Inter-comparison of multiple rainfall datasets derived from ground-base and satellite-base observations and inter-annual variations in water recycling in the atmosphere. (JAXA PMM7 PI No. 306)

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Global Hydrological Cycle
interannual and long-term changes

- Long-term changes and interannual variations of hydrological cycle on global scale.
- Global Warming => deaccelerate water circulation in the atmosphere (τ become larger; $\tau = PW/P$; residual time in water vapor in the atmosphere)
  - We would like to investigate the changes in global hydrological cycle using observational datasets

TO DO (for 3-yrs)

- To inter-compare various precipitation datasets, which were derived from various satellites and ground observations.
- Different sensors (radar, microwave imager, IR imager), algorithms.

Evaluation of climatology by numerical models

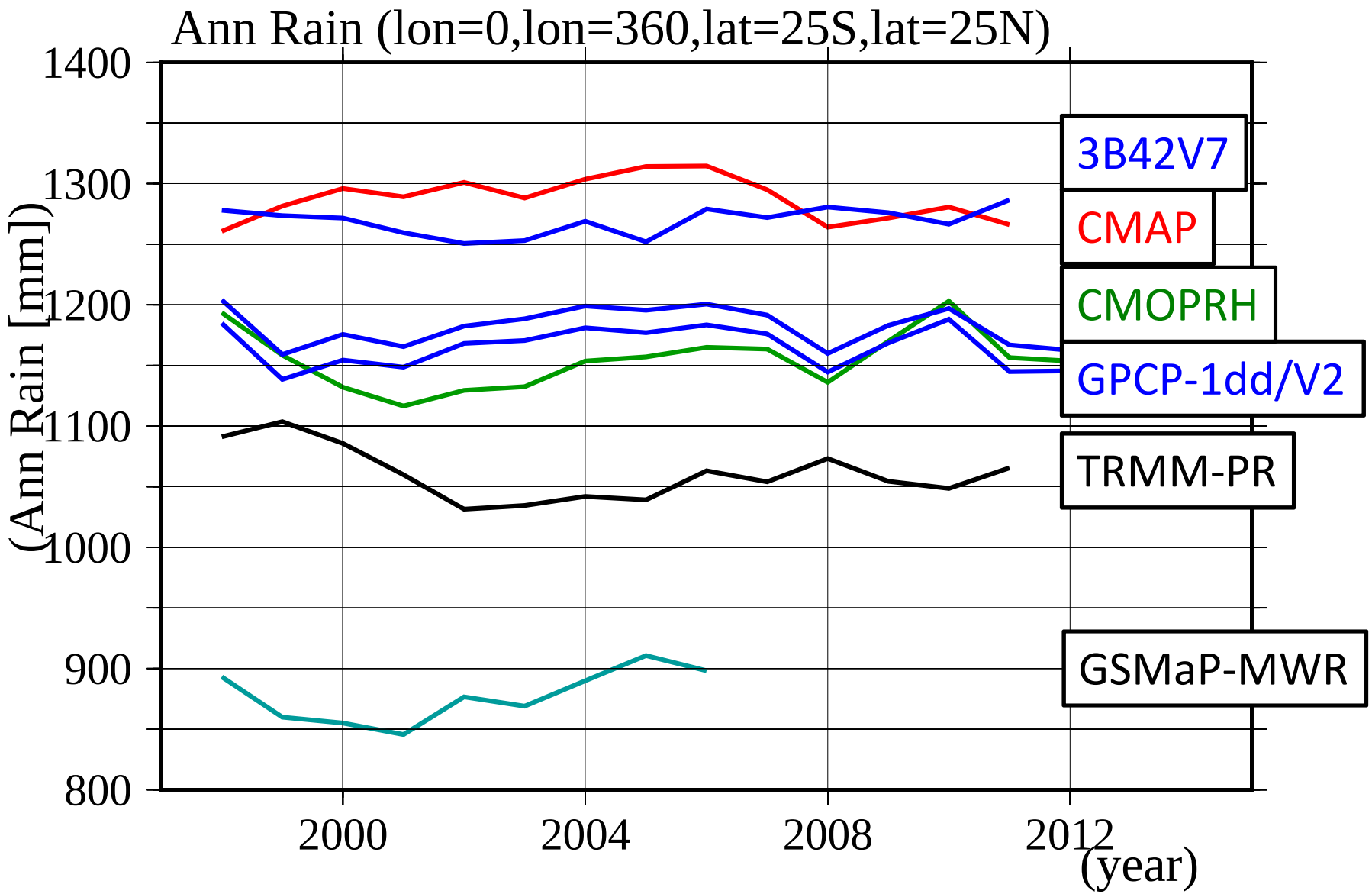
- Many precipitation products are provided by various agencies.
  - GSMaP
  - TRMM(many products)
  - GPCP
  - CMAP
- One of them are used for the evaluation of simulated precipitation by numerical models.
  - There are some discrepancies in precipitation over the Asian monsoon region (e.g., Sperber et al. 2013)

Science interest :
from the inter-comparison among the many several precipitation products

- To quantify the uncertainty among the precipitation products
  - Total amount, seasonal evolution, interannual variations, and their regionality
- To understand characteristics of cloud-precipitation systems
  - What kind of precipitation system has large uncertainty in precipitation estimation

Tropical mean (25S-25N)
Annual precipitation

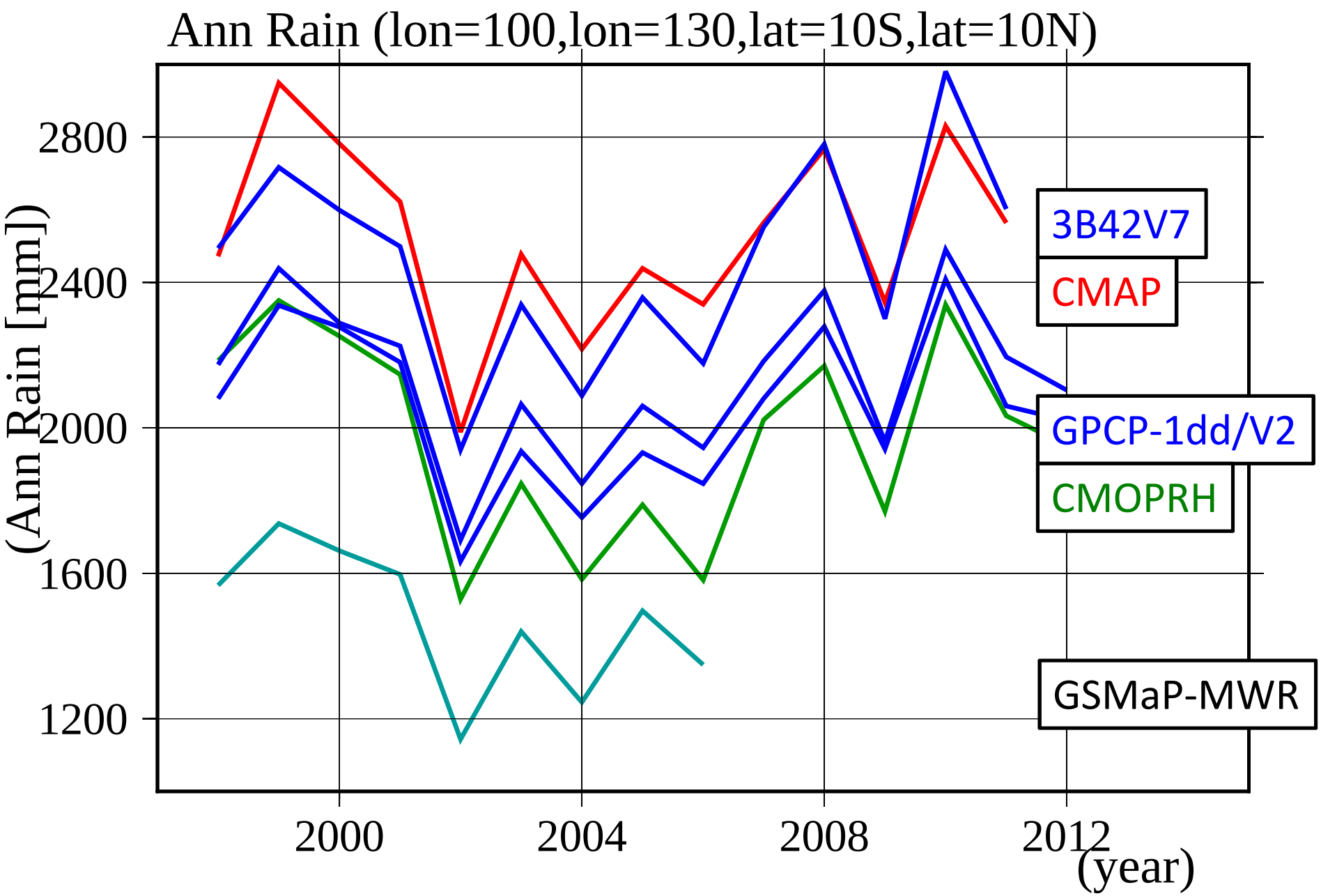
- Datasets
  - TRMM-PR V7 (only PR)
  - GPCP V2.2
  - GPCP 1DD V1.2
  - GSMaP MWR V484
  - TRMM 3B42 V7
  - CMOPRH V1.0
  - CMAP


Ann Rain (lon=0,lon=360,lat=25S,lat=25N)
(Ann Rain [mm])
1400
1300
1200
1100
1000
900
800
2000
2004
2008
2012
(year)
3B42V7
CMAP
CMOPRH
GPCP-1dd/V2
TRMM-PR
GSMaP-MWR

Large discrepancy in total precipitation

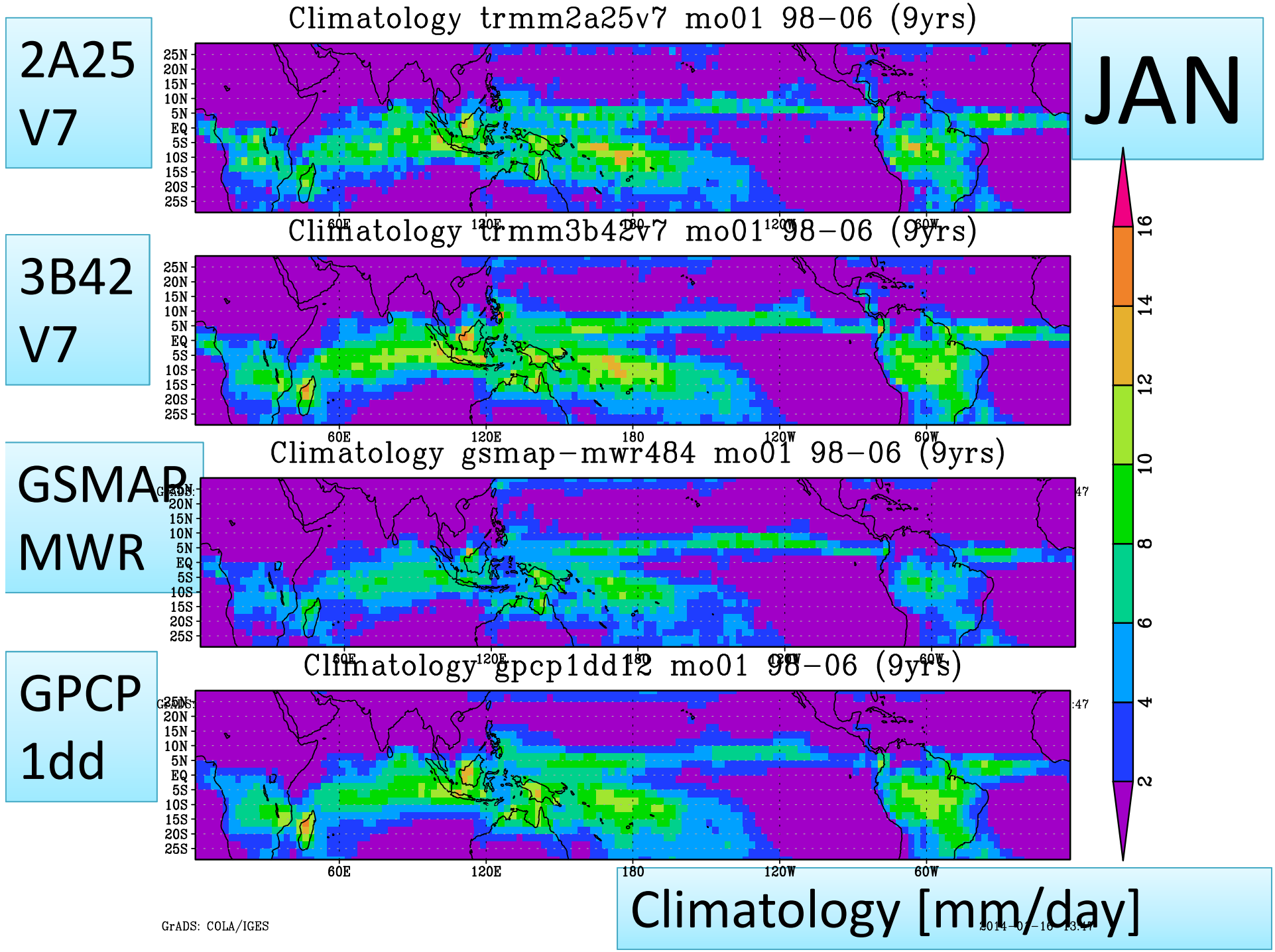
- Estimation of total precipitation is very difficult.

- Order of difficulty of precise estimation
  - Seasonal change < Interannual variation < long-term change < total precipitation


Ann Rain (lon=100,lon=130,lat=10S,lat=10N)
(Ann Rain [mm])
2800
2400
2000
1600
1200
2000
2004
2008
2012
(year)
3B42V7
CMAP
GPCP-1dd/V2
CMOPRH
GSMaP-MWR

Interannual Standard Deviation

- To understand spatial difference in interannual variation in precipitation
  - Interannual STD was calculated
  - Grid size was unified as 2.5 degree x 2.5 degree


2A25
V7
Climatology trmm2a25v7 mo01 98–06 (9yrs)
JAN
3B42
V7
Climatology trmm3b42v7 mo01 98–06 (9yrs)
GSMAP
MWR
Climatology gsmap–mwr484 mo01 98–06 (9yrs)
GPCP
1dd
Climatology gpcp1dd12 mo01 98–06 (9yrs)
25N
20N
15N
10N
5N
EQ
5S
10S
15S
20S
25S
60E
120E
180
120W
60W
2
4
6
8
10
12
14
16
Climatology [mm/day]
GrADS: COLA/IGES

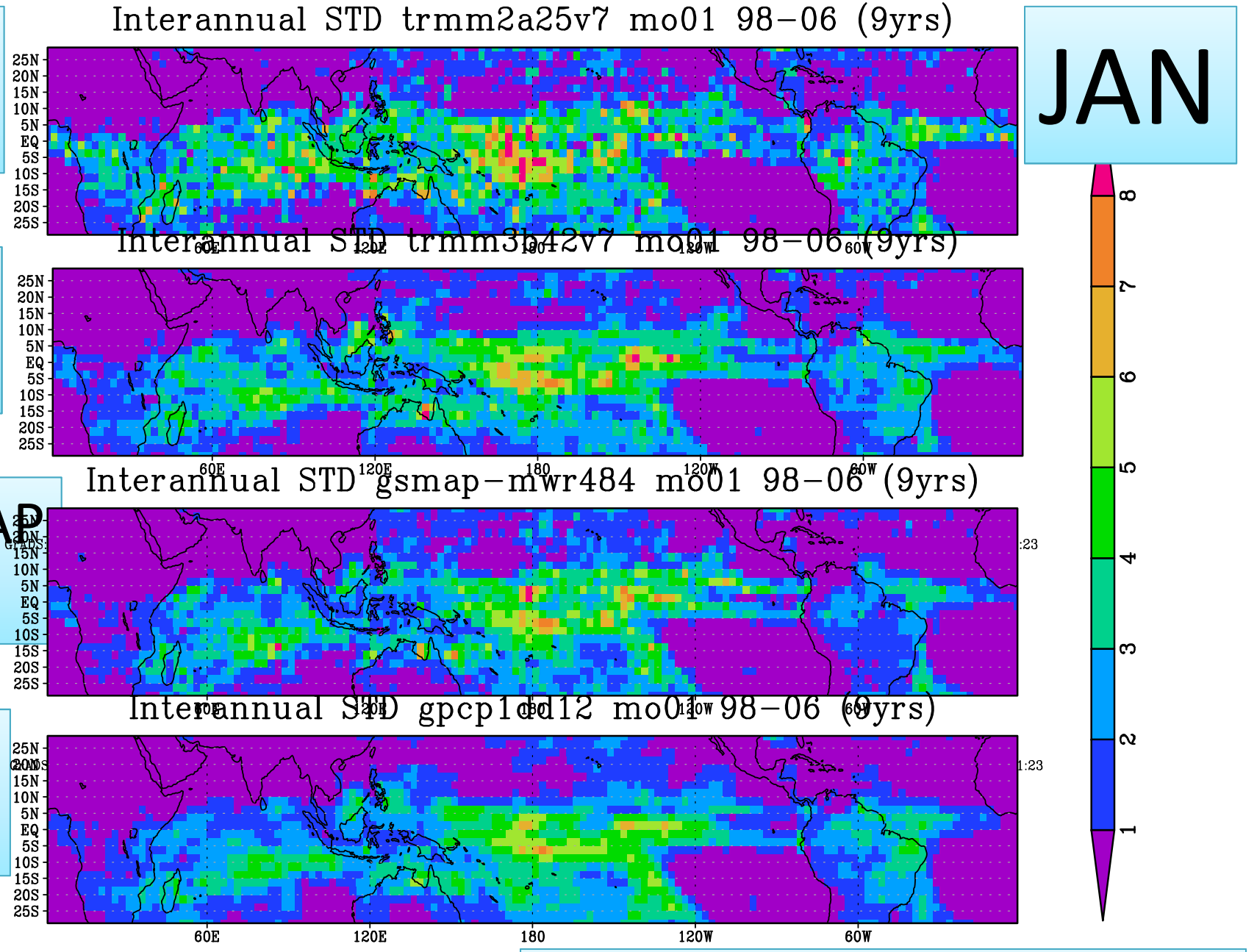
2A25 V7

3B42 V7

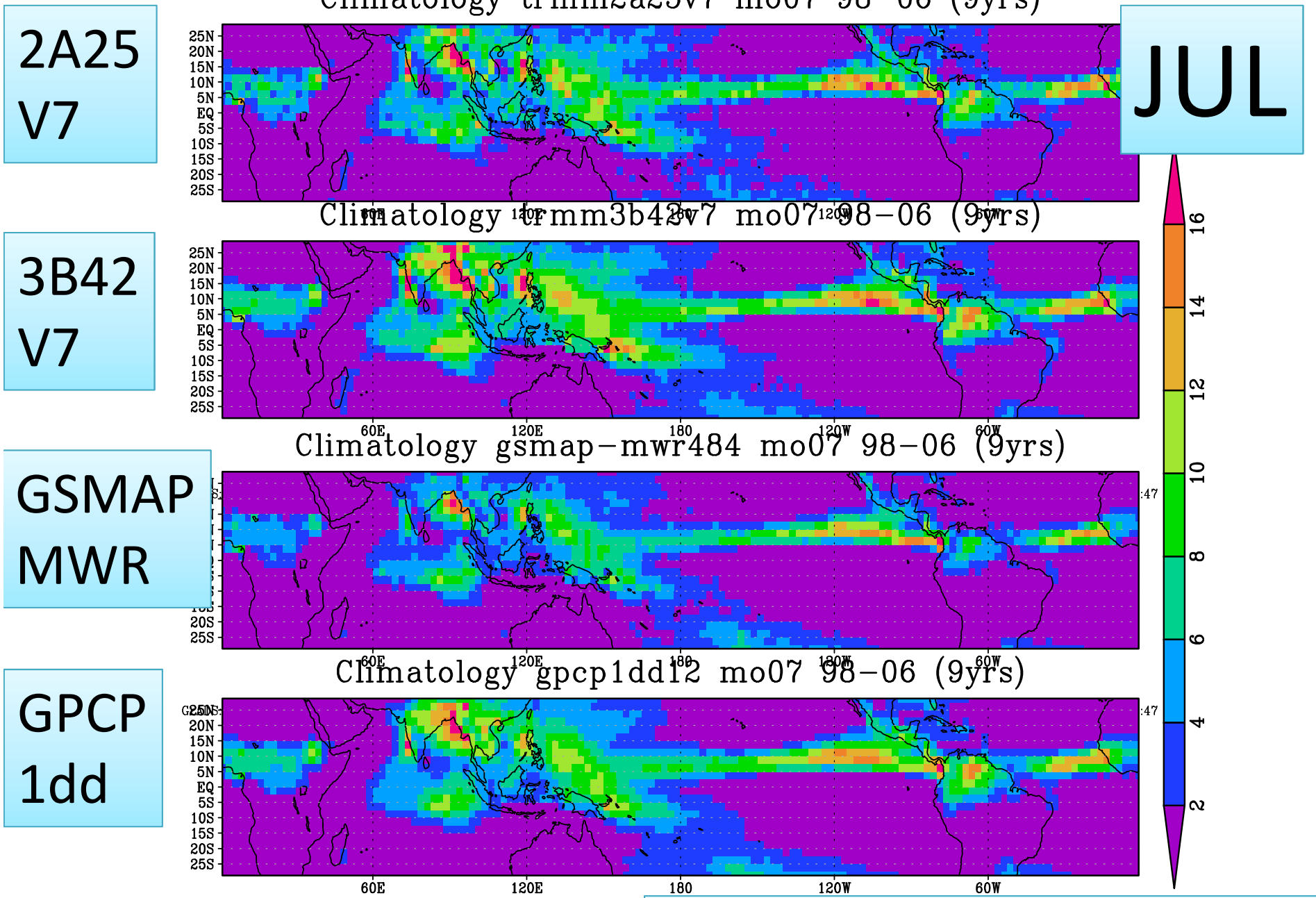
GSMAP MWR

GPCP 1dd

JAN



Interannual STD [mm/day]


2A25
V7
3B42
V7
GSMAP
MWR
GPCP
1dd
JUL
Climatology trmm2a25v7 mo07 98-06 (9yrs)
Climatology trmm3b42v7 mo07 98-06 (9yrs)
Climatology gsmap-mwr484 mo07 98-06 (9yrs)
Climatology gpcp1dd12 mo07 98-06 (9yrs)
25N
20N
15N
10N
5N
EQ
5S
10S
15S
20S
25S
60E
120E
180
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2
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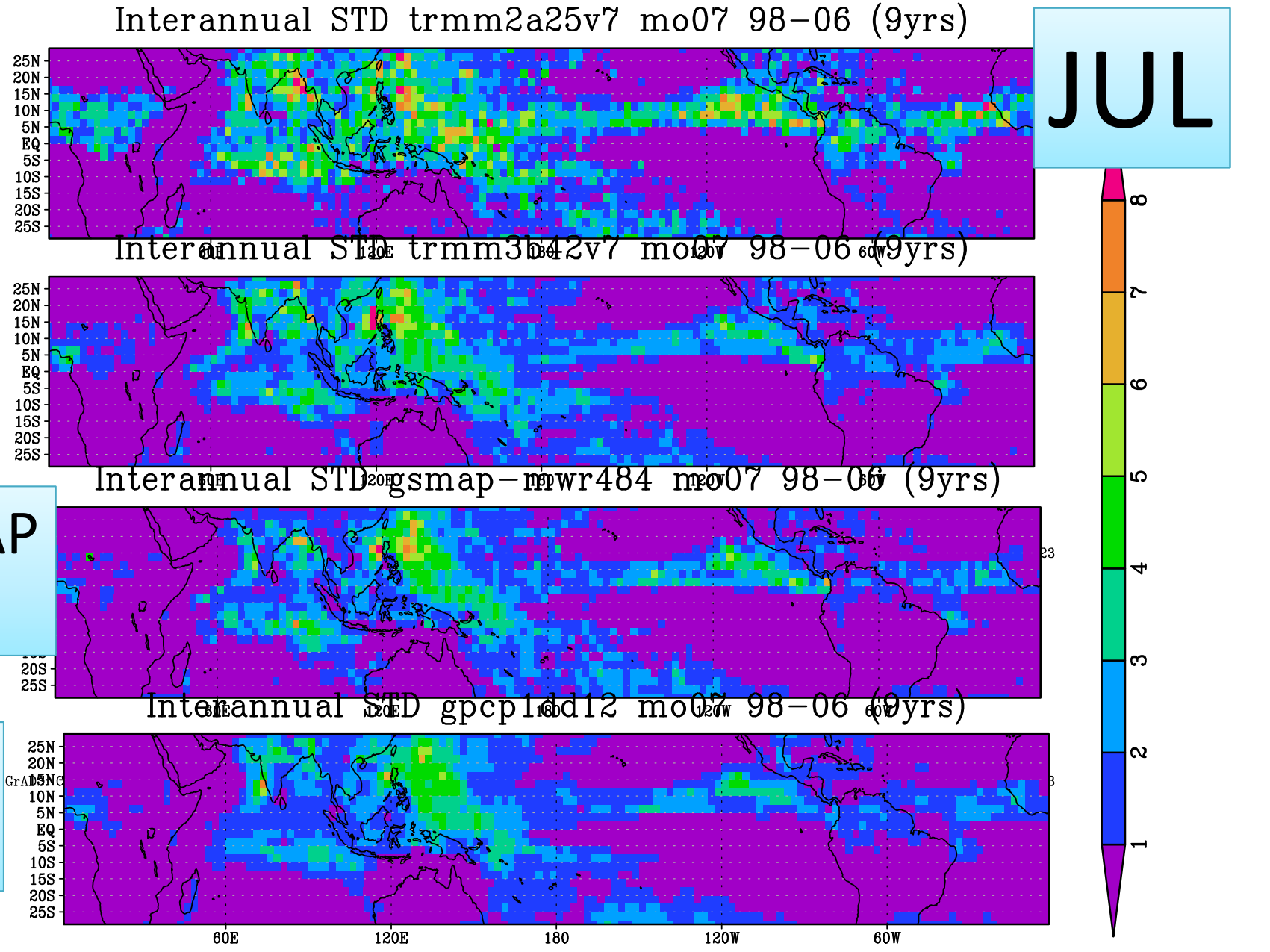
16
GrADS: COLA/IGES
Climatology [mm/day]

2A25 V7

3B42 V7

GSMAP MWR

GPCP 1dd



JUL

Interannual STD [mm/day]

Summary

- We preliminarily inter-compared several precipitation datasets, focusing on an interannual time-scale.
- Particularly over land, systematic bias can be identified.
  - African Continent, Maritime Continent,
- Note that the biases can be found the major local rainy seasons,
  - although total precipitation is not so small.