Development of a daily grid precipitation analysis dataset over Asia

Akiyo YATAGAI

Research Institute for Humanity and Nature, Kyoto, Japan

Asian Precipitation -- Highly Resolved Observational Data Integration Towards Evaluation of the Water Resources (APHRODITE's Water Resources)

Akiyo Yatagai[1], Akio Kitoh[2], Kenji Kamiguchi[2], Osamu Arakawa[2],
Haruko Kawamoto[1], Tsugihiro Watanabe[1], Jumpei Kubota[1],
Makoto Taniguchi [1], Shinjiro Kanae[3]

1. Research Institute for Humanity and Nature (RIHN), Kyoto, Japan
2. Meteorological Research Institute (MRI), Japan Meteorological Agency (JMA), Tsukuba, Japan
3. Institute for Industrial Science, University of Tokyo, Japan

Background

Regional impact of global warming is estimated by using high-resolution climate models.

- Model validation: High resolution，Accuracy (Quantified)
- Statistical downscaling：Long-term data
- Climate impact on hydrological resources: Grid precipitation data

- Extreme events：High resolution，Accuracy，Long-term data
- Hydrological resources over mountains:
  grid precipitation data＋snow accumulation＋temperature

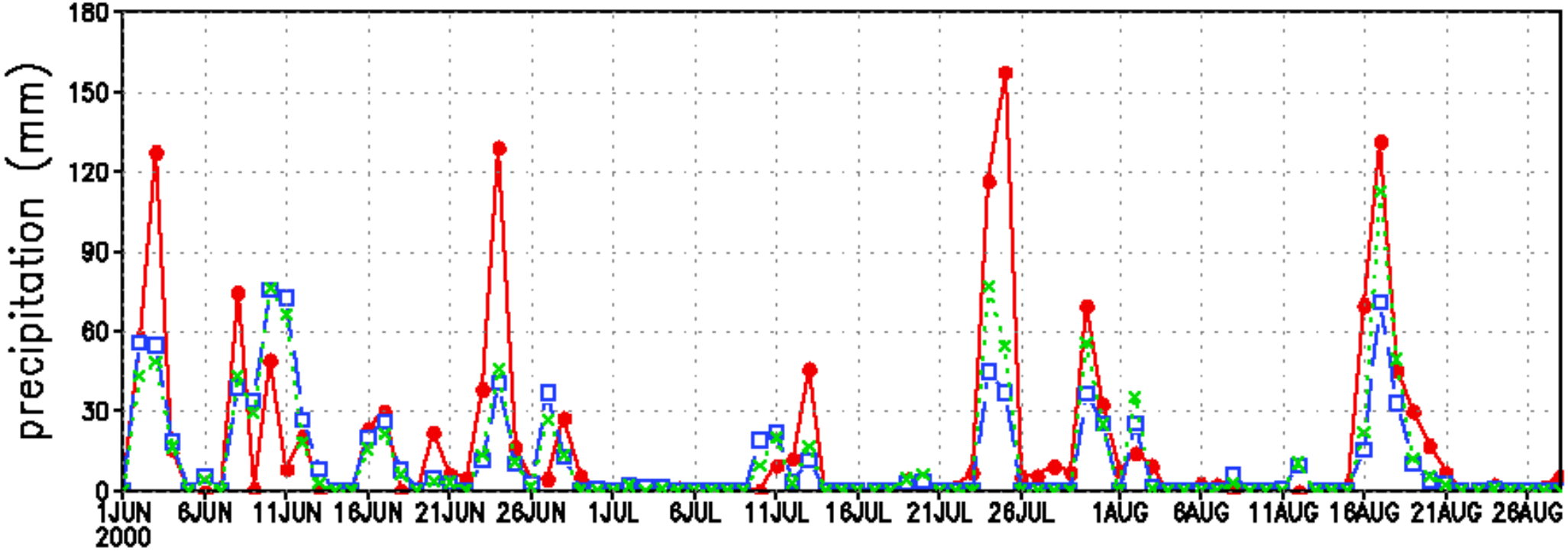
Do we have sufficient data?

Grid precipitation data used for model validation

Data set		Source	Coverage	Time resolution	Horizontal resolution	Period
Legates and Willmott		Rain gauge	Global Land	climatology	0.5 deg	1921-1980
GPCP CMAP		Merged (GTS, IR, MW)	Global	monthly	2.5	1979-
GPCP_pen CMAP_pen		Merged	Global	pentad	2.5	1979-
GPCP1DD		IR	Global	daily	1	1997-
CRU PREC/L		Rain gauge	Global Land	monthly	0.5	1900-1998 1948-2001
TRMM		PR,TMI,VIRS 3B42 (Ver6)	37N-37S 50N-50S	Path 3-hrly	4.3km(PR) 0.25	1997.12- 1998-
CMORPH		MW+IR	60N-60S	30min	0.25	2002-
GSMaP_TMI		TRMM/TMI	40N-40S	Daily	0.25	1998-2005
GSMaP_MVK		MW+IR	60N-60S	hrly	0.1	2005.7
Regional analysis	East Asia	Rain gauge	Regional	daily	0.5 0.05 (clim)	1978-2003.7 (1961-
APHRODITE			Asia		0.5	1978-2004
	India	Rain gauge	Regional	daily	1	1951-2004
Re-analysis	ECMWF JRA NCEP	Atmospheric observation＋4DDA(model)	Global	6-hrly	0.5～2.5	1957-2002 1979- 1948-

Can we use satellite-based daily precipitation data to study extreme events?

Daily Precipitation for June to August, 2000 at Kagoshima (mm/day)

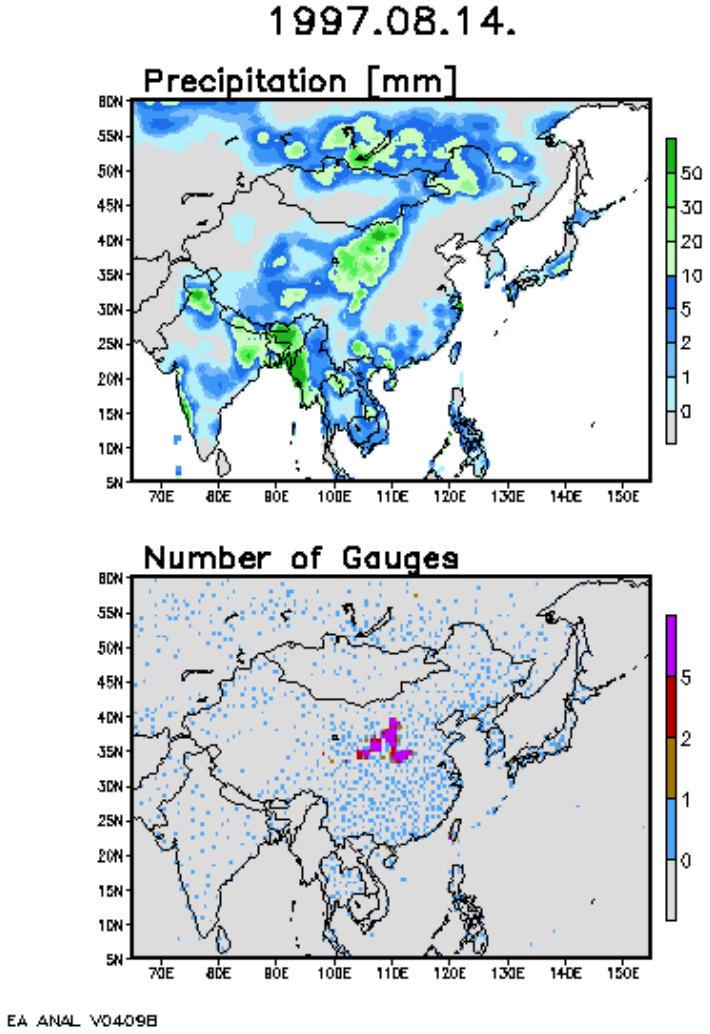


Satellite-based "observation" underestimates heavy precipitation compared to rain-gauge-based observation (Radar-AMeDAS)

● Radar-AMeDAS
□ GPCP-1DD
× TRMM3B42

Satellite-based rainfall estimation is not sufficient to validate extreme precipitation events simulated by high-resolution models

East Asia rain-gauge-based analysis of daily precipitation



Daily grid precipitation data

- Grid size 0.5º

-from 1978 through July, 2003

-Information on “Number of Gauges”

Available from

http://www.chikyu.ac.jp/precip/index.htm

Reference

Xie, P., A. Yatagai, M. Chen, T. Hayasaka, Y. Fukushima, C. Liu and S. Yang (2007) JHM, 8, 607-627.

Strategy to Define Analysis of Daily Precipitation

Step 1: Construct analyzed fields of daily precipitation climatology

Step 2: Compute analyzed fields of the ratio of the daily observation to the daily climatology for the target day

Step 3: Define analysis of daily precipitation by multiplying the daily climatology by the daily ratio.

(Xie et al., 2007)

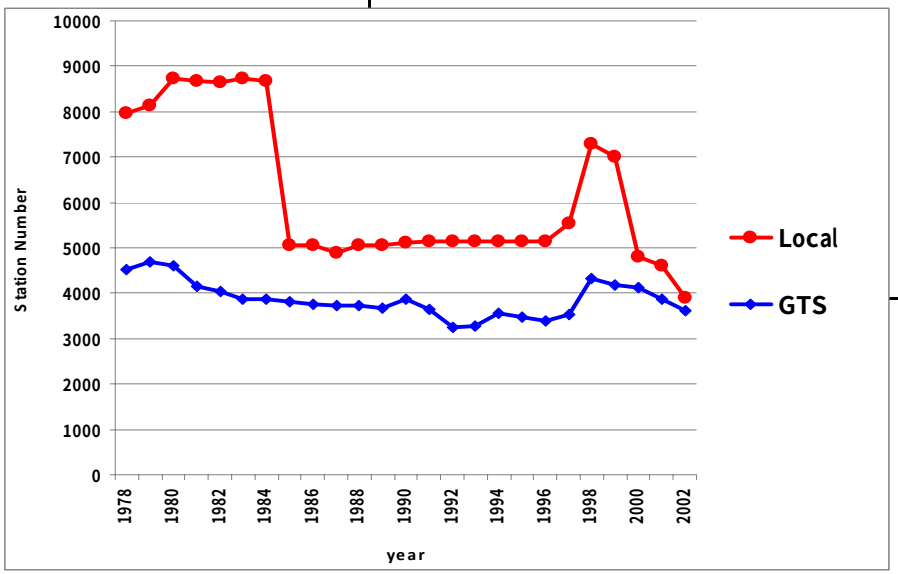
Purpose of this study

Based on the algorithm of Xie et al.(2007):

- We are collecting additional rain-gauge data from across Asia.
- We are holding discussing with potential users.
- We are analyzing daily grid precipitation data across Asia (mainly gauge-based).

Data Collection

Time series

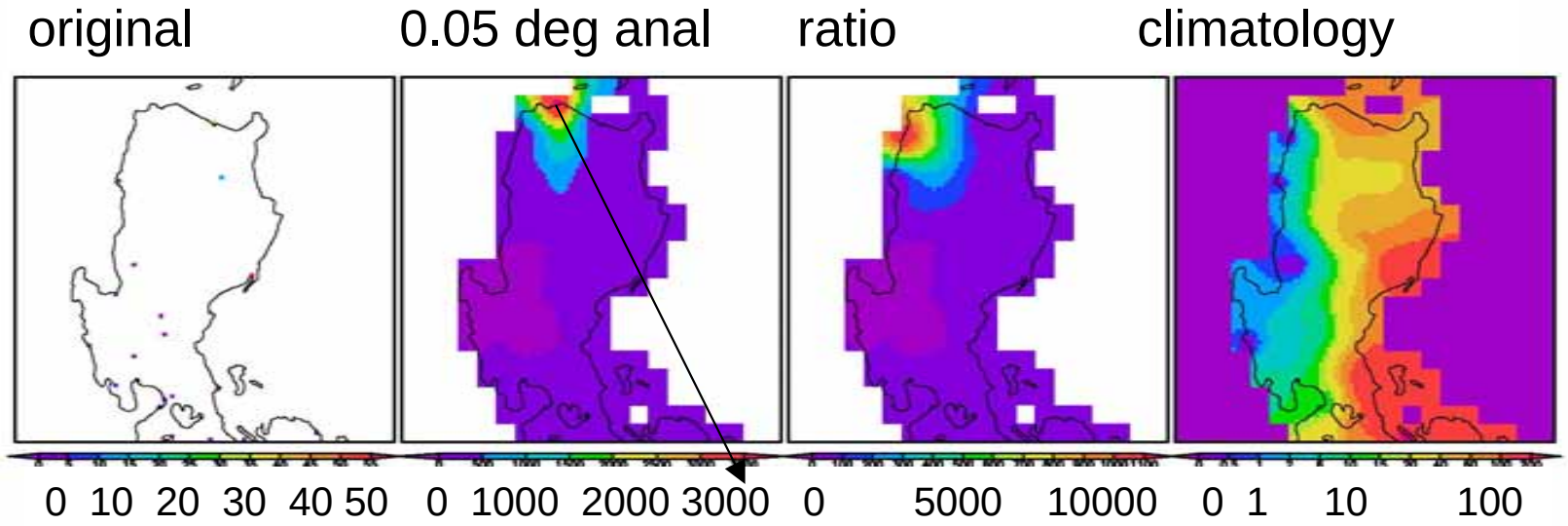


Blue：GTS

Black：Pre-compiled dataset

Red：Individual collection

Small problems in EA V0409



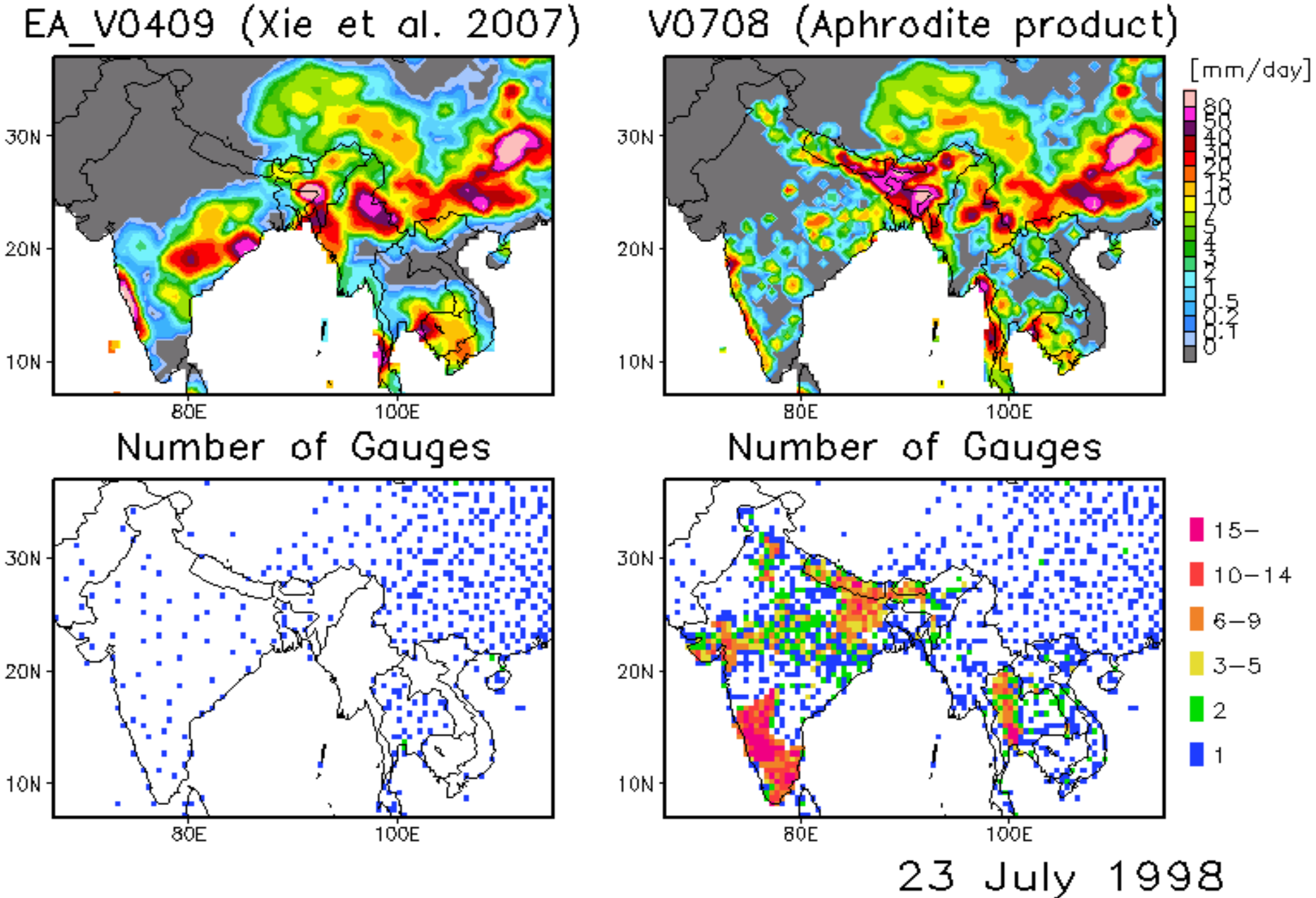
Abnormally large values are appeared over the Philippines and South Asia.

Add Off-line Data

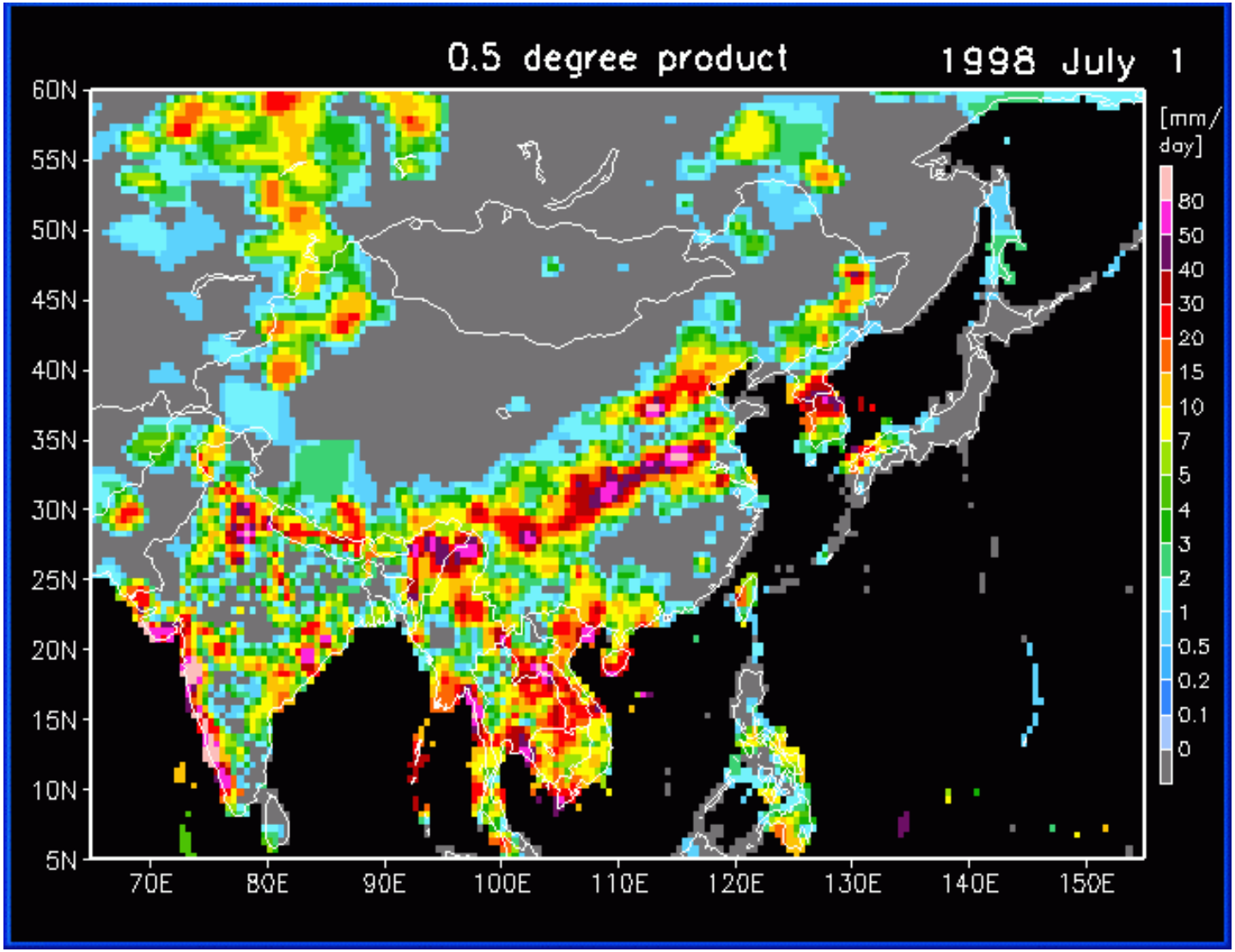
Some suspicious values are observed in the GTS data

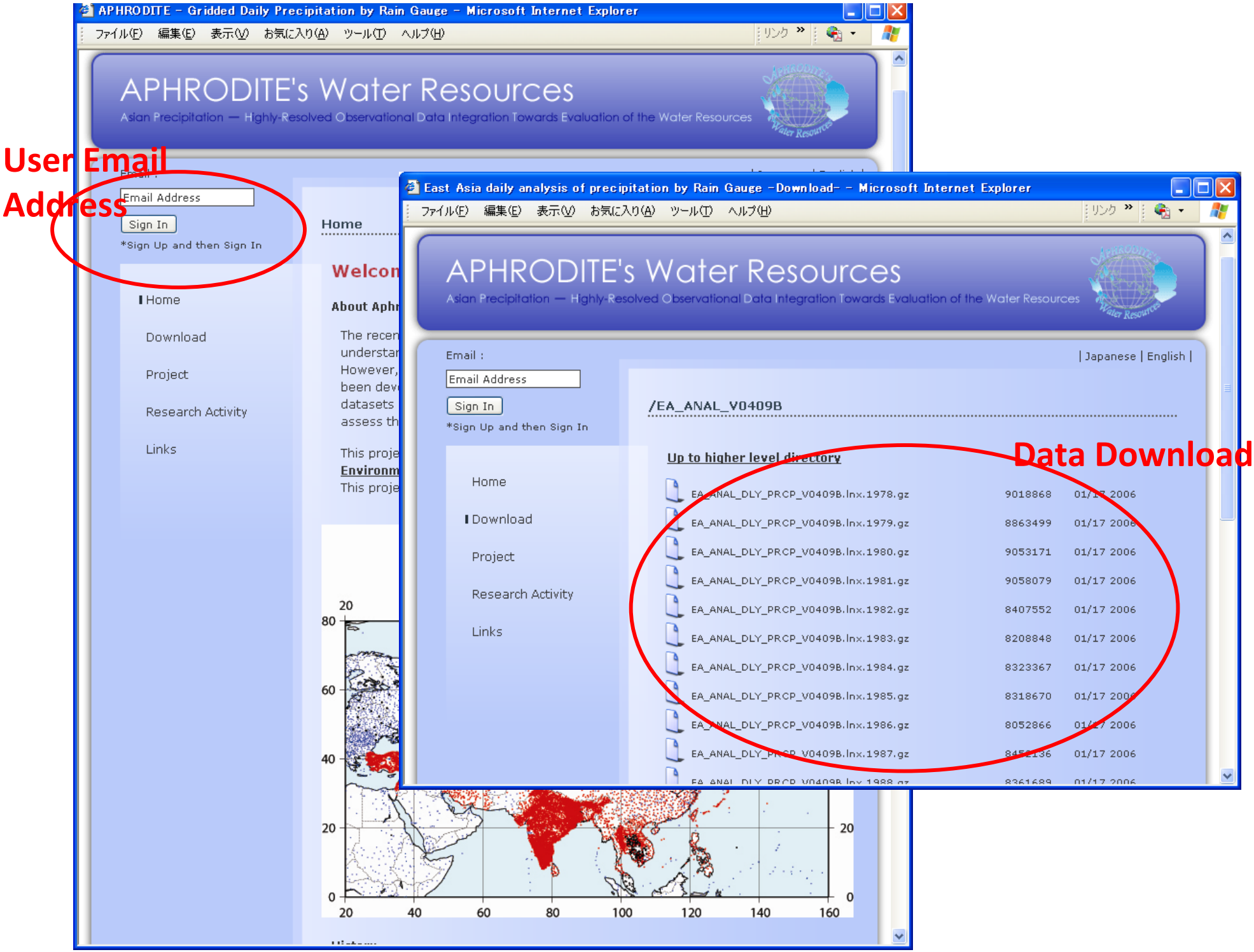
Interpolation problems.

Input more rain gauges



The latest version of daily grid precipitation over the Monsoon Asia (July 1998)




APHRODITE - Gridded Daily Precipitation by Rain Gauge - Microsoft Internet Explorer
APHRODITE's Water Resources
Asian Precipitation — Highly-Resolved Observational Data Integration Towards Evaluation of the Water Resources
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Up to higher level directory
Data Download
EA_ANAL_DLY_PRCP_V0409B.lnx.1978.gz 9018868 01/17 2006
EA_ANAL_DLY_PRCP_V0409B.lnx.1979.gz 8863499 01/17 2006
EA_ANAL_DLY_PRCP_V0409B.lnx.1980.gz 9053171 01/17 2006
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EA_ANAL_DLY_PRCP_V0409B.lnx.1982.gz 8407552 01/17 2006
EA_ANAL_DLY_PRCP_V0409B.lnx.1983.gz 8208848 01/17 2006
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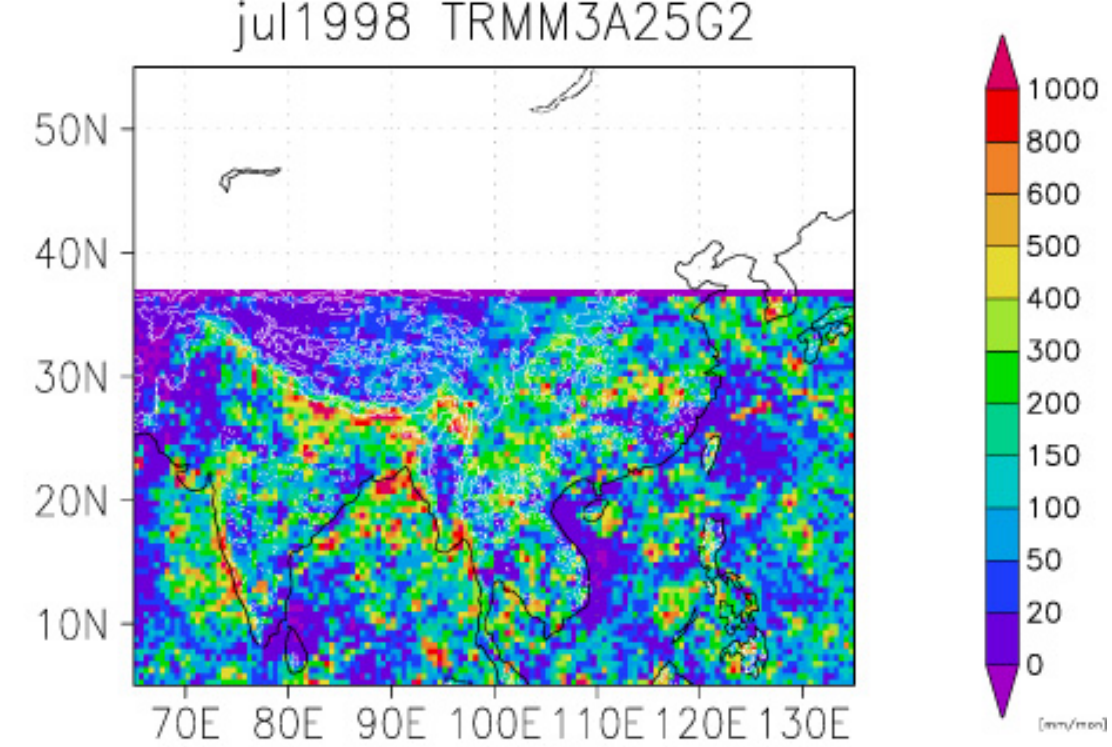
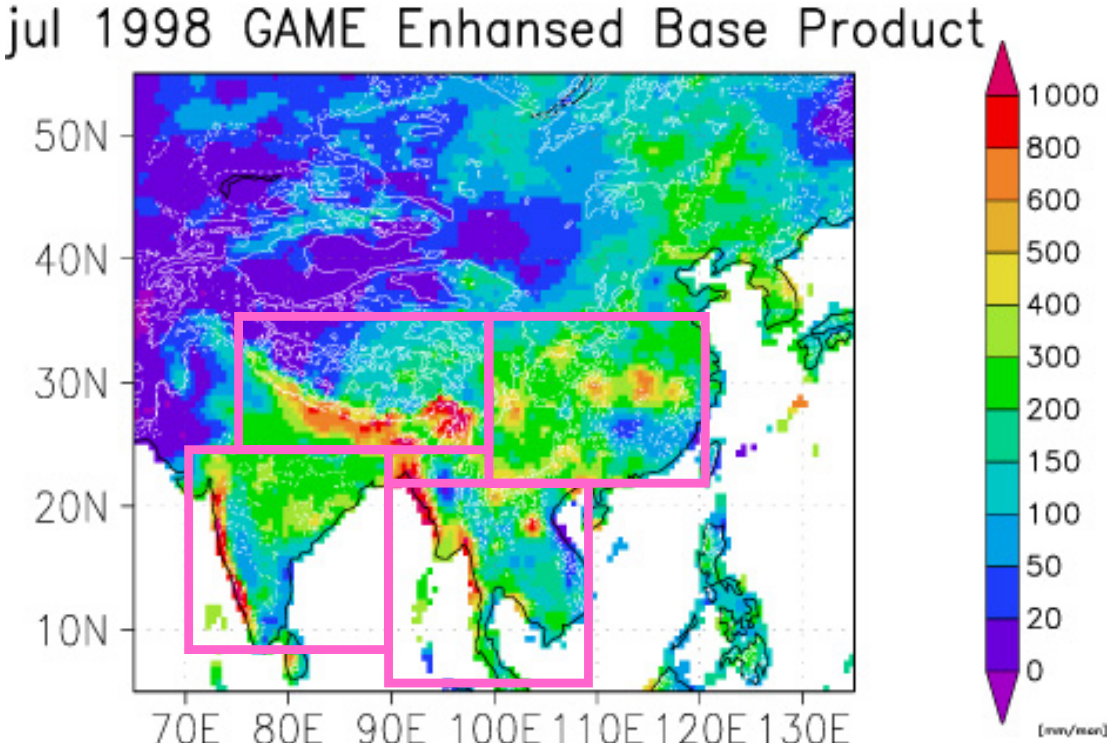
EA_ANAL_DLY_PRCP_V0409B.lnx.1988.gz 8361689 01/17 2006



TRMM Precipitation Radar (PR) Ver.5

Monthly mean rain rate



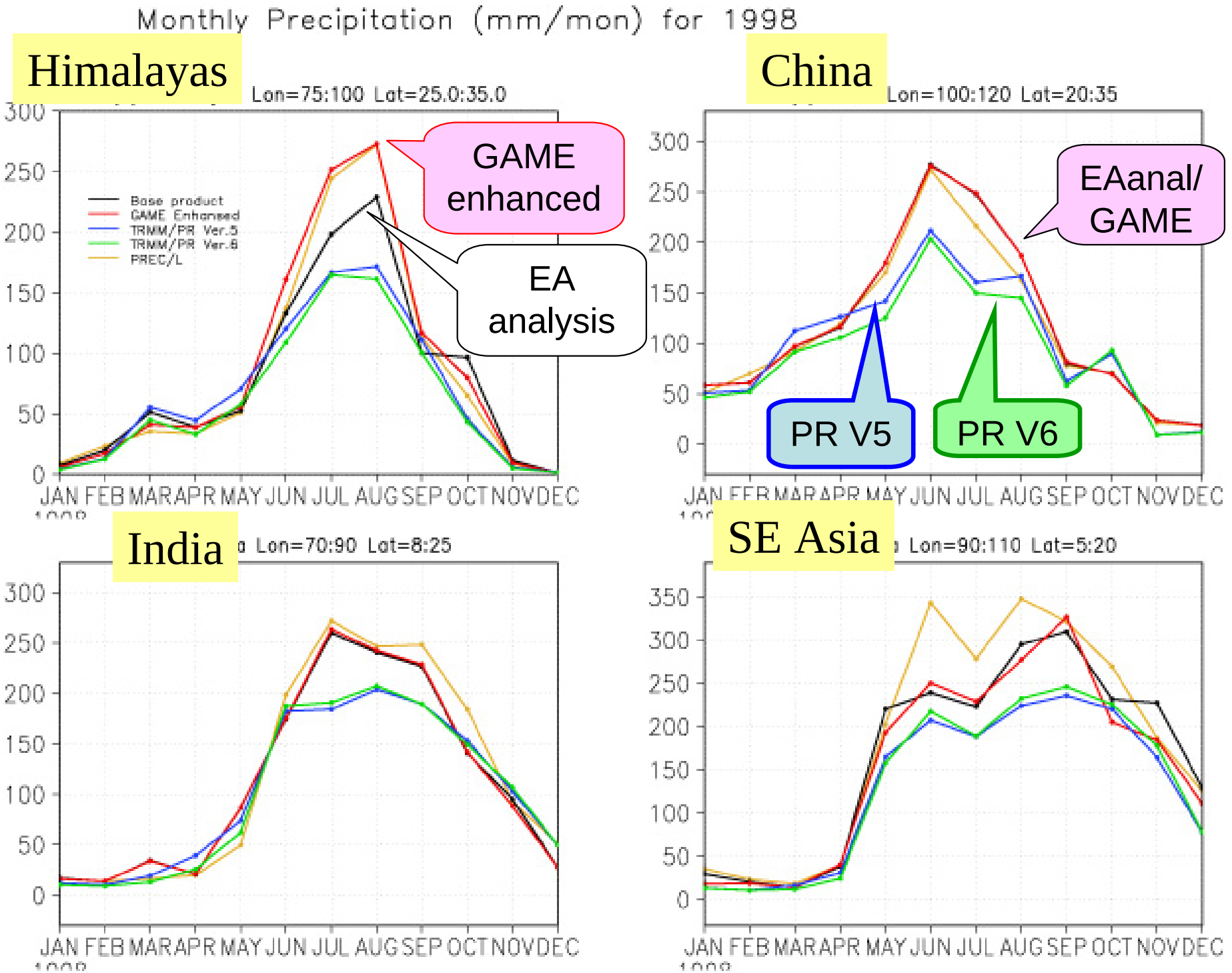
Himalayas

China

India

SE Asia

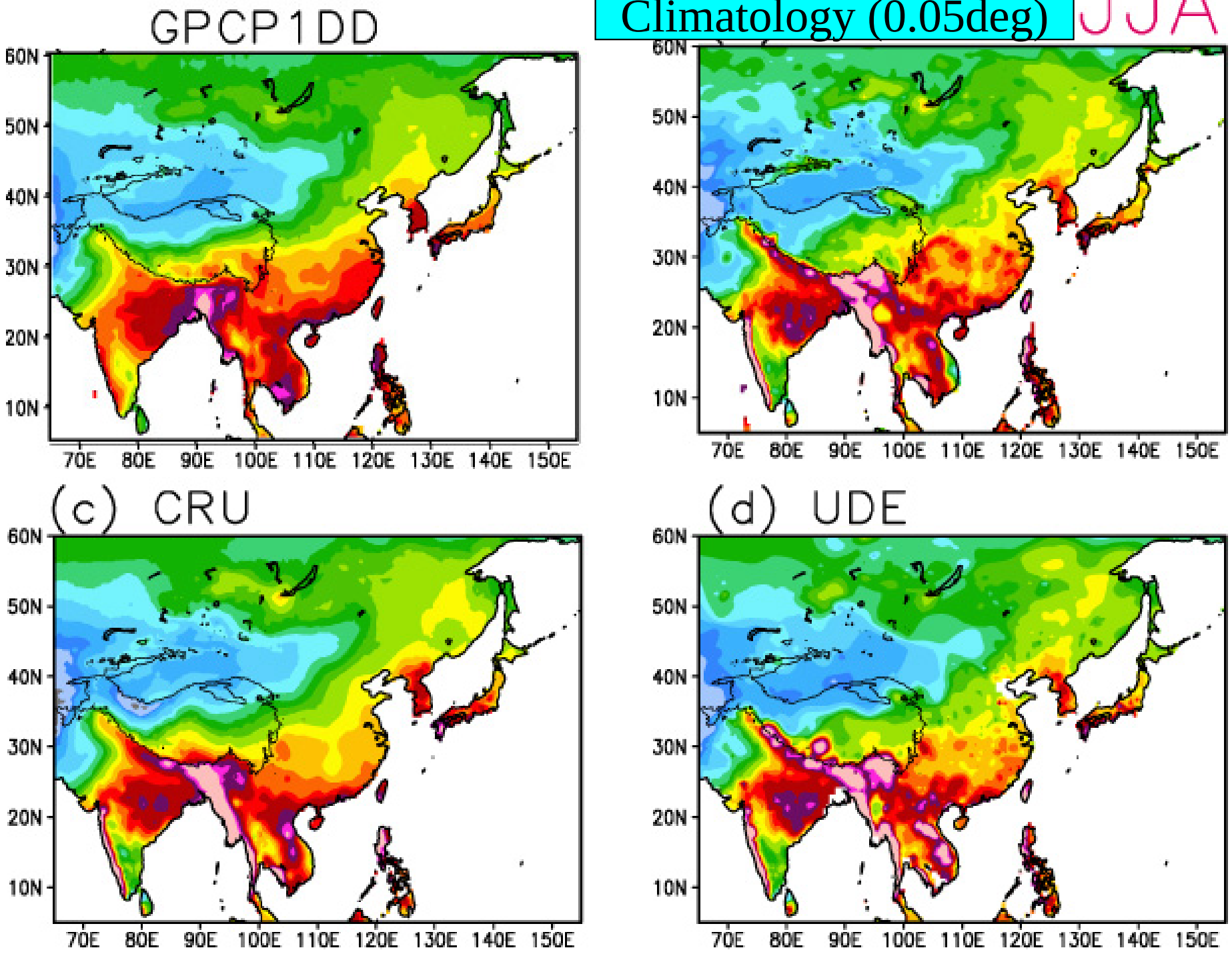
Yatagai and Xie (2006)



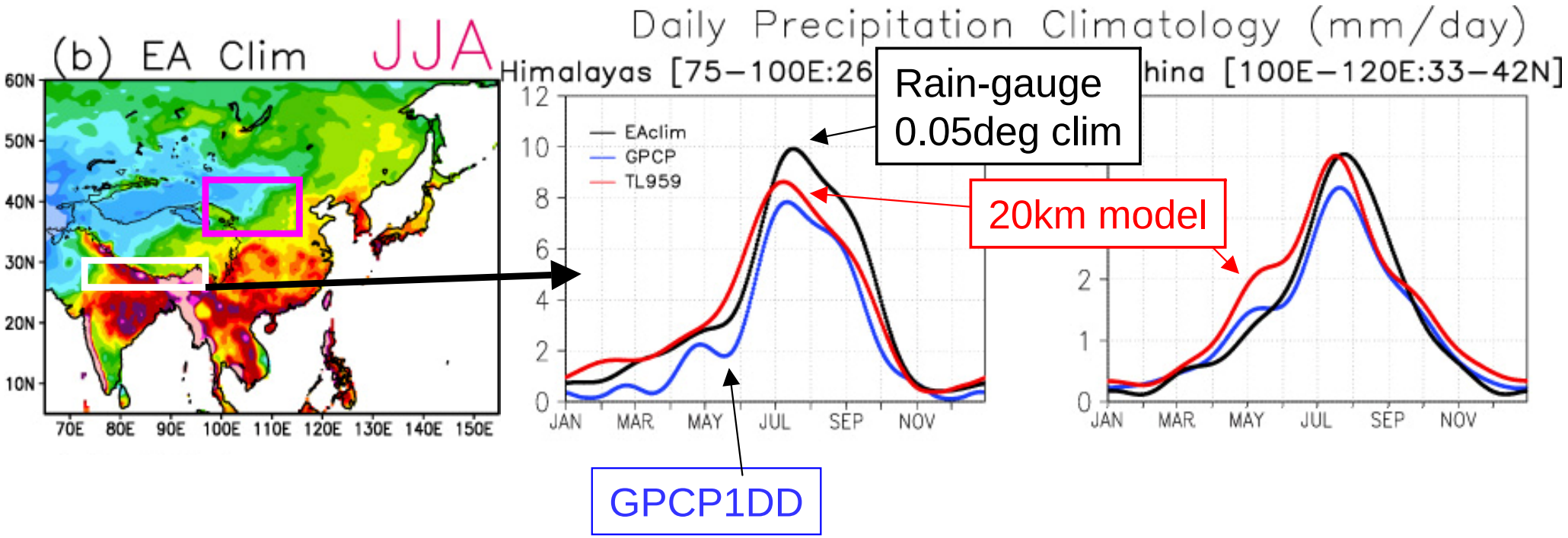
Yatagai and Xie (2006)

East Asia Analysis Climatology (0.05deg)

JJA



Information to the modelers



Yatagai, Xie and Kitoh (2005)

Discussion with local policy makers; Data collection and capacity building

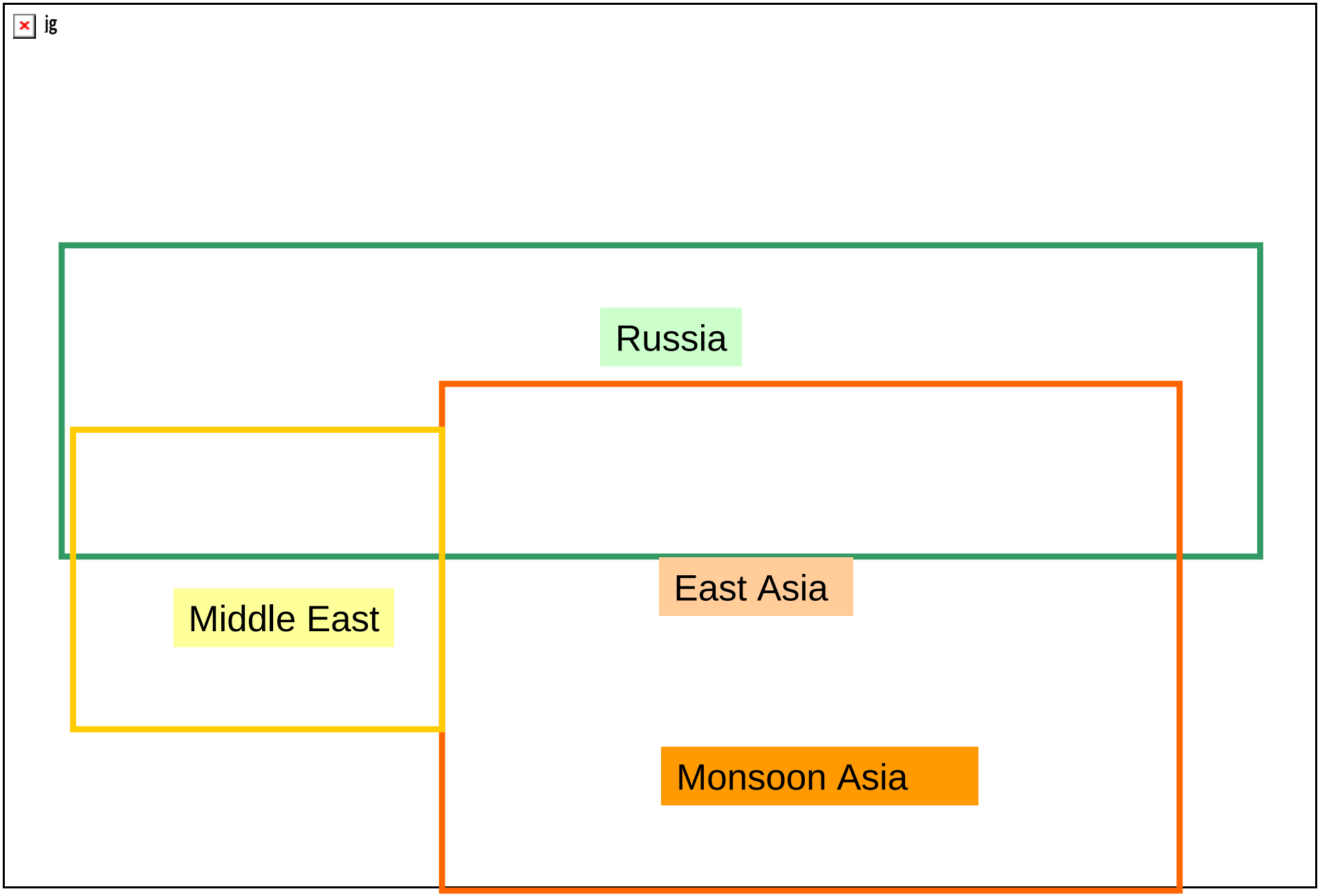
Turkey (DSI)

IRAN IRIMO

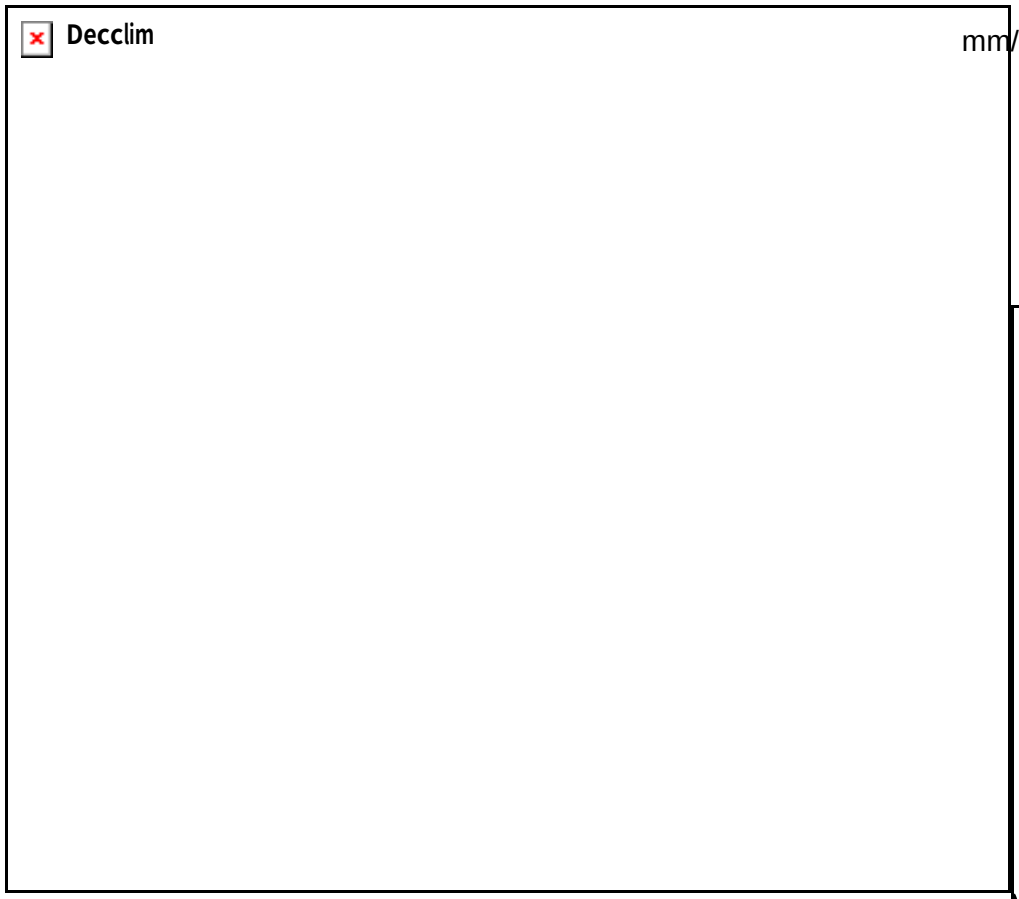
INDIA Tamil Nadu Aggr. Univ.

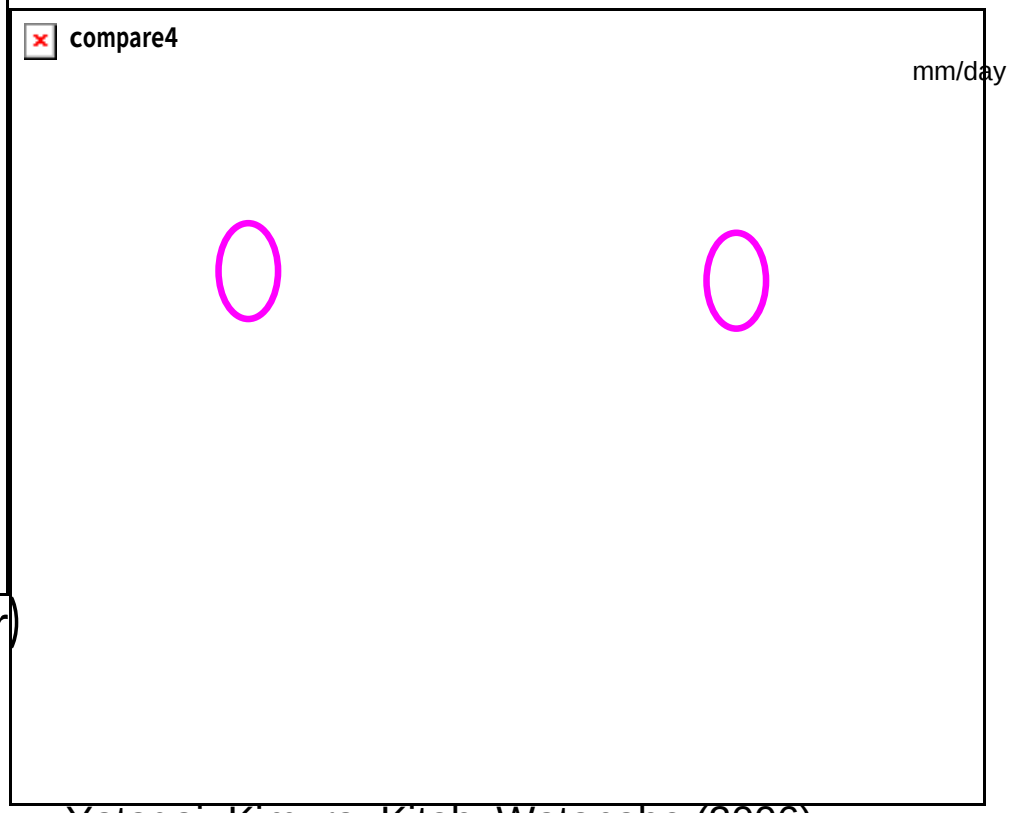
PHILIPPINES PAGASA

Data provided (or discount) ⇔ training, invitations, co-authorship!!


jg
Russia
East Asia
Middle East
Monsoon Asia

Middle East version and model validation

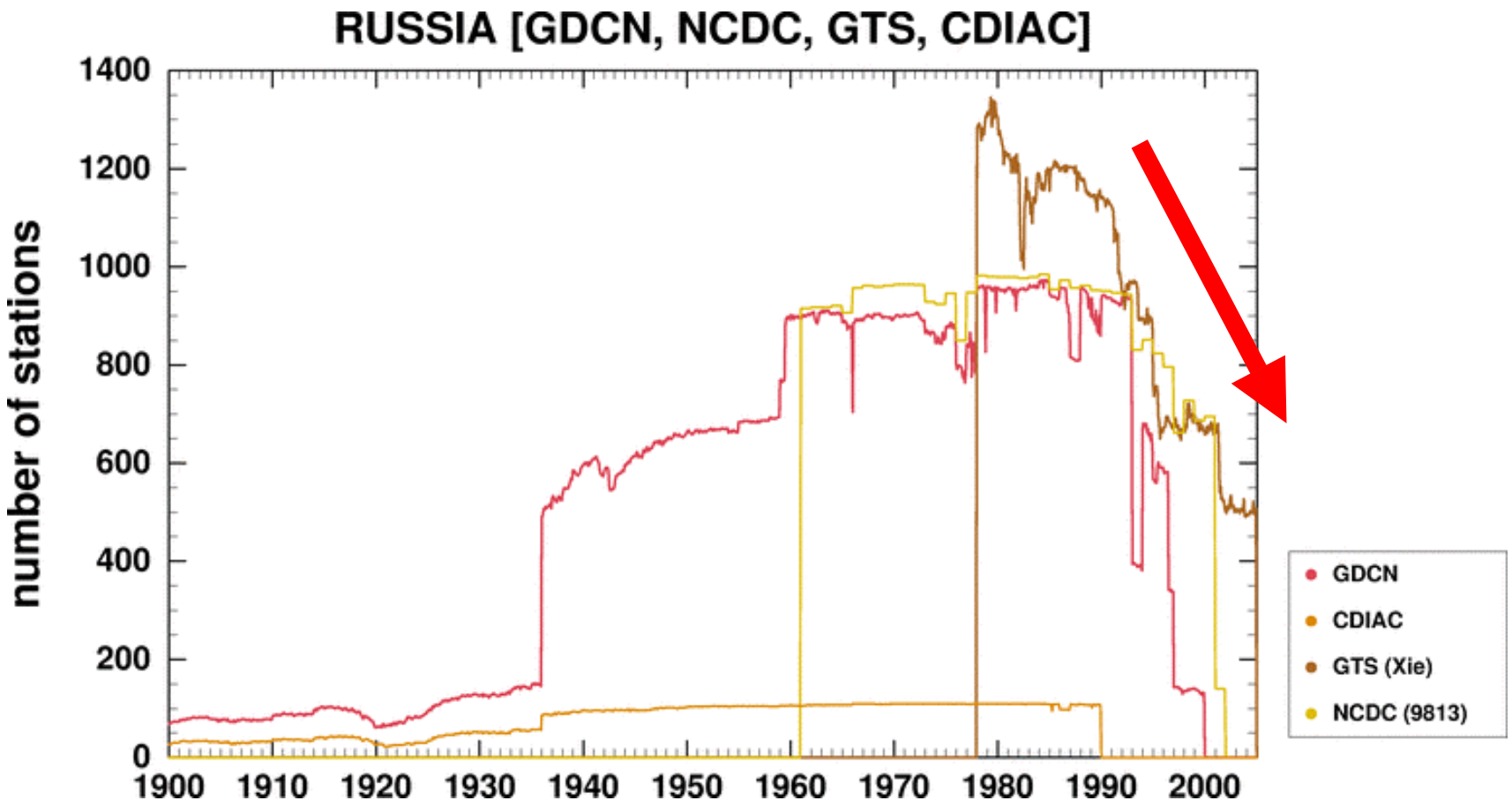




Rain gauge-based climatology(upper)
TRMM/PR composite (lower)
For December

Yatagai, Xie and Alpert (2008)
Kitoh, Yatagai and Alpert (2008)

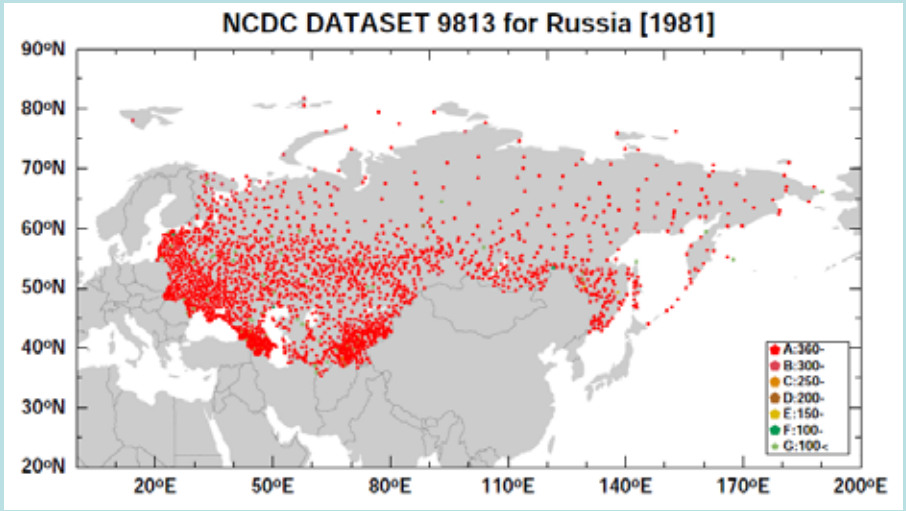
Yatagai, Kimura, Kitoh, Watanabe (2006)
Proceedings for International Symposium on Water and Land Management for Sustainable Irrigated Agriculture, Turkey



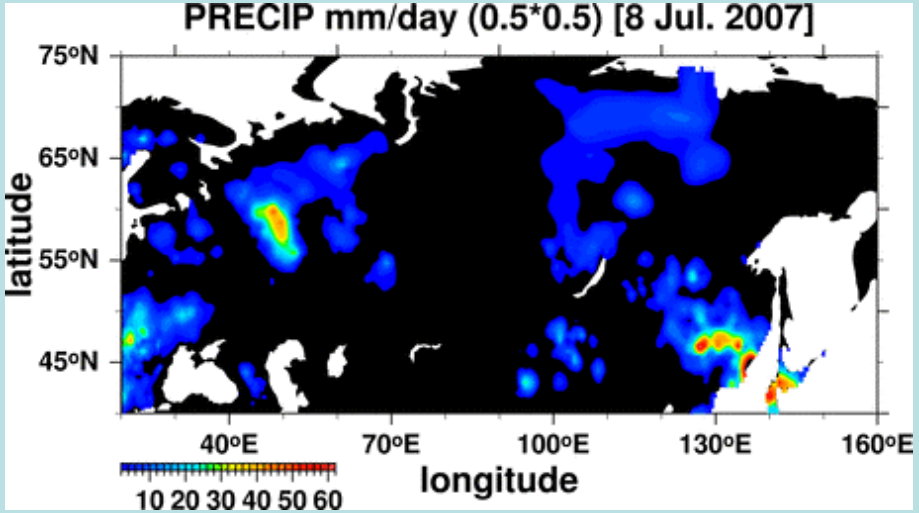
- Number of data is decreasing…?

Russia and Central Asia

Observation of former USSR



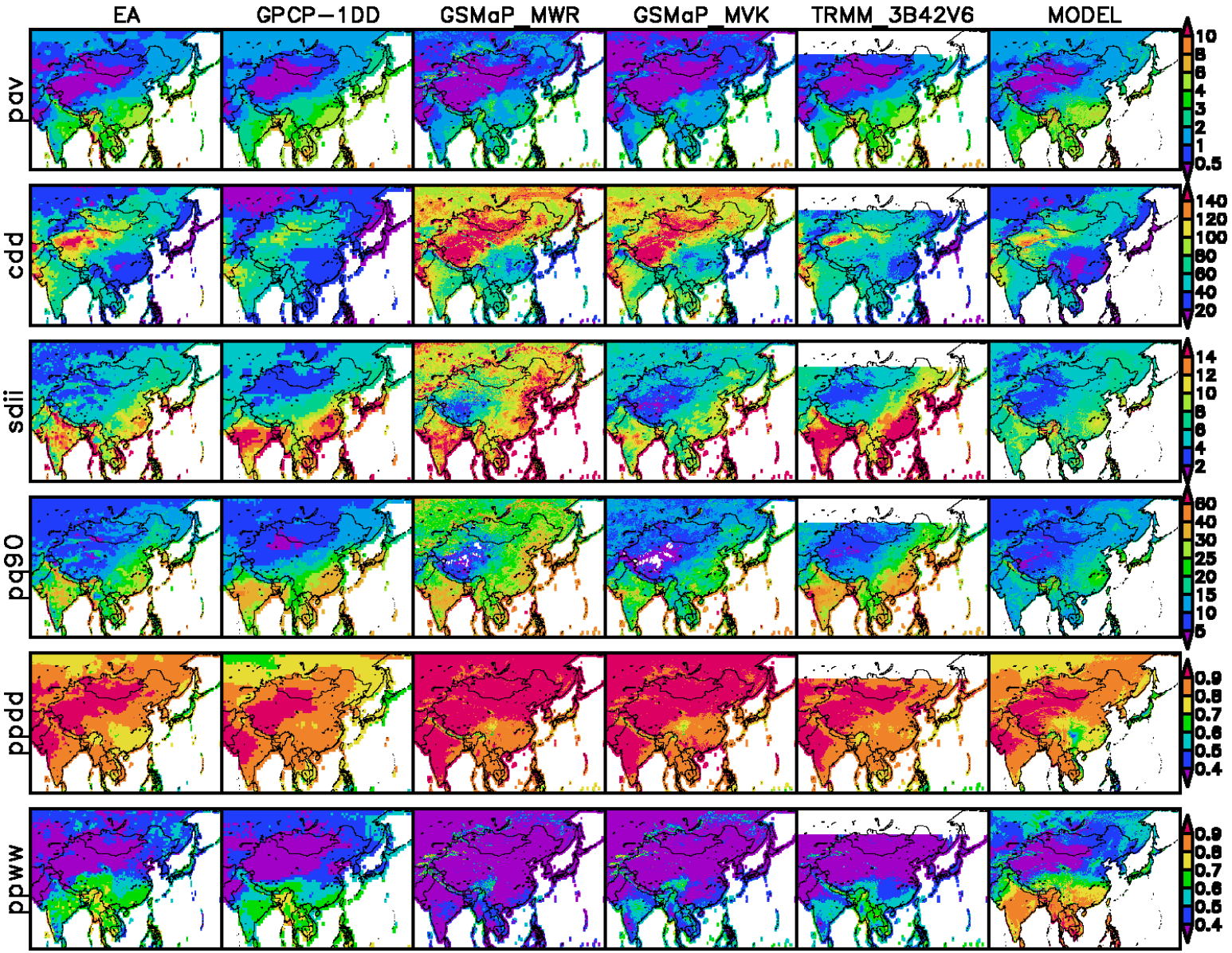
Grid product



- NCDC dataset 9813 is useful.

- Collections of rain gauge data (Groisman and Rankova, 2001; Bogdanova et al., 2002)

Intercomparison with other data



Summary

- We upgraded the EA analysis (Xie et al., 2007) by collecting more rain-gauges data from across the monsoon Asia (1978–2003).
- We analyzed daily grid precipitation data over the Middle East.
- QC (using TRMM. etc.) is on the way.
- We are collecting observation data from Russia as well as Central Asia.
- We have started validation of model results as well as satellite observations.
- We plan to develop long-term datasets (from 1961 and from 1930)
- 0.25˚ products will be released in the next version (APHRO_EA_V0804).
- Collaborators are welcome!