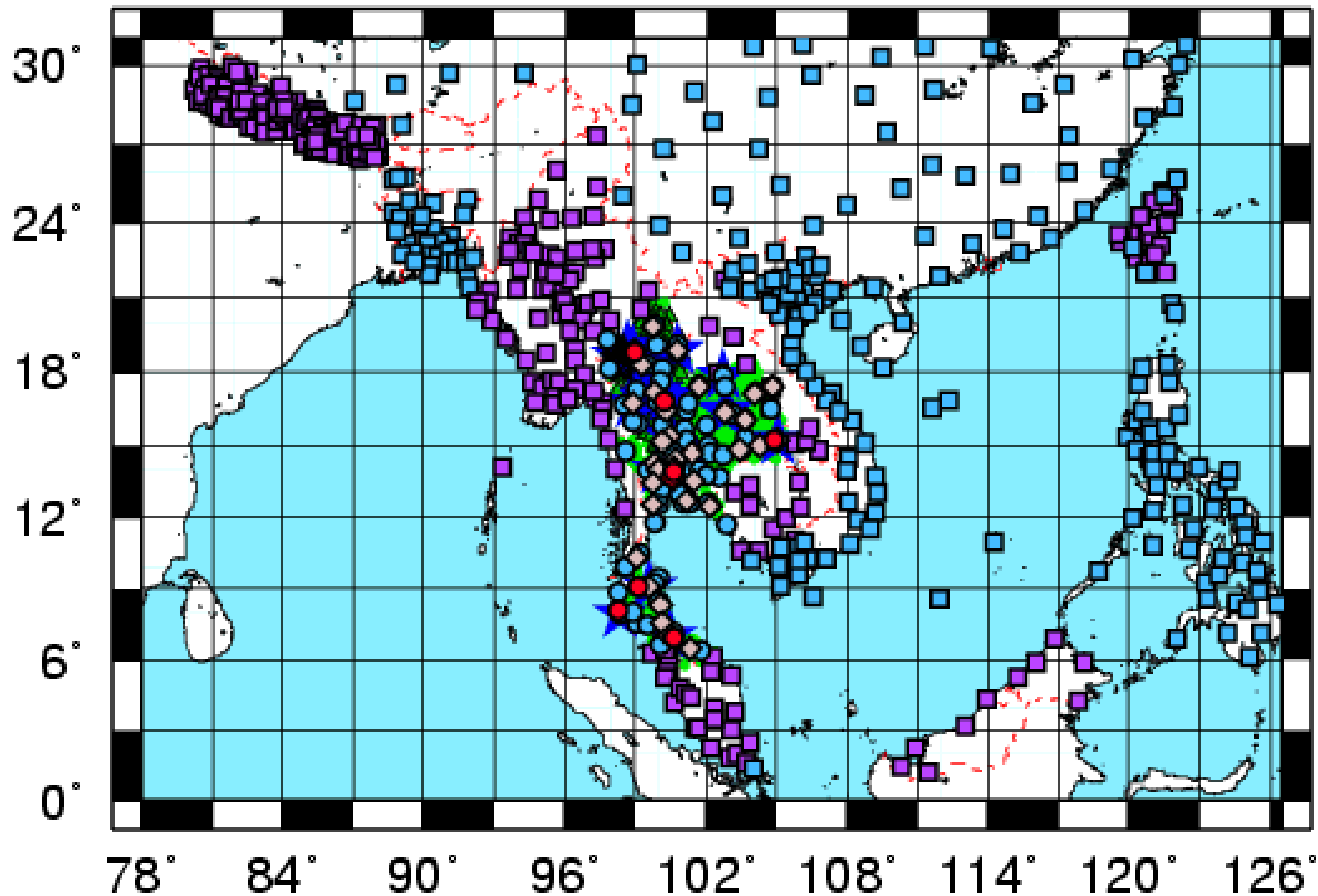


Indochina has been a data sparse region in monsoon Asia

STATIONS AVAILABLE FOR DAILY DATA



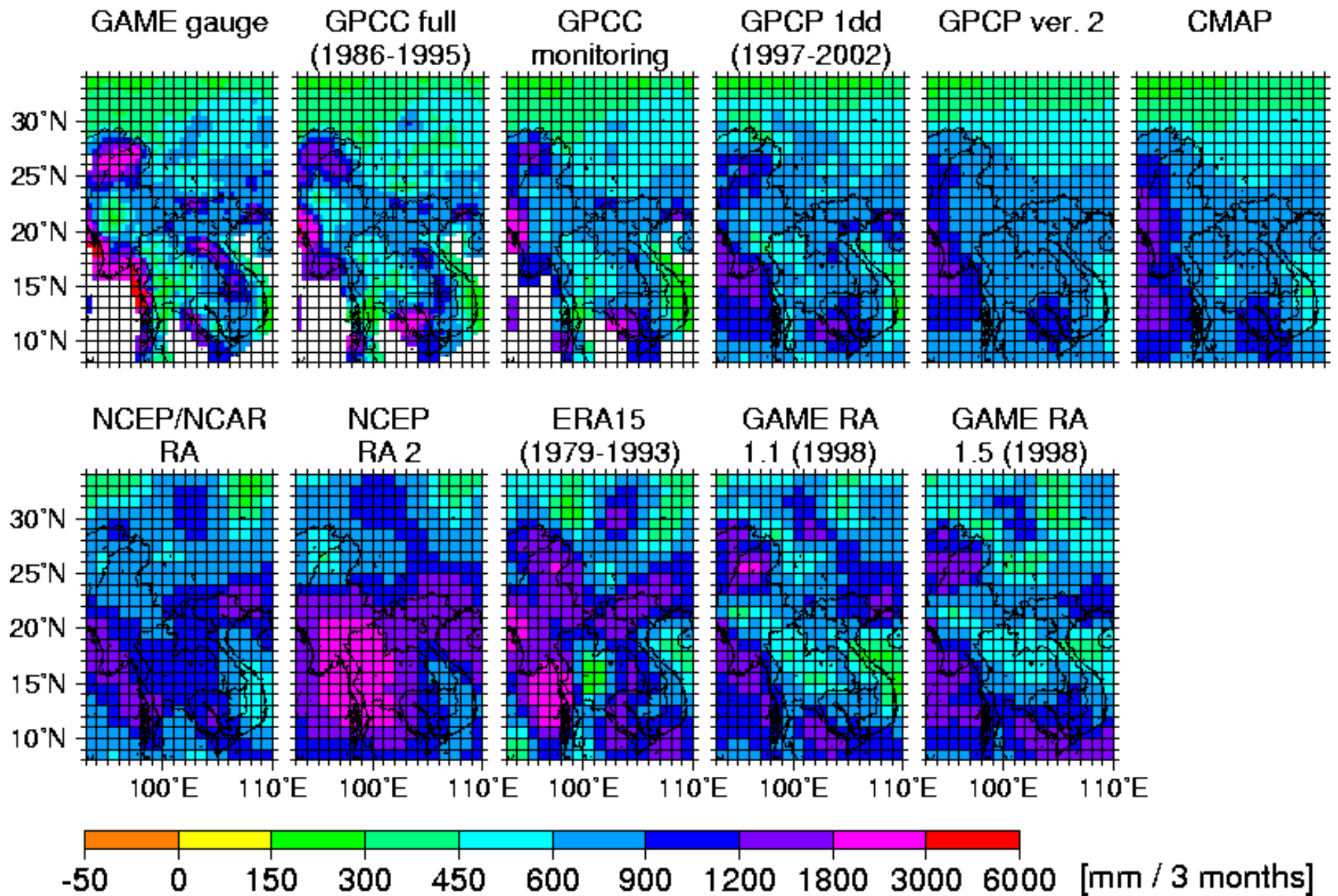
We have collected quite good data for Indochina
Routine Obs. Stations in Ver. 2



<http://hydro.iis.u-tokyo.ac.jp/GAME-T/GAIN-T/index.html>

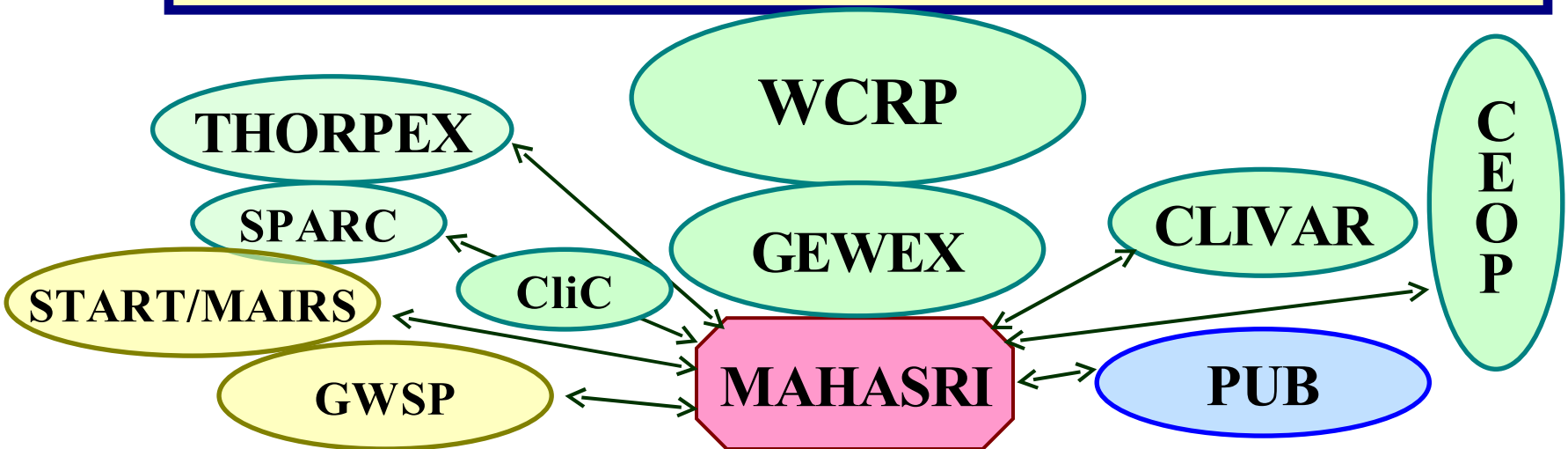
<http://gain-hub.mri-jma.go.jp>

Precipitation, June-July-August (1991-2000 average)



(Masuda, K. 2004)


Structure of MAHASRI



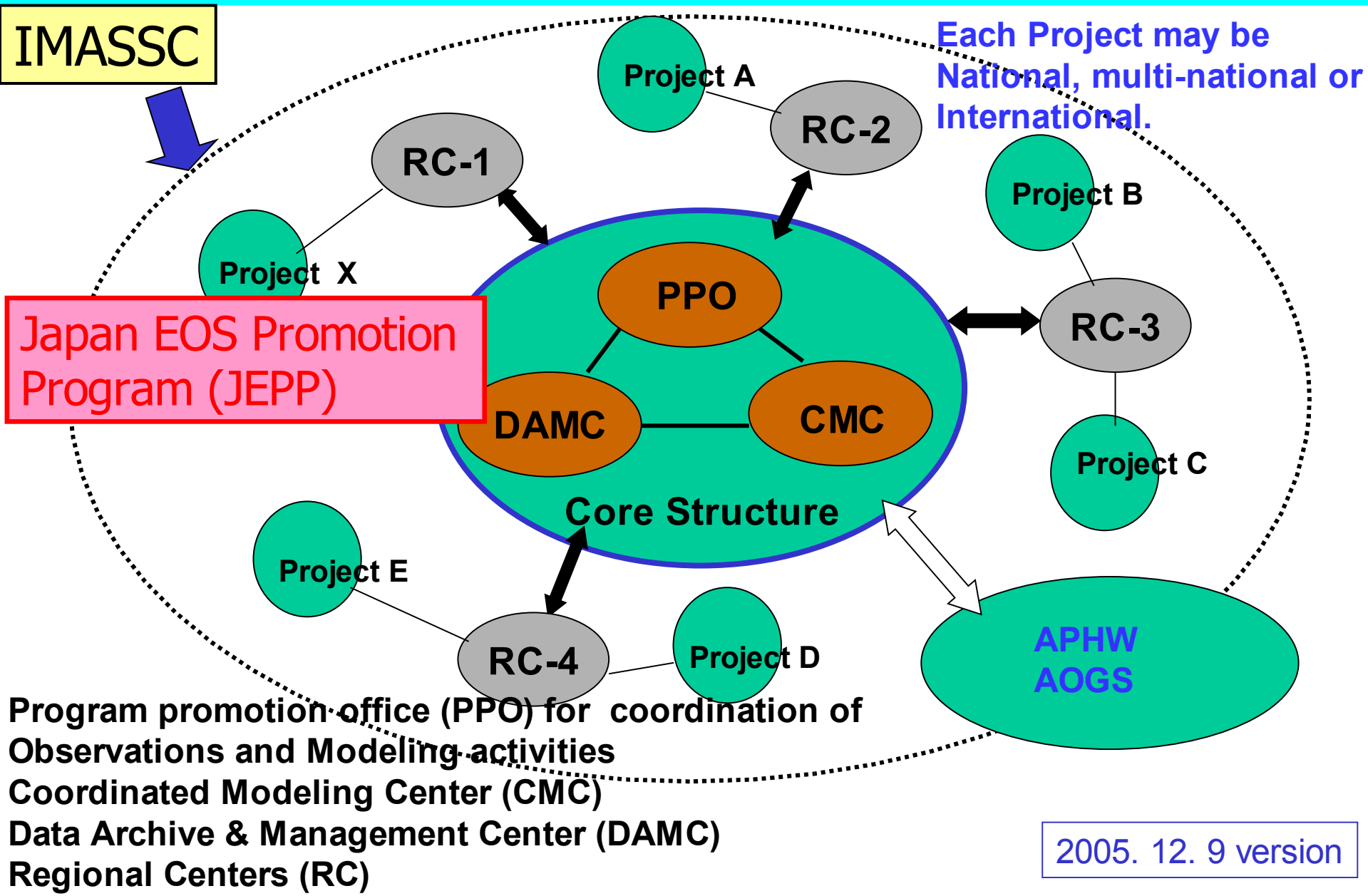
International MAHASRI Science Steering Committee (IMASSC)



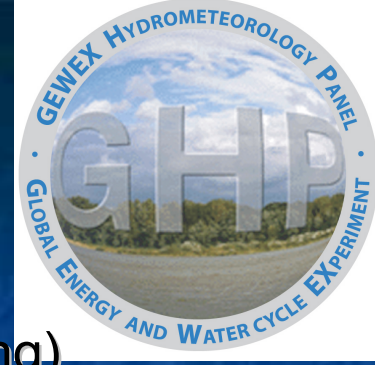
National Committee for MAHASRI



Structure of (MAHASRI)



CSE Requirements (1)



- Technical Requirements, P, I, F (Planned, Initiating, Functioning)
- F (i) Co-operation of an NWP centre...
Y (JMA (Japan), CMA (China), APCC (Korea), NCMWF (India?)....)
 - F (ii) Development of suitable atmospheric-hydrological models...
Y (U. Tokyo, Kyoto U., Yamanashi U. (Japan), IAP, Tsinghua U. (China), NHMS, Hanoi U. (Vietnam)....)
 - I-F (iii) Collection and management of hydrometeorological data sets...
Y (JAMSTEC/IOCGC, (Japan), APCC (Korea)...) Y (Some restriction for some SE Asian countries' data)
 - F (iv) Commitment to the international exchange of scientific data...
Y (Some restriction for some SE Asian countries' data)
 - I-F (v) Interactions with water resource agencies or related groups...
Y (RID, Kasetsart U. (Thailand), NHMS (Vietnam), BWDB, BUET (Bangladesh), IMH (Mongolia).....)
 - I-F (vi) Contributions to the evaluation of GEWEX global data products...
Y (In-situ rainfall/discharge data)
 - F (vii) Contributions to CEOP and transferability data bases...
Y (CAMP sites will be kept and enhanced)

CSE Requirements (2)



Scientific Requirements B, Pr, C (Beginning, Progressing, Completed)

Pr (i) Simulation of the diurnal, seasonal, annual and interannual cycles.

Y (Kyoto U. Tsukuba U., MRI, JAMSTEC/FRCGC/IORGC (Japan), IAP, CMA, Hongkong City U. (China), IITM (India?).....)

Pr (ii) Closure of water and energy budgets.

Y (JAMSTEC/FRCGC/IORGC, IAP...)

Pr (iii) Understanding climate system variability and critical feedbacks.

Y (Nagoya U., MRI, JAMSTEC/FRCGC/IORGC, IAP....)

Pr (iv) Improved prediction of water-related climate parameters.

Y (JMA, CMA, IMD....)

Pr (v) Transferability of techniques and models to other regions.

Y (U, Tokyo, Kyoto U., JAMSTEC/FRCGC (Japan)....)

Long-term Time Schedule

- October, 2006-March, 2010: Research phase I (2006-2007: Build-up new observation systems)
- 2008(-2009): IOP-year (AMY: Asian Monsoon Year)
- 2011-2014: Research phase II
- 2015: Concluding phase



Program on October 19

- **International collaborations (Chair: Johnny Chan)**
CLIVAR (Bin Wang), ESSP (Fu Congbin), EAMEX (T.C. Chen)
- **Collaboration in Northeast and East Asia (Chair: Jun Asanuma)**
Mongolia (Azzaya Dolgorsuren), China (Li Jianping), Korea (Chi-Yung Tam)
- **Discussions on East Asian monsoon issues (Chair: Fu Congbin)**
- **Group Photo**
- **Collaboration in Southeast Asia (Chair: Somchai Baimoung)**
Vietnam (Nguyen Thi Tan Thanh), Thailand (Hansa Vathananukij),
Malaysia (Moten Subramaniam), Indonesia (Fadli Syamsudin)
- **Discussions on Southeast Asian monsoon issues**
- **Collaboration in South Asia (Chair: Sardar Mohammad Shah-Newaz)**
Nepal (Madan L. Shrestha), India (B.N. Goswami), Bangladesh (Nazrul Islam)
- **Discussions on South Asian monsoon issues**
- **Discussions on cross-cutting issues, common targets (Chair: Taikan Oki)**

Program on October 20

- **Concept and structure of the intensive observation (Chair: Taiichi Hayashi)**
Jun Matsumoto, Li Jianping, T.C. Chen, B.N. Goswami, Manabu Yamanaka,
Bin Wang
- **Target for meteorological and hydrological modeling (Chair: Shinjiro Kanae)** Chi-Yung Tam, Takehiko Satomura, Johnny Chan, Kenji Tanaka, Hansa Vathananukij, Sardar Mohammad Shah-Newaz
- **Data management and policy (Chair: Atsushi Higuchi)**
Kooiti Masuda
Lunch
- **Discussions on international collaborations and future schedule (Chair: Jun Matsumoto)**



**I expect active discussions on
MAHASRI during two days**

Thank you!

