

Towards more active sharing of hydro-climatic information in Asia

Kooiti MASUDA

Frontier Research Center for Global Change

Japan Agency for Marine-Earth Science and TEChnology

3173-25 Showa, Kanazawa-ku, Yokohama 236-0001, Japan

<http://www.jamstec.go.jp/frcgc/research/p2/masuda/>

International MAHASRI Science Steering Committee meeting
Bangkok, Thailand, 20 October 2006

- (1) Basic idea
- (2) Proposed structure of data management in MAHASRI
- (3) A "data integration" project just starting
- (4) Example of under-representation of Asia in global data (river discharge)
 - Contributed by Naota HANASAKI (NIES, Japan)
- (5) An attempt of synthesis of GAME data (precipitation climatology)
- (6) Examples of data quality issues found in the course of (5)

(1) Basic idea

- Combination of data from various sources is often necessary.
- Environmental data are (or should be) "public goods".
 - They should be exchanged freely without restriction.
 - Matter of human survival ... IMO(1873), "Essential" data of WMO 1995
 - Academic tradition ... IGY(1957-58), GARP(1970s), WCRP etc.
 - Costs must somehow be accounted for.
 - Probably not-so-poor users should pay part of the cost.
 - In practice, some data may be restricted. ("Additional" data of WMO 1995)
 - Some are made public, but "for non-commercial use only".
 - Some are shared by science program members (as "club goods").
- Data quality is important.
- Feedback between users and producers is important for data quality.
 - Data problems are often discovered by users.
 - Correction of data problems are usually possible only by the producers.
- Documentation of data (metadata) is important.
 - Users may not have the same background knowledge as producers do.
- We learn from sharing experience (incl. experience of failure).
- Persons enthusiastic for sharing of data/knowledge are important.

(2) Proposed structure of data management in MAHASRI

- Distributed Active Archive Center(s) JAMSTEC, APCC, MRI(JMA), UT ...
 - MAHASRI participants-(data)→ DAAC-(data collection)→global public
 - MAHASRI participants→DAAC→MAHASRI participants [restricted case]
 - MAHASRI collection + public data →DAAC-(data+support)→Asian users
 - Quality check, standardization, documentation, portal to knowledge
- MAHASRI Data Management "Policy Board" / "Working Group"
 - Representing institutions (data providers, DAACs, major data users)
 - PB: persons making (proposals for) decisions of institutions
 - WG: persons actually handles data and detailed comments
- Data "Fan Club" ... Voluntary association of individuals
 - To exchange information about data, techniques, ideas of application
 - To promote the idea of sharing data and to attract support to it
- MAHASRI Data Management "Core Team"
 - Coordination between DAACs, DMPB+DMWG, DFC
 - Management of digital bulletin boards for DMPB+DMWG and DFC

(3) A "data integration" project just starting ... support or burden?

- Japanese contribution to Global Earth Observation System of Systems
 - Observation: Japan EOS Promotion Plan, FY 2005 - 2007 or 2008
 - Data: "Data integration and analysis system" project, FY 2006-2010
 - Modeling and data assimilation: FY 2007-2011? (in prep.)

- "Data integration and analysis system" project (not yet "data center")
 - National (MEXT) contract awarded to University of Tokyo (T. Koike)
 - Development of technology for large archive (M. Kitsuregawa, IIS/UT)
 - Standardiation of metadata (R. Shibasaki, CSIS/UT)
 - Demonstration: Contribution to science, Contribution to social benefit
 - Transition to sustainable data management at the next phase (2011-)

- JAMSTEC subcontract to data project in science of hydrological cycle
 - We will have a few experts to partly work for MAHASRI data
 - Land-atmosphere interaction in Eurasian cold region (Mongolia included)
 - Hydrological cycle & predictability in Monsoon Asia (see next page)
 - Routes of water vapor transport and sources of precipitation

(3) Investigating the hydrological cycle in Monsoon Asia

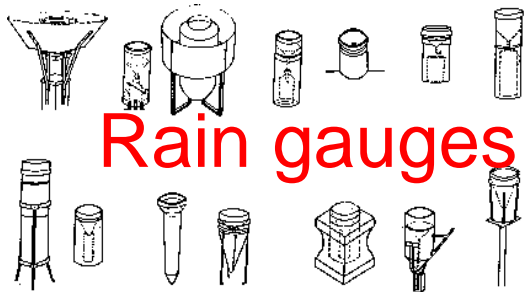
Part of Japanese MEXT project “ Data Integration & Analysis System”

Intra-seasonal variability

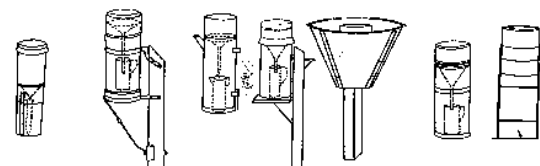
Knowledge on global-local connections

Global data sets

Radars

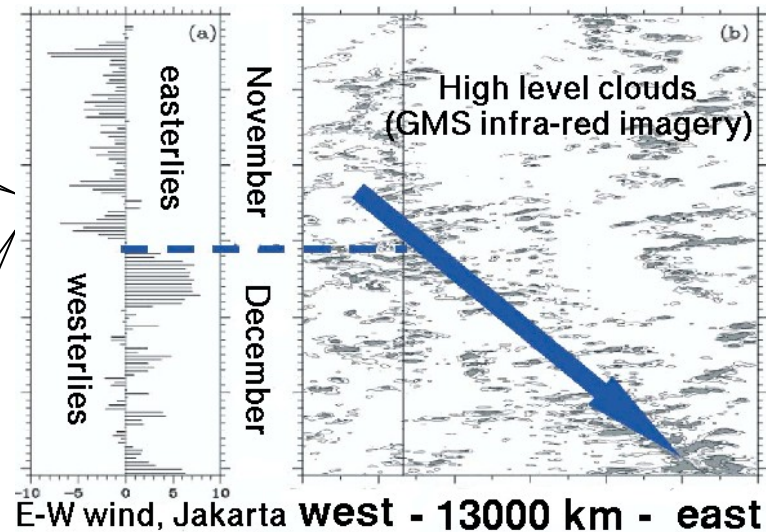


Rain gauges



Distributed
quantitative
precipitation
data sets
(for tropics)

cf.
Radar-AMeDAS composite data
(Japan Meteorological Agency)



Drought warning

Flood warning

(4) Example of under-representation of Asia in global data (river discharge)

Distribution of station data of river discharge from Global Runoff Data Centre

Naota HANASAKI (National Institute of Environmental Studies, Tsukuba, Japan)

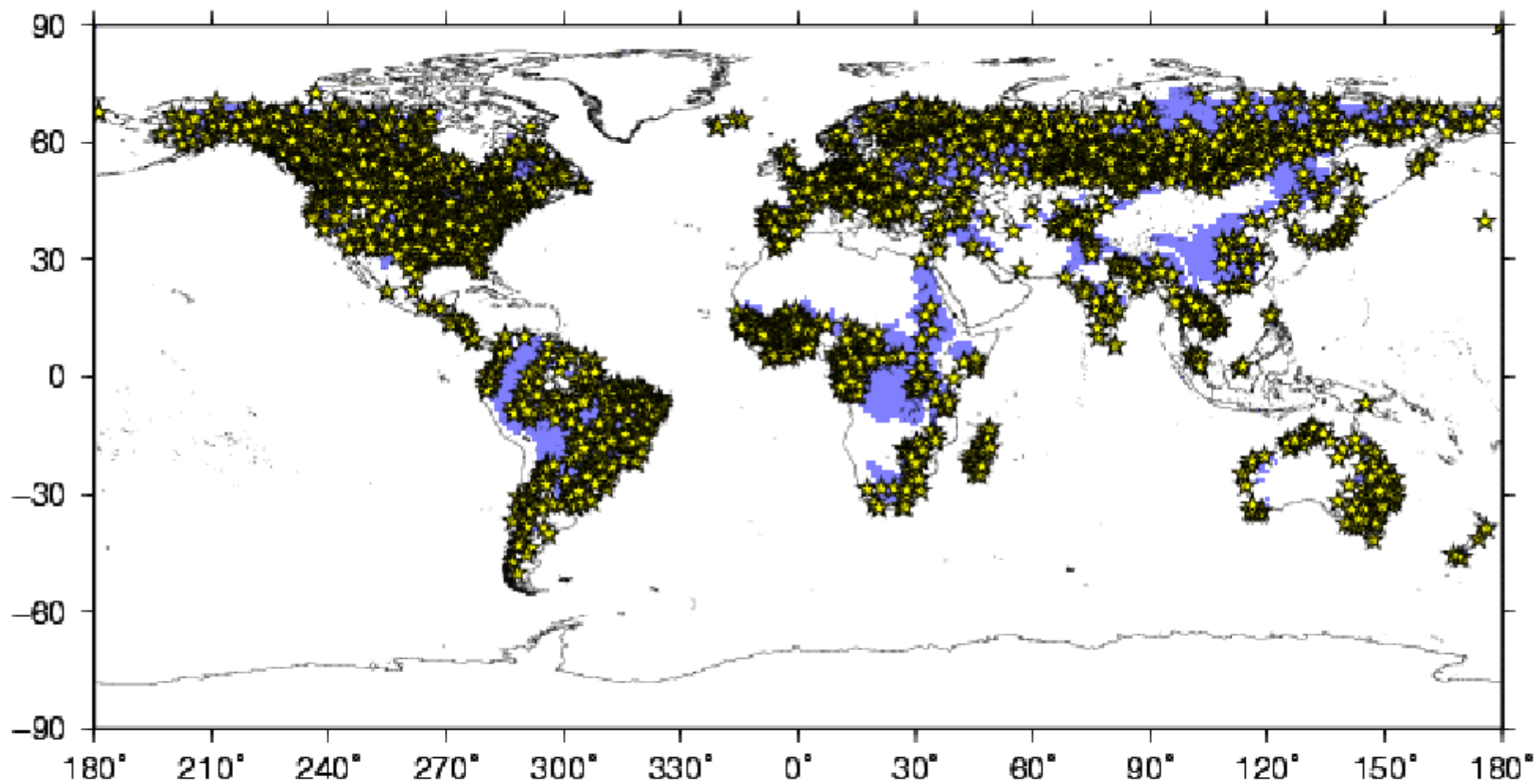
Motivation

- Needs of verification data for global-scale modeling studies
- esp. The 2nd Global Soil Wetness Project (GSWP2) 1986-1995
- Collab. with Yuji MASUTOMI (NIES) "Global Drainage Basin Database"

Previous studies ... number of stations, criteria of selection

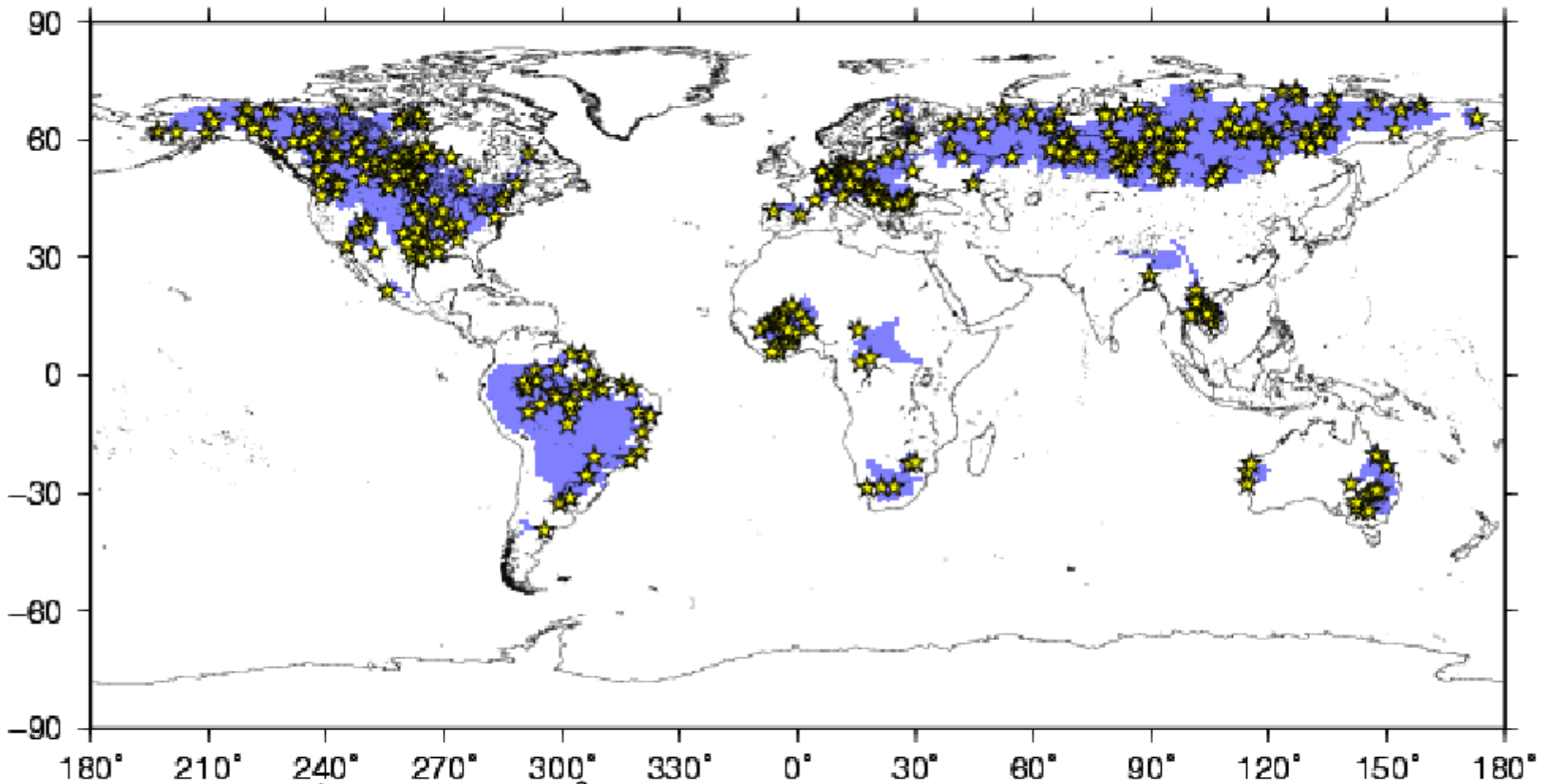
- Fekete et al. (2002): 663
 - area $\geq 10000 \text{ km}^2$
 - data availability ≥ 12 years
- Doell et al. (2003): 724
 - area $\geq 9000 \text{ km}^2$
 - area difference $\geq 20000 \text{ km}^2$ if multiple stations used
- Hirabayashi (2006): 723
 - area $\geq 10000 \text{ km}^2$
 - availability of daily data ≥ 30 years in 1941-1990

AREA_71508454_km²



All stations
Count: 3035

AREA_41733673_km²



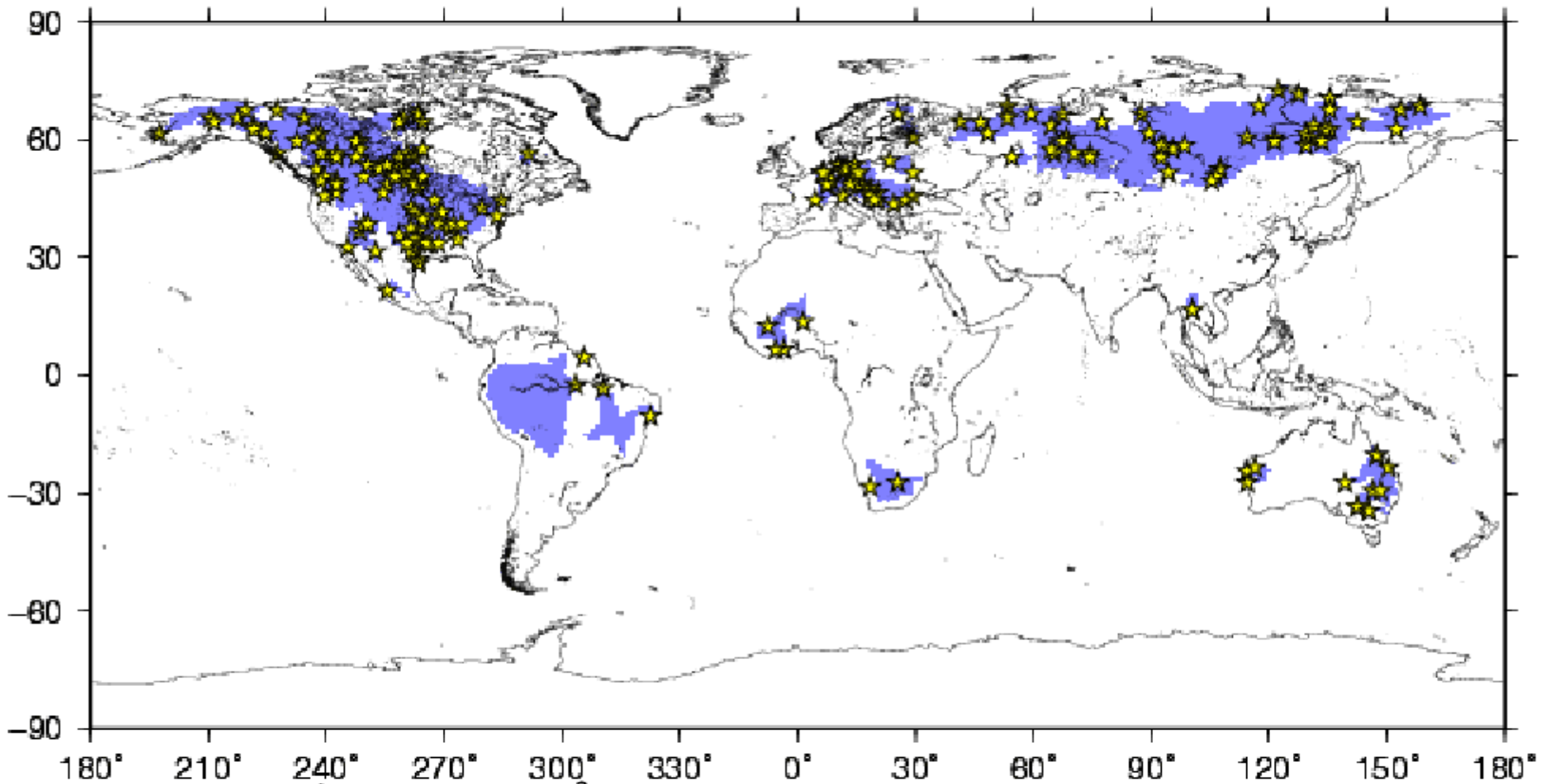
Drainage area ≥ 50000 km²

More than 50% monthly values available in 1986-1995

Count: 386

Total drainage area: 41.7×10^6 km²

AREA_30523481_km²



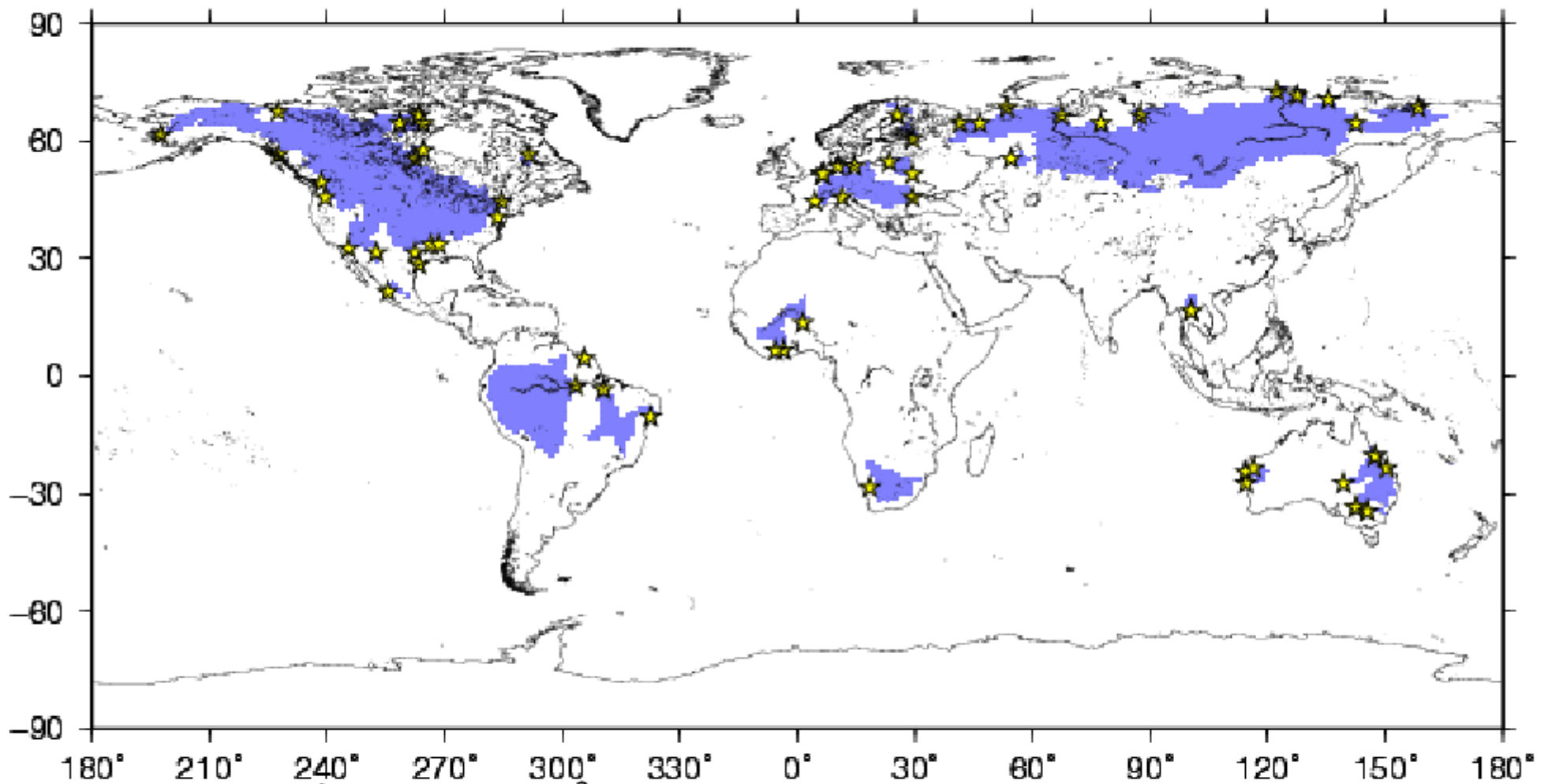
Drainage area ≥ 50000 km²

All monthly values available in 1986-1995

Count: 205

Total drainage area: 30.5×10^6 km²

AREA_30523481_km²



Drainage area ≥ 50000 km²

All monthly values available in 1986-1995

Lowest stations in each drainage area only

Count: 68

Total drainage area: 30.5×10^6 km²

(5) Precipitation climatology of continental Southeast Asia

Kooiti MASUDA (Frontier Research Center for Global Change, Japan)

Jun MATSUMOTO (Tokyo Metropolitan University, Japan; also at IORGC)

Yasushi AGATA (University of Tokyo, Japan)

Borjiginte AILIKUN (Institute of Atmospheric Physics, China)

Testuzo YASUNARI (Nagoya University, Japan; also at FRCGC)

Autumn Meeting, Meteorol. Soc. Japan, 8 October 2004, Fukuoka, Japan

[Minor revision 2 December 2004; Summarized 18 August 2006]

Collaborations in research projects

■ GAME (GEWEX Asian Monsoon Experiment)

● GAME-Tropics

- ▶ Routine observations from many nations. Collection ... MATSUMOTO
- ▶ Database ... AGATA; <http://hydro.iis.u-tokyo.ac.jp/GAME-T/GAIN-T/>

■ RR2002 Hydrology and Water Resources in the Mekong River Basin

● Kuniyoshi TAKEUCHI, Yukiko HIRABAYASHI, et al. (Yamanashi Univ.)

- ▶ <http://water.cee.yamanashi.ac.jp/RR2002/>

● Mekong River Commission (Thailand, Laos, Cambodia, Vietnam)

Availability of precipitation station data (Counts in 1 degree grid boxes) July

Station count in 1-degree boxes, July, GAME-gauge and GPCC monitoring product

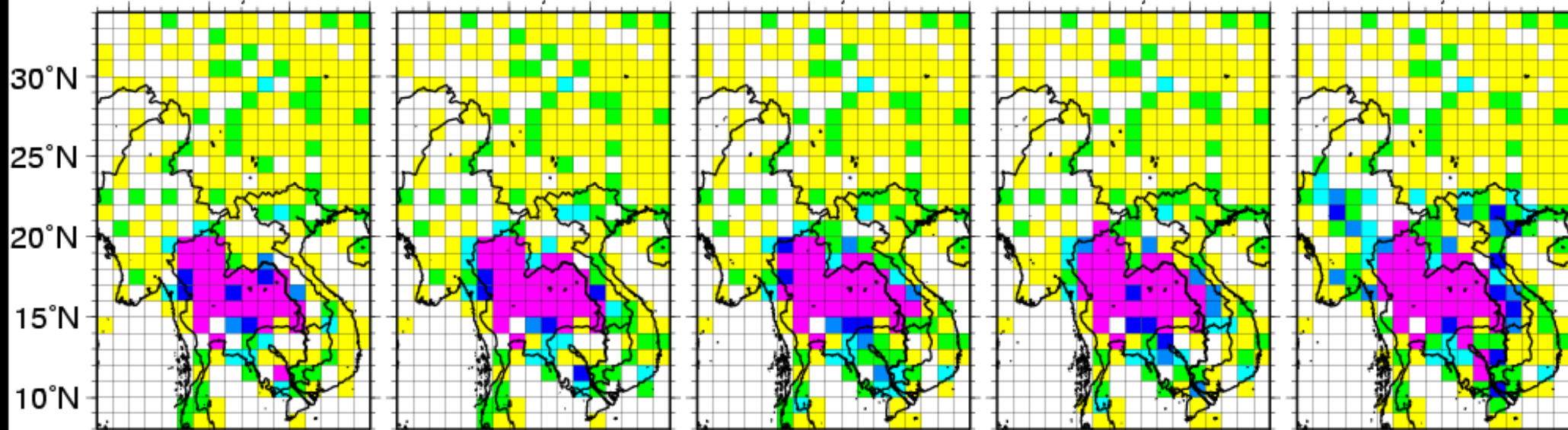
GAME, 1986

GAME, 1989

GAME, 1992

GAME, 1995

GAME, 1998



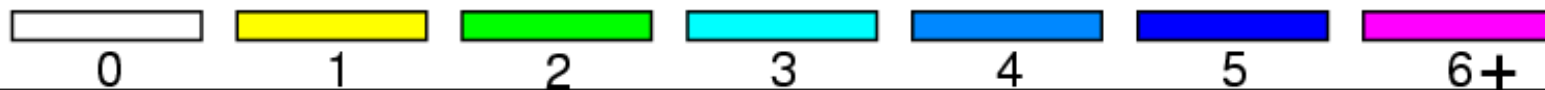
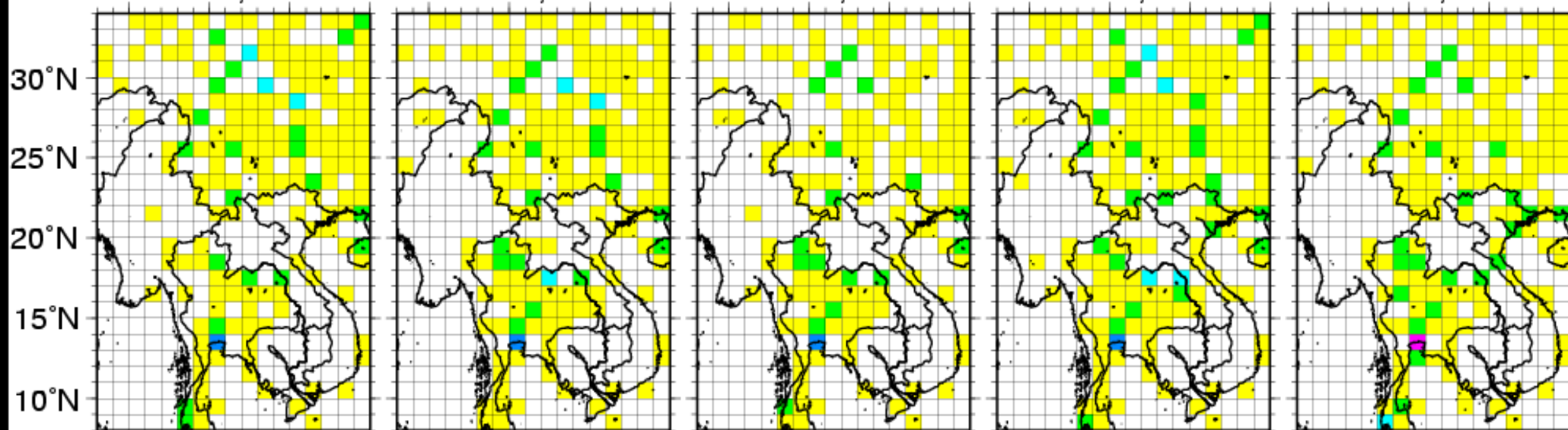
GPCC, 1986

GPCC, 1989

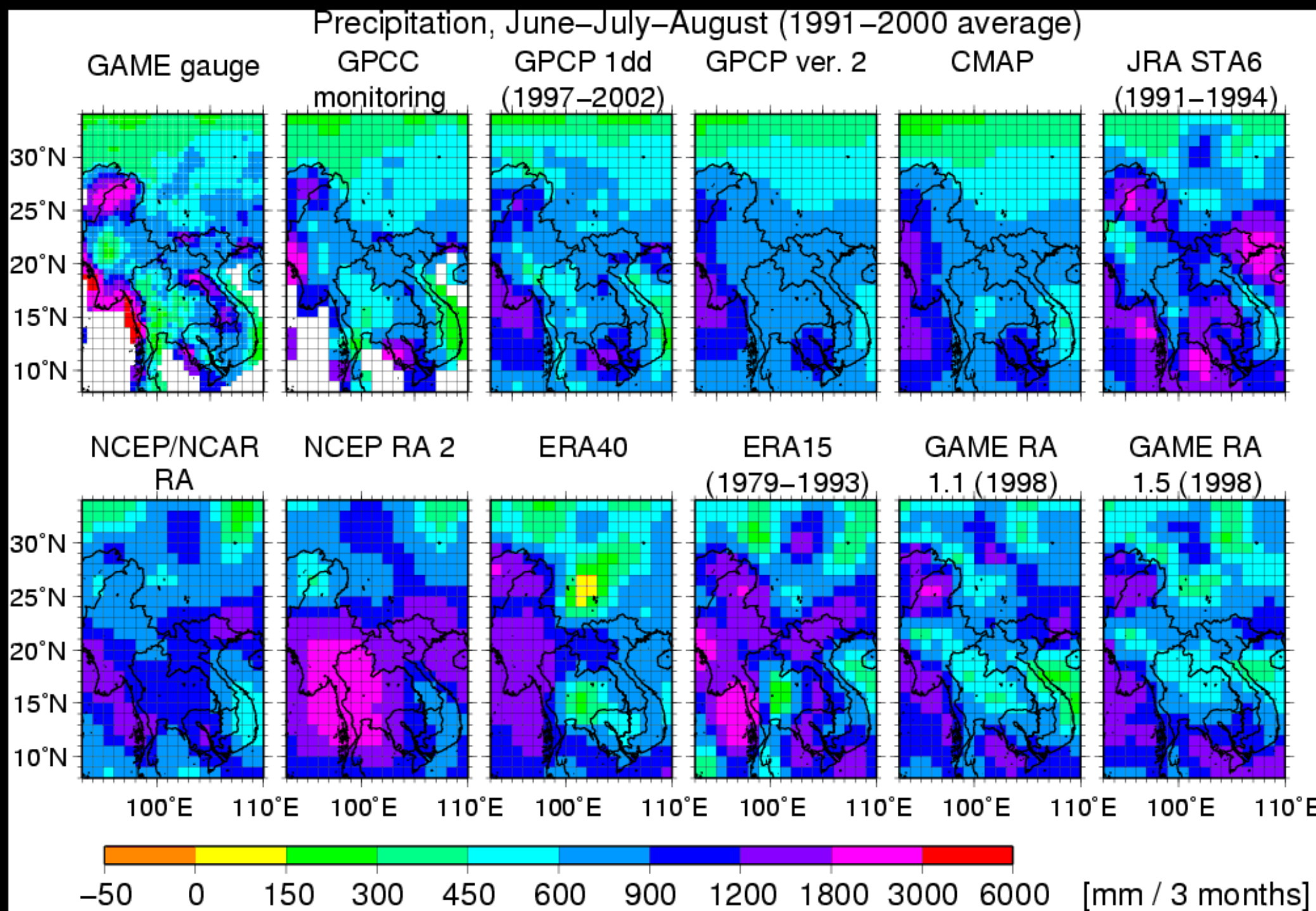
GPCC, 1992

GPCC, 1995

GPCC, 1998



Precipitation: comparison between data sets (obs. and assimil.) JJA 1991-2000



Precipitation: "climatological" (1981-2000) average monthly values

Precipitation (1981 – 2000 average) interpolated from stations (GAME+MRC+national)

January

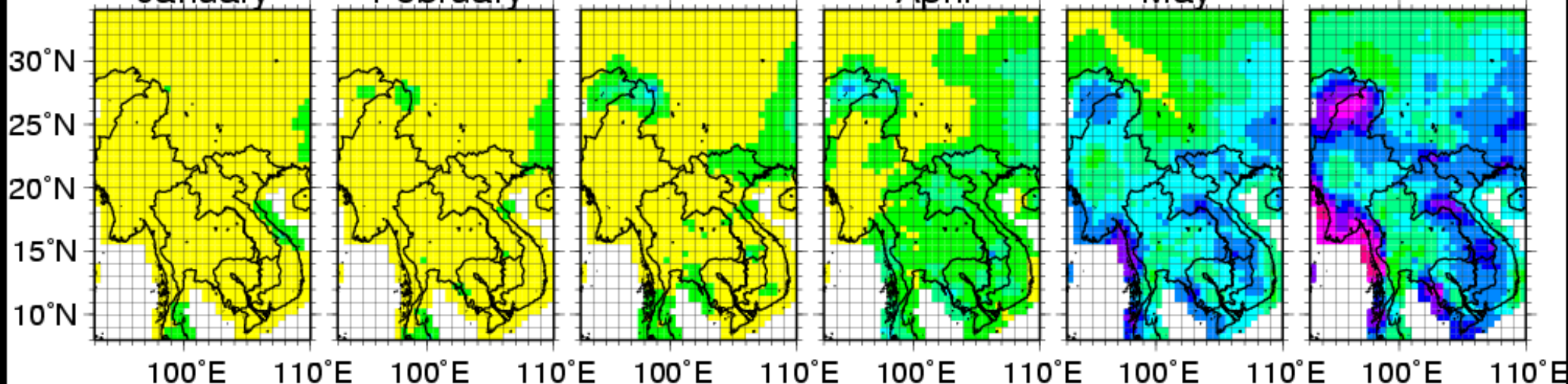
February

March

April

May

June



July

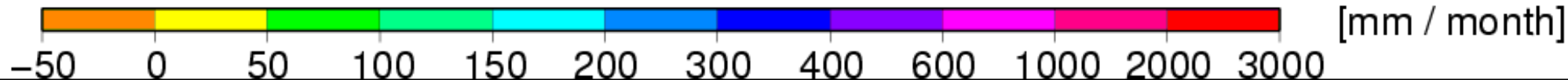
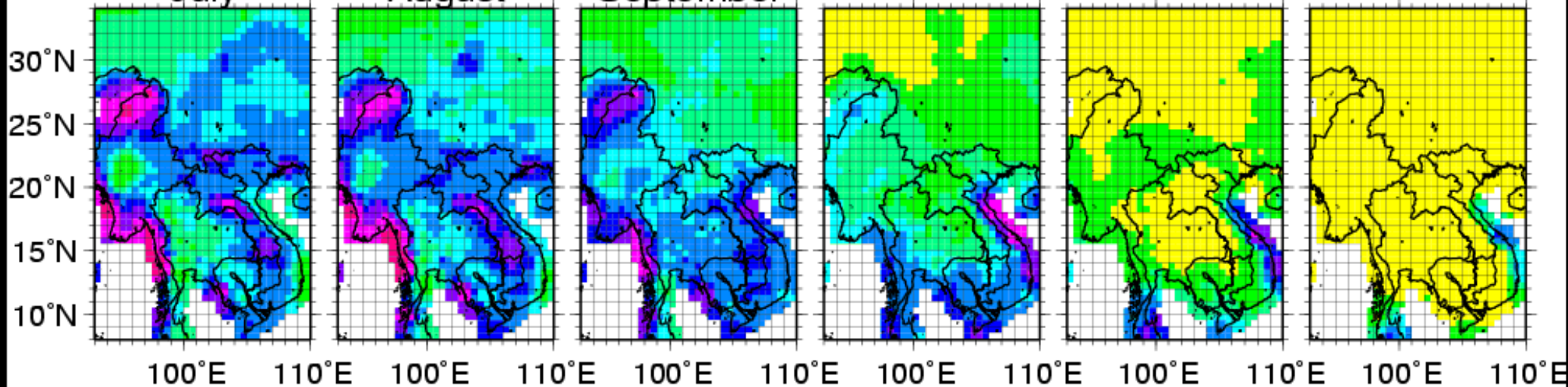
August

September

October

November

December



SW monsoon pattern: mid-May to Aug.; NE monsoon pattern: Oct. to Dec.

Summary of results of water balance relevant to evaluation of precip. data

■ Middle Mekong (between Chiang Saen and Pakse): realistic

● Precipitation

- ▶ As areal average, GPCP etc. agree with station-based analysis.

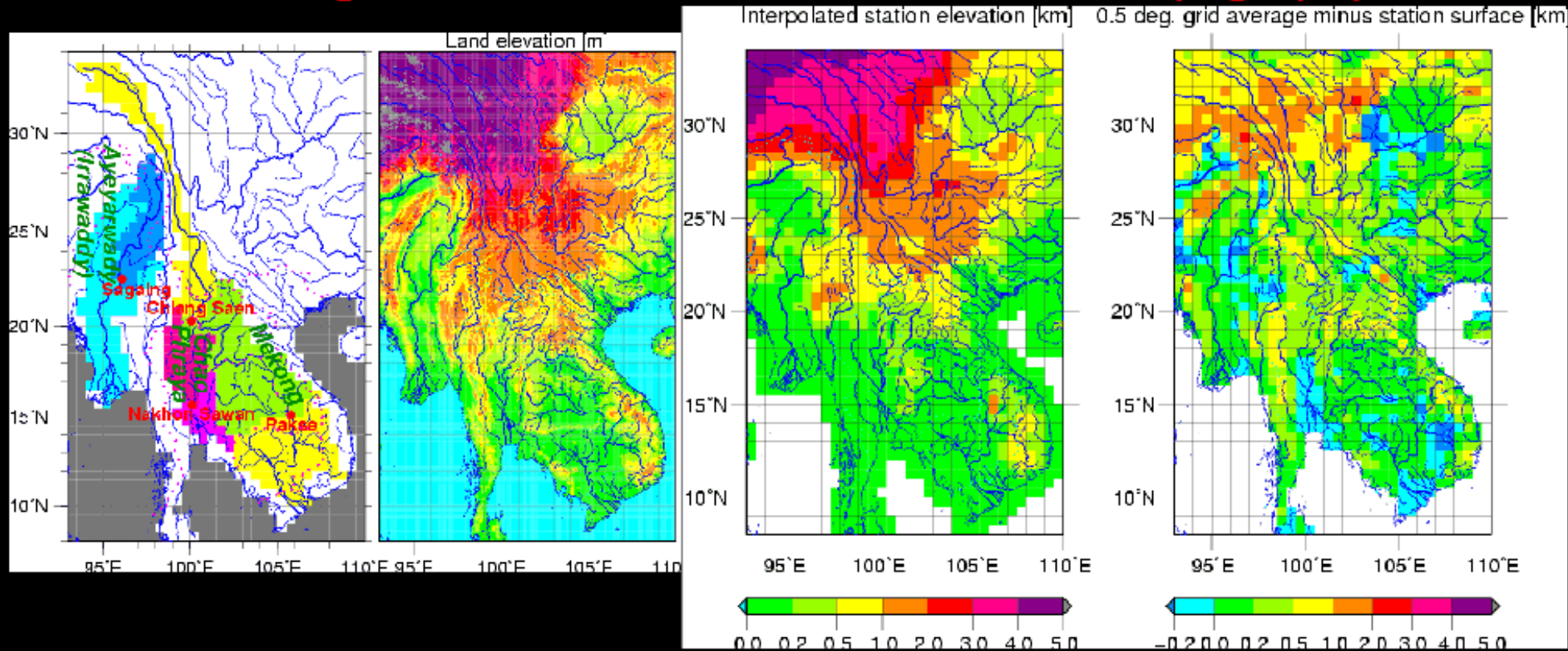
■ Upper Ayeyarwady (Irrawaddy) (upstream of Sagaing): unrealistic

● Precipitation

- ▶ Station-based (1950 mm/yr) > GPCP (1420 mm/yr) etc.

● Still, $P < R$ (2140 mm/yr), implying annual Evaporation < 0.

- ▶ Note: average station elevation lower than actual topography



(6) Examples of data quality issues - case of raingauge data of Indochina

■ Distinction between "value missing", "no precip." and "trace precip."

- Insufficient description in some source
- Monthly sum 0 mm in rainy season

■ Very large (but physically possible) values

- Real heavy rain?
- Mistake? (Decimal column shift? Extra character inserted?)

■ Data at the same station at the same time do not match each other

- Parallel observation?
- Mistake in transcription and/or digitization?

■ Unrealistic seasonal cycle

- Mistake between rows and columns of a table
- Mistake between calendar year and hydrological year

■ Problem of boundary of day (for daily precipitation)

- 00 UTC for Thailand; 12 UTC for China; sometimes undocumented
- Is observation today called "precip. today" or "precip. yesterday"?

■ Problems of identification

- Location (latitude/longitude) wrong or unknown
- Duplicate? (more than one data sets may include the same source)

(2) Proposed structure of data management in MAHASRI

- Distributed Active Archive Center(s) JAMSTEC, APCC, MRI(JMA), UT ...
 - MAHASRI participants-(data)→ DAAC-(data collection)→global public
 - MAHASRI participants→DAAC→MAHASRI participants [restricted case]
 - MAHASRI collection + public data →DAAC-(data+support)→Asian users
 - Quality check, standardization, documentation, portal to knowledge
- MAHASRI Data Management "Policy Board" / "Working Group"
 - Representing institutions (data providers, DAACs, major data users)
 - PB: persons making (proposals for) decisions of institutions
 - WG: persons actually handles data and detailed comments
- Data "Fan Club" ... Voluntary association of individuals
 - To exchange information about data, techniques, ideas of application
 - To promote the idea of sharing data and to attract support to it
- MAHASRI Data Management "Core Team"
 - Coordination between DAACs, DMPB+DMWG, DFC
 - Management of digital bulletin boards for DMPB+DMWG and DFC