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 ($\tau$ 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)

800 900 1000 1100 1200 1300 1400


TRMM-PR
CMAP
CMOPRH
3B42V7
GPCP-1dd/V2
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
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
Climatology trmm2a25v7 mo01 98-06 (9yrs)

Climatology trmm3b42v7 mo01 98-06 (9yrs)

Climatology gsmap-mwr484 mo01 98-06 (9yrs)

Climatology gpcp1dd12 mo01 98-06 (9yrs)

Climatology [mm/day]
Climatology [mm/day]
Interannual STD trmm2a25v7 mo07 98–06 (9yrs)

Interannual STD trmm3b42v7 mo07 98–06 (9yrs)

Interannual STD gsmap–mwr484 mo07 98–06 (9yrs)

Interannual STD gpcp1d12 mo07 98–06 (9yrs)

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.