DPR V4 Algorithm

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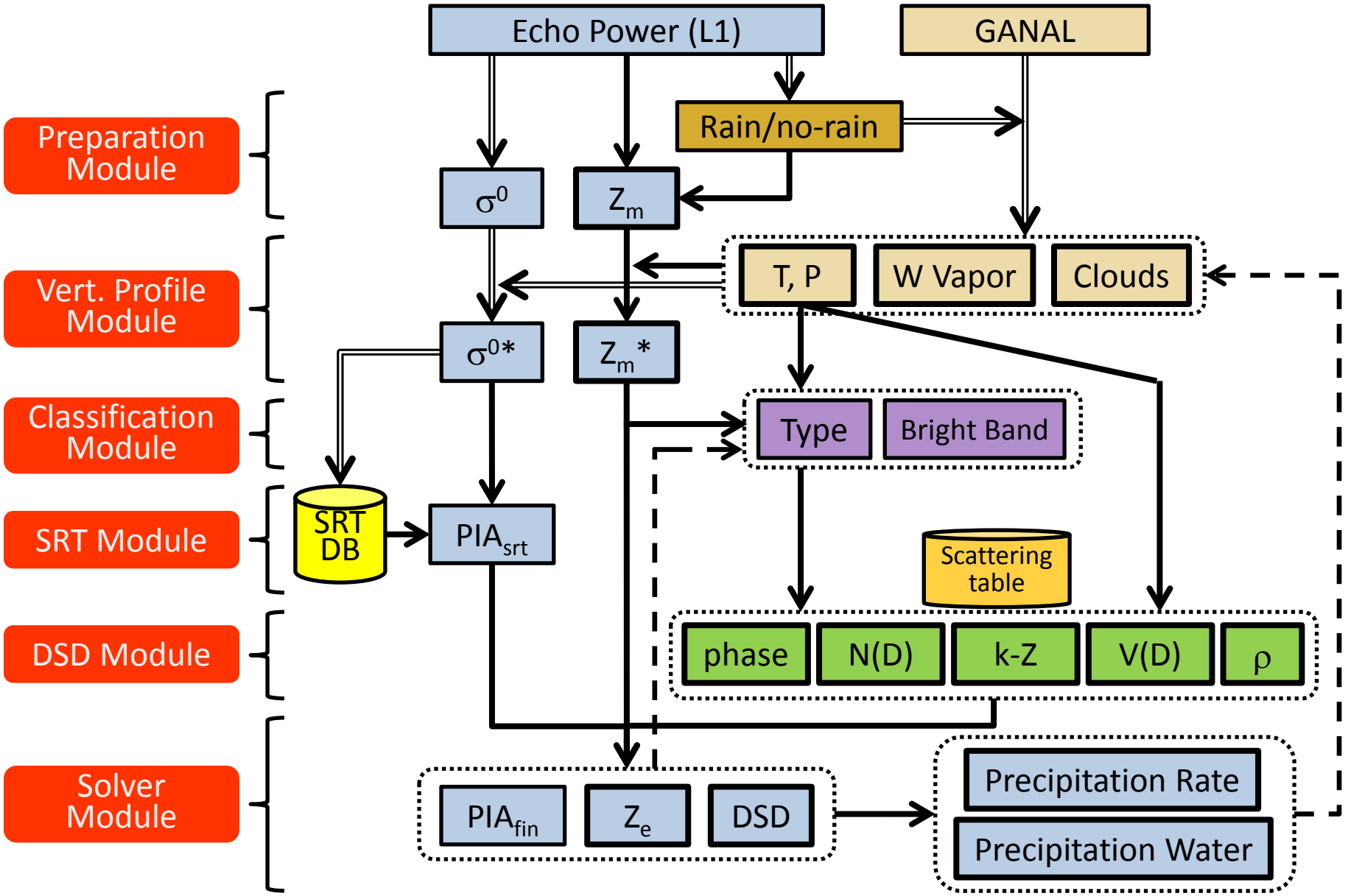
JPST

23 February 2016

GPM/DPR rain profiling algorithm flow

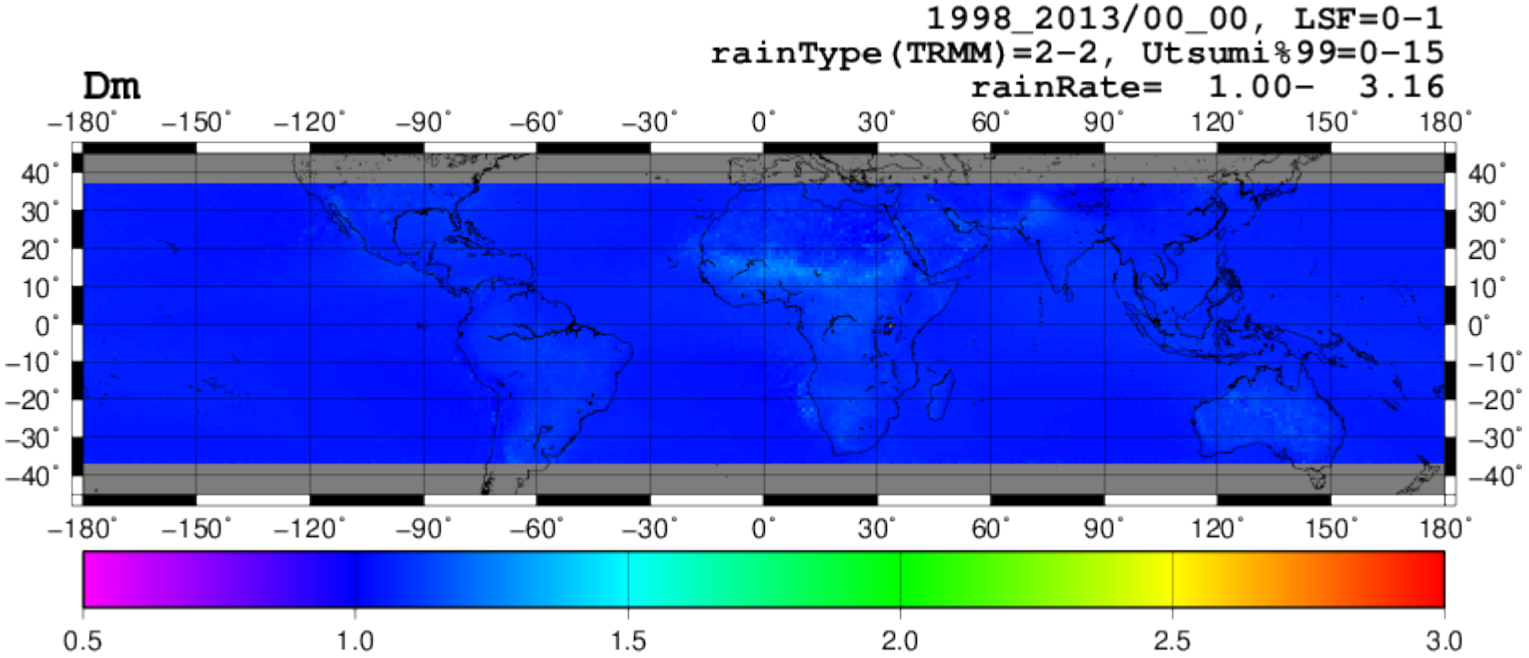


Major Improvements

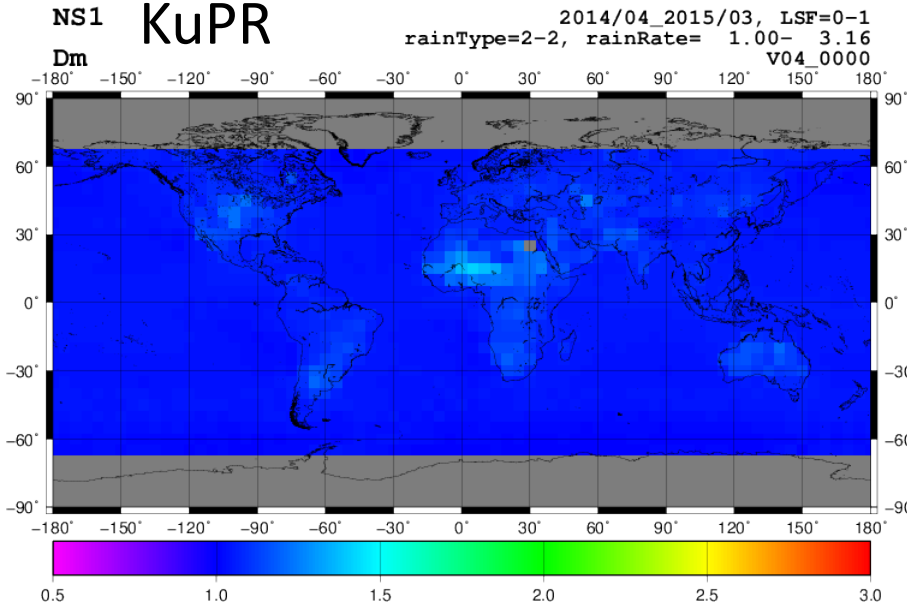
- Preparation module
  - Range bin mismatch between Ku and Ka channels
  - Rain detection threshold in KaMS and KaHS
- Classification module
  - Rain type classification improved
- SRT module
  - Introduction of the temporal reference data in V4
- Solver module
  - Introduction of R-D_m relationship
  - δPIA by DSRT is directly used in SLV module
  - Non-uniform beam filling correction implemented

D_m in convective rain with 1<R(mm/h)<3.2

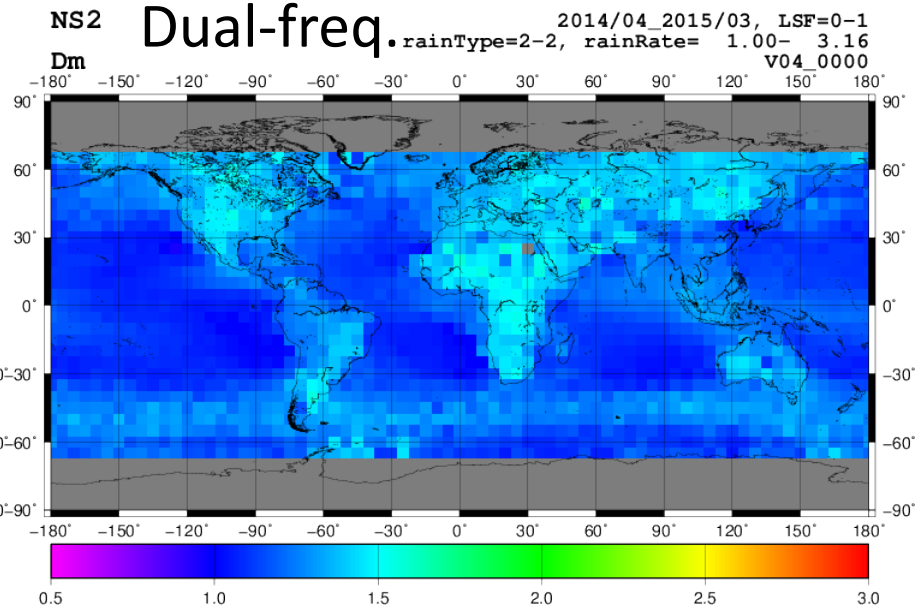
PR



NS1 KuPR



NS2 Dual-freq.

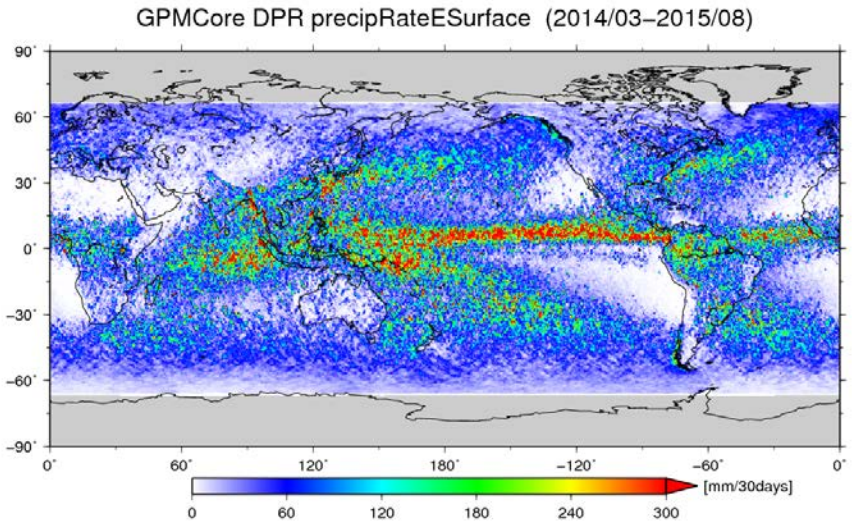


Comparison of DPR 04 (ITE 049) with 03B

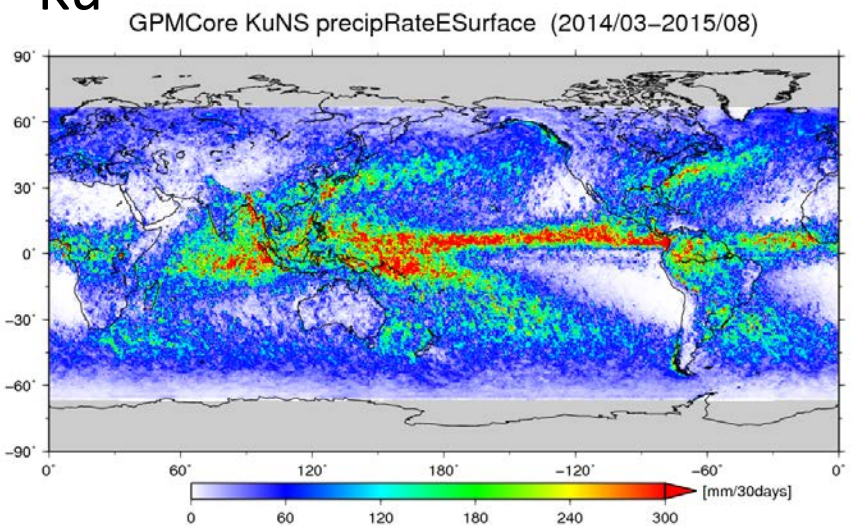
(Prepared by K. Kanemaru)

Estimated Surface Rain in V4

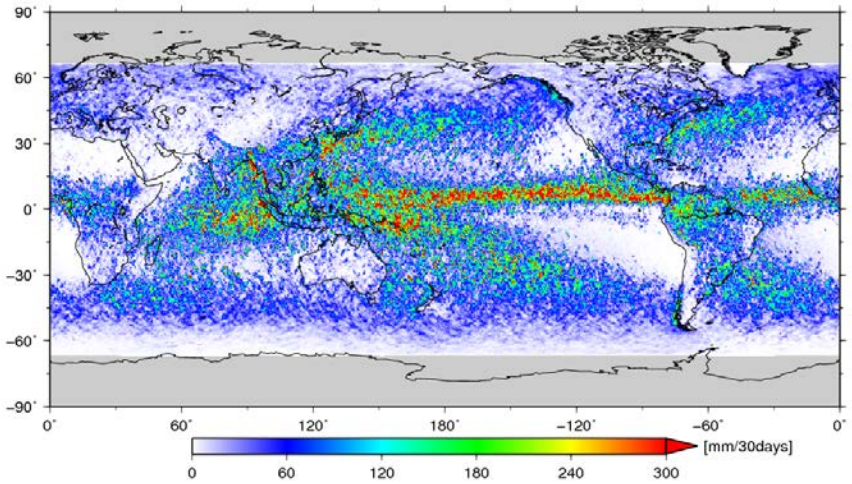
DPR



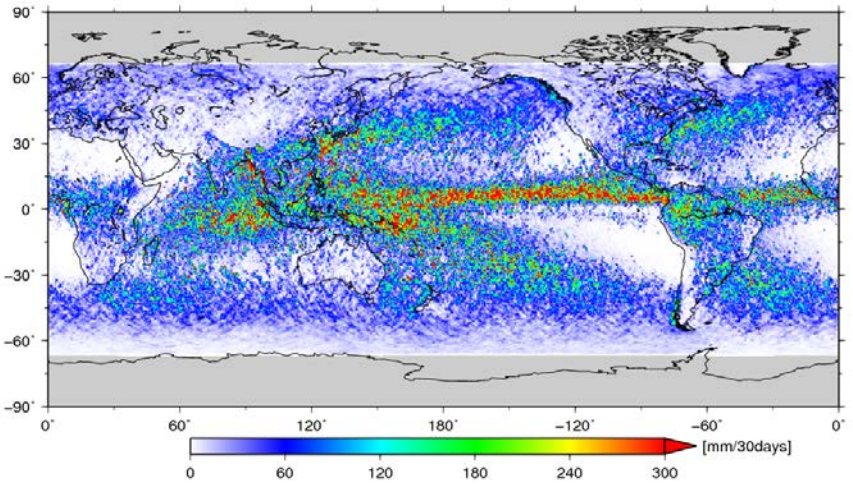
Ku



Ka(MS)



Ka(HS)

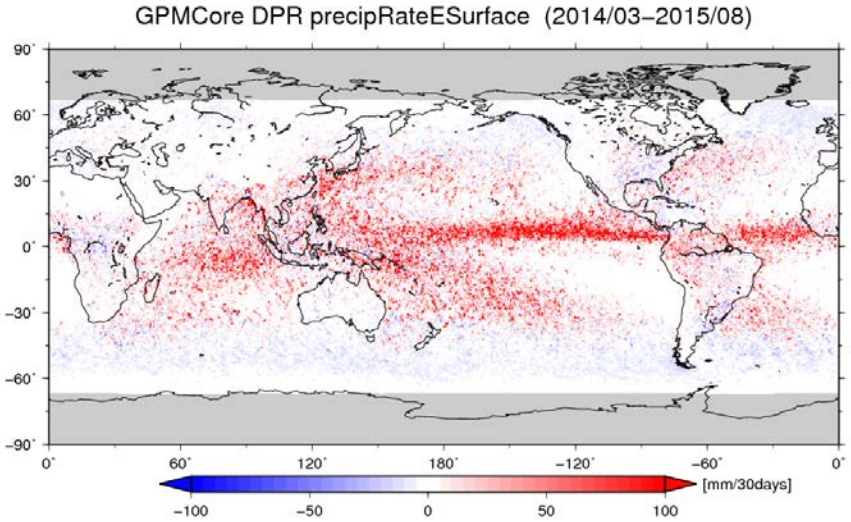


Comparison of DPR 04 (ITE 049) with 03B

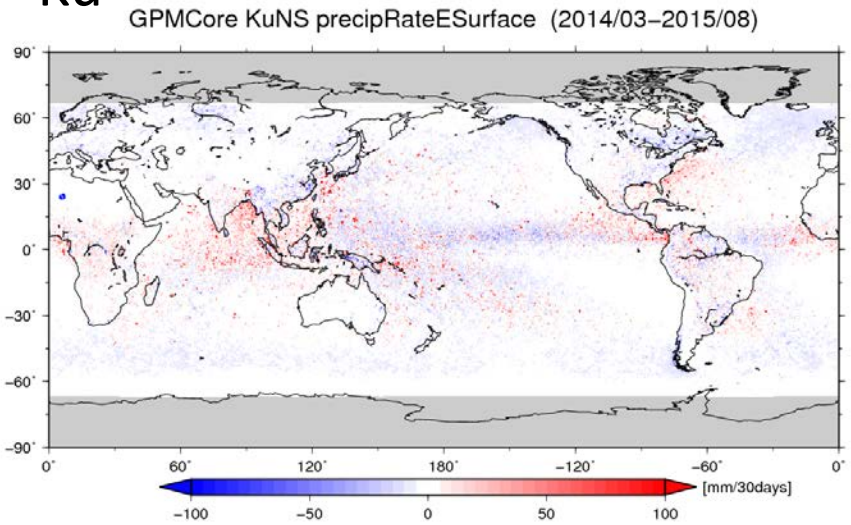
(Prepared by K. Kanemaru)

Absolute change (V4-V3)

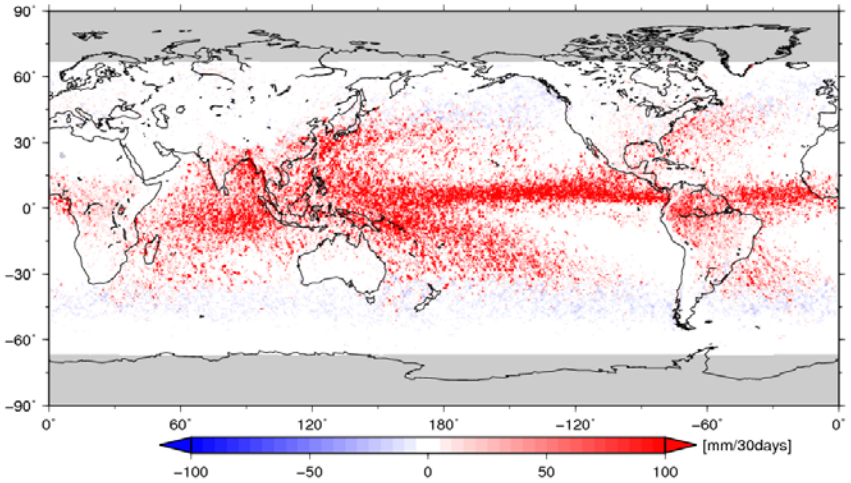
DPR



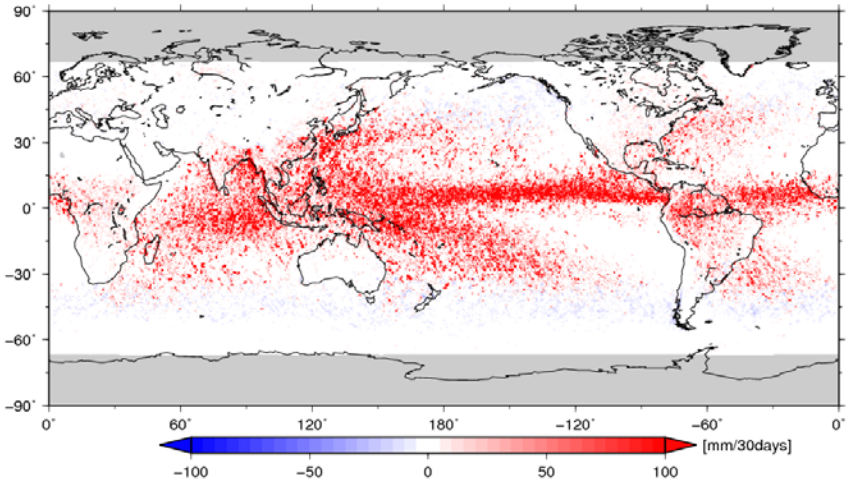
Ku



Ka(MS)



Ka(HS)

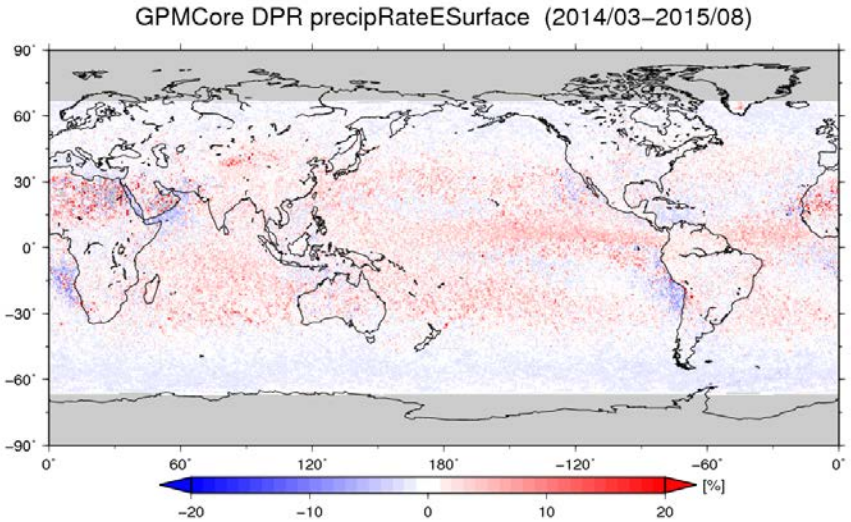


Comparison of DPR 04 (ITE 049) with 03B

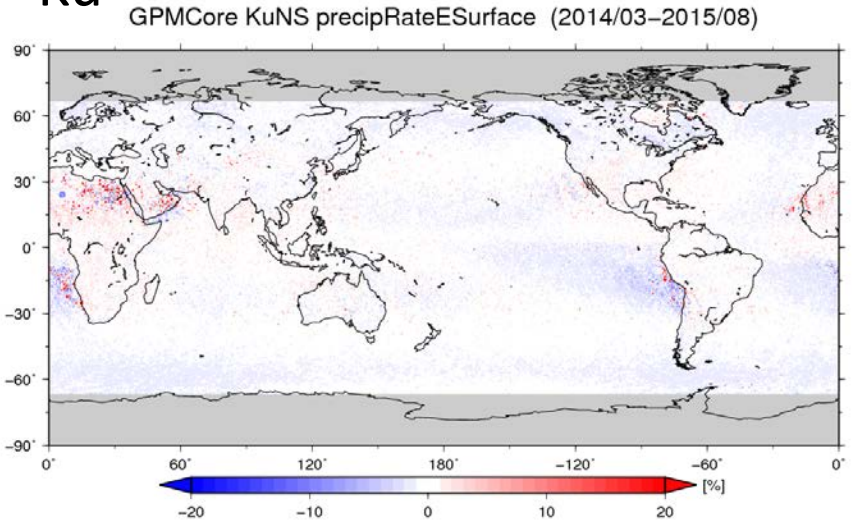
Relative change (V4-V3)/V3

(Prepared by K. Kanemaru)

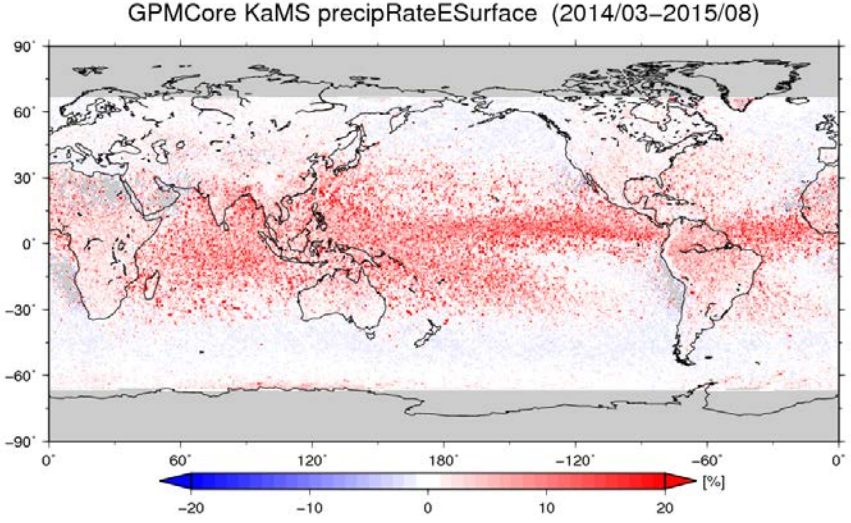
DPR



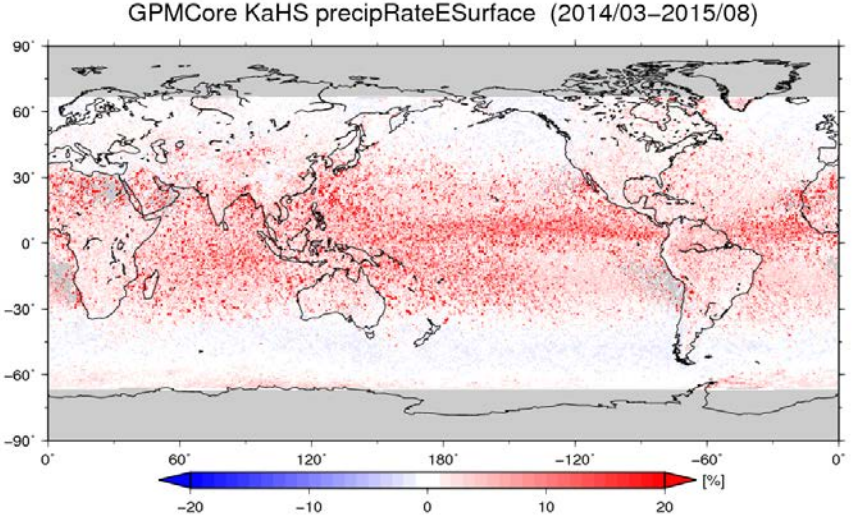
Ku

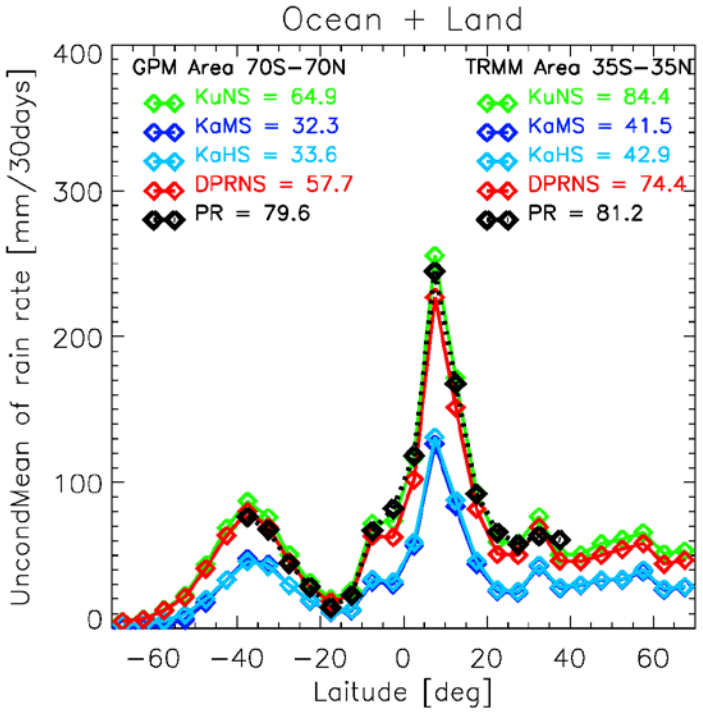


Ka(MS)

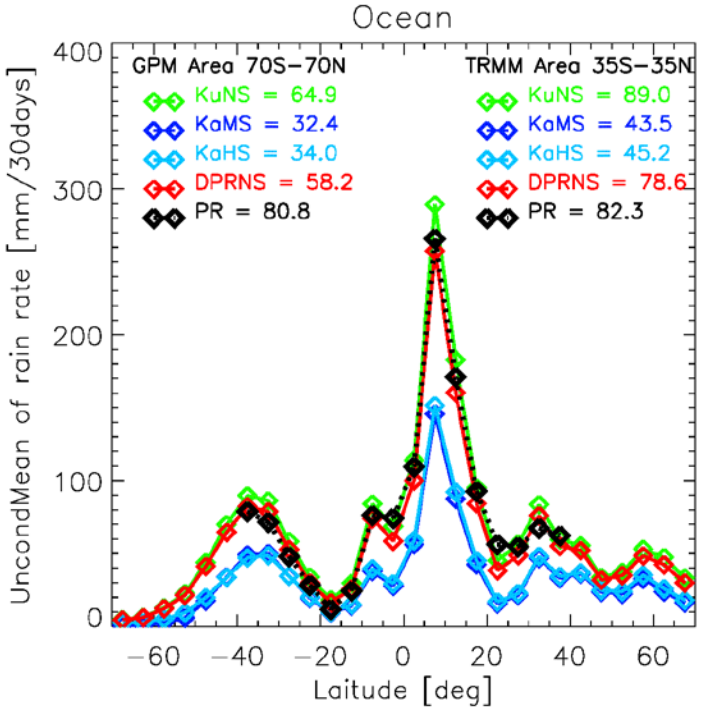


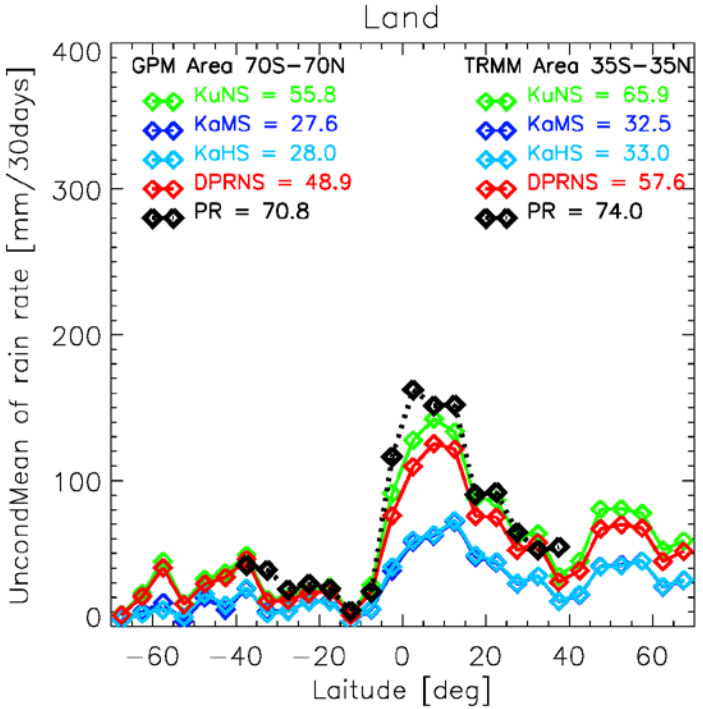
Ka(HS)



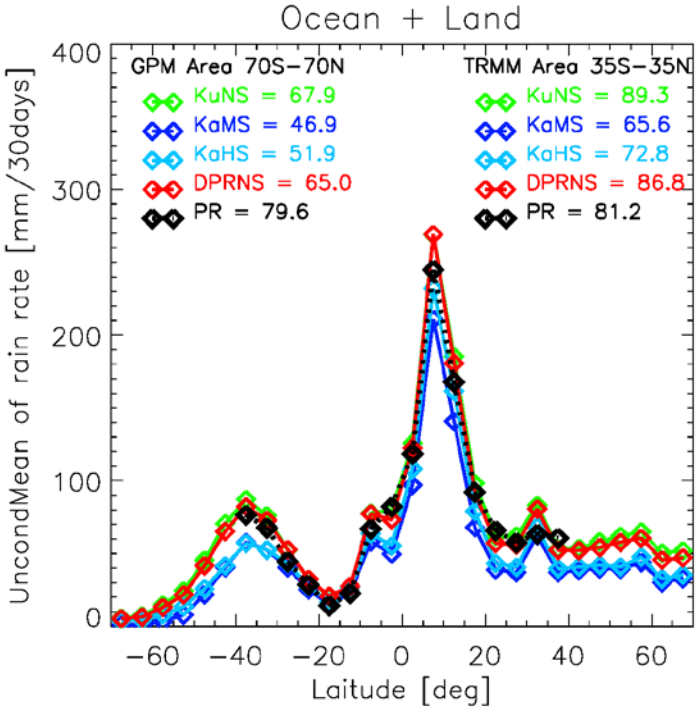


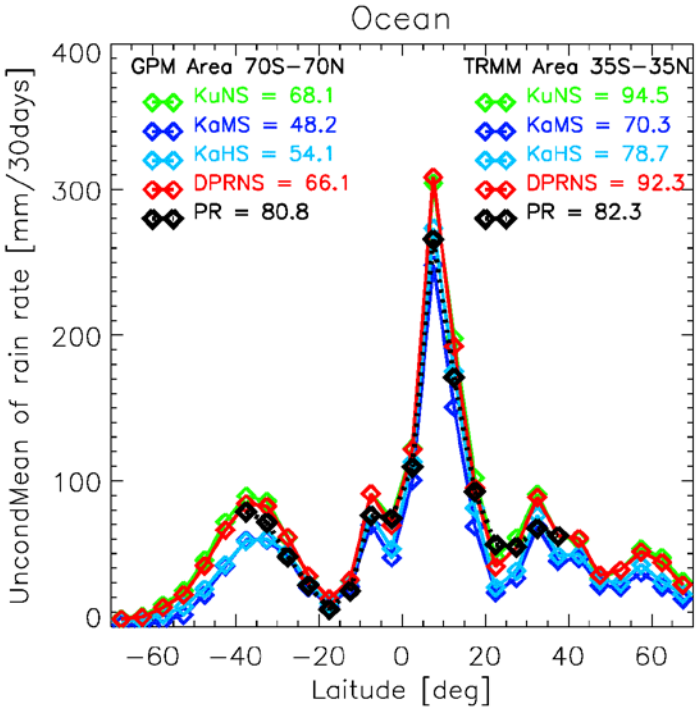
V03B
current version
rain @ 2km

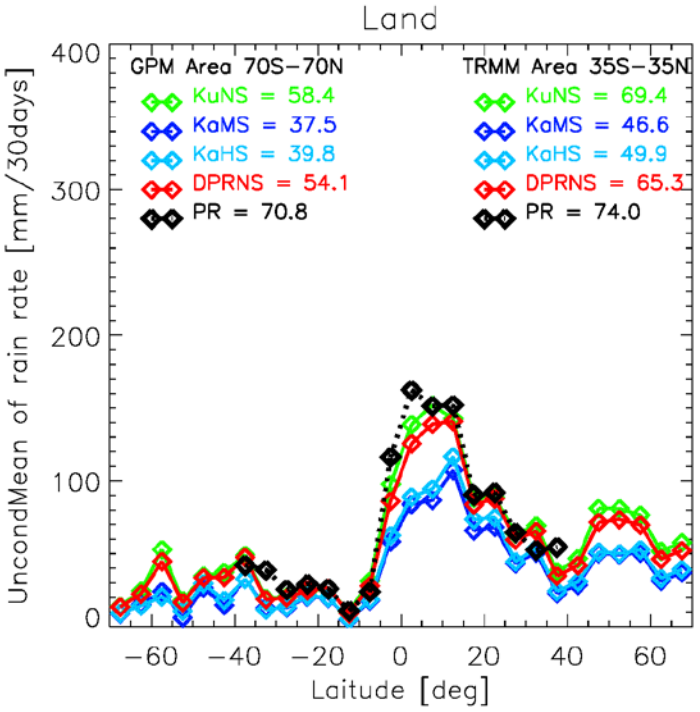




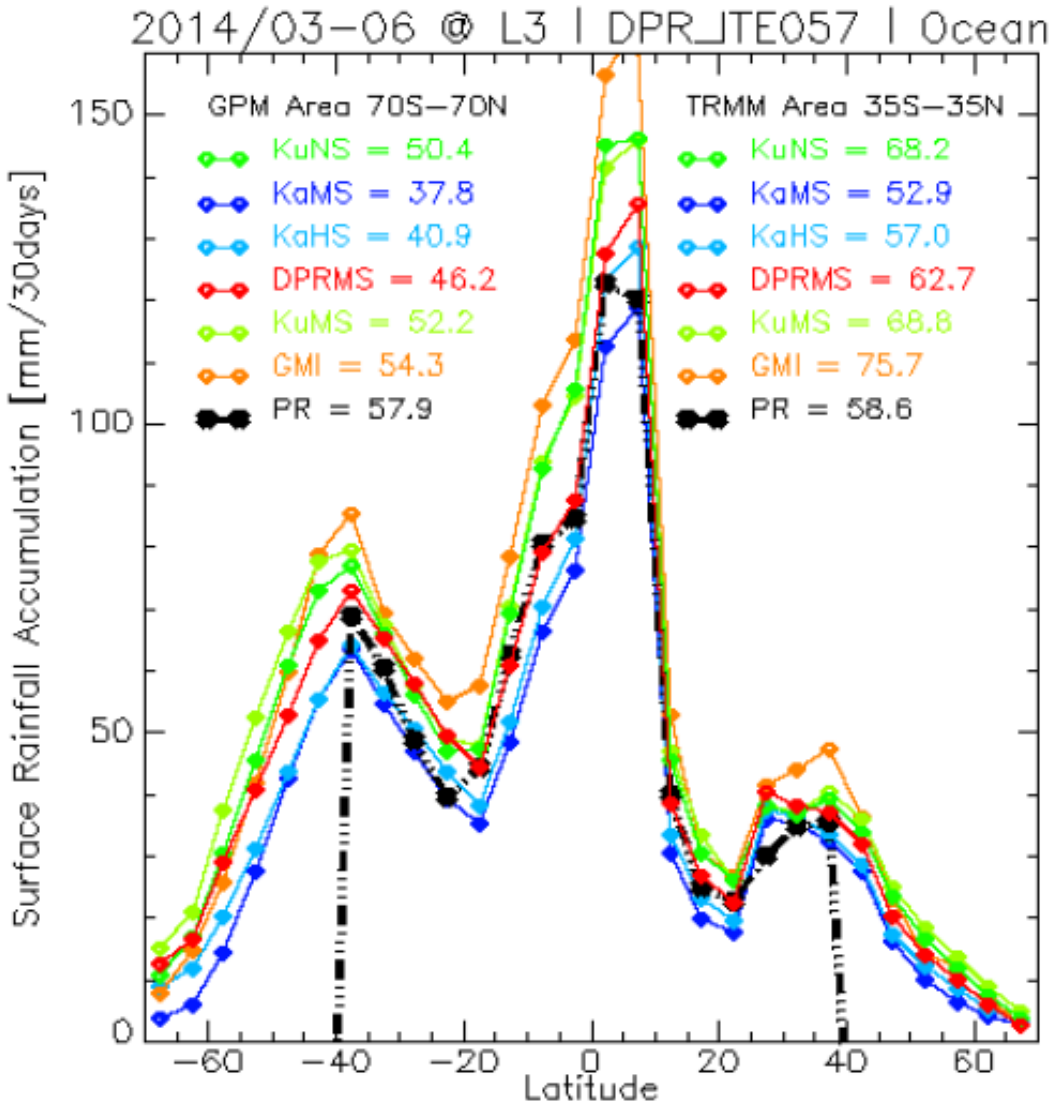
V04C
new (V6.20150706)
rain @ 2km







Comparisons in zonal means



Ku(NS)

Ka(MS)

Ka(HS)

DPR(MS)

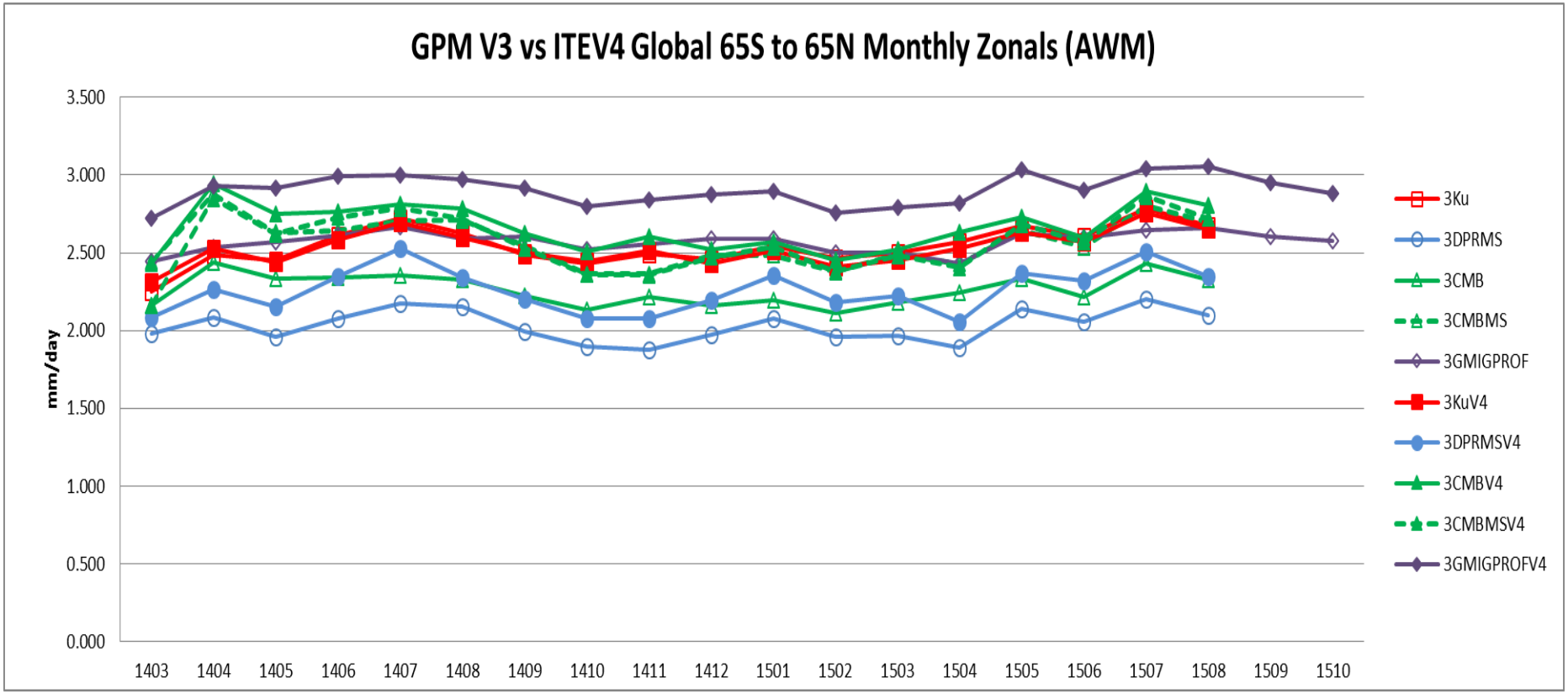
Ku(MS)

GMI

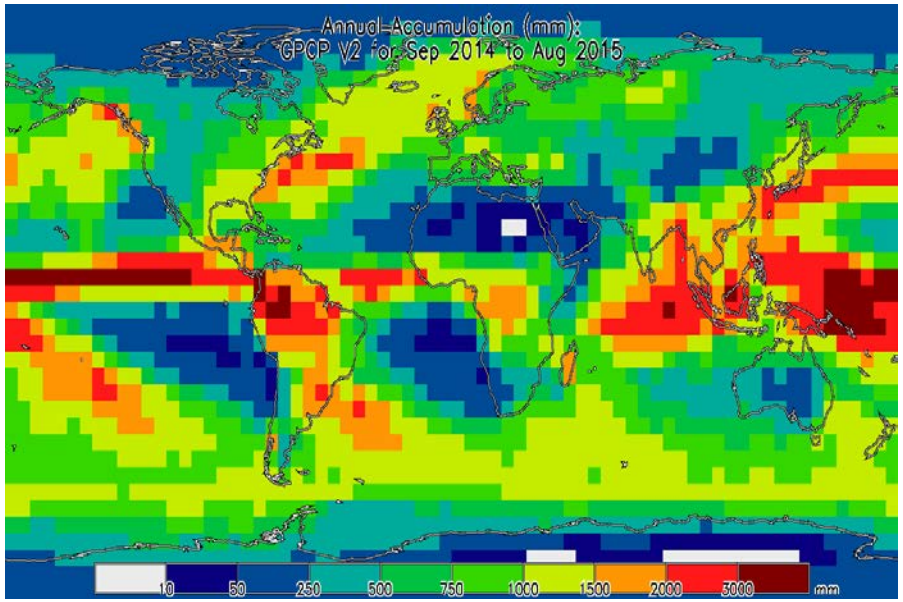
PR

Comparison of GPM V3 (public) and V4 (ITE057) algorithms Zonal Global Mean Comparison.

Solid symbols are V4 (ITE057)
Open symbols are V3 (Public)
Agreement in zonal mean does not imply regional agreement between estimates.



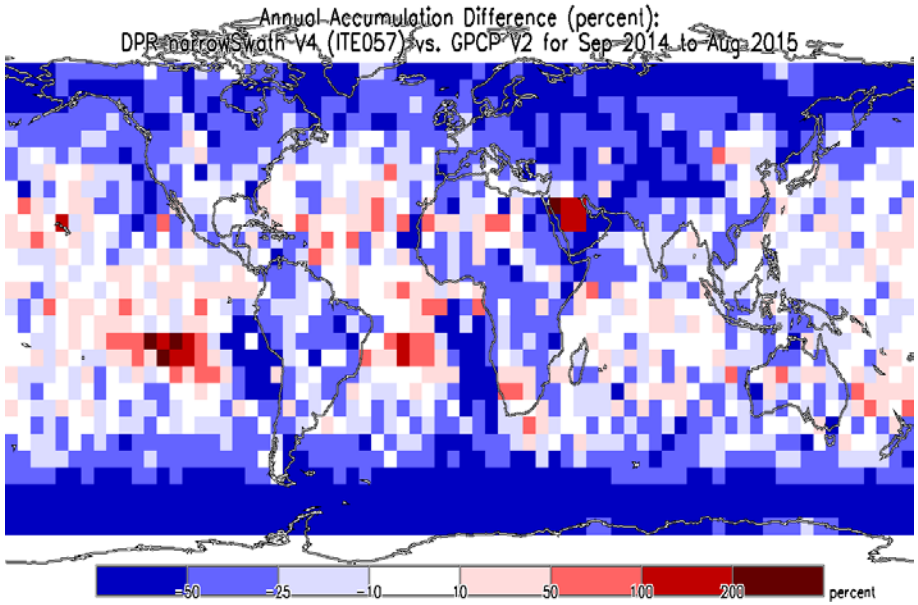
GPCP V2.2 Accumulation



Annual Accumulations Sept. 2014 – Aug. 2015

GPCP V2.2 and DPR (MS)

DPR (MS) V4 - GPCP V2.2 Relative Differences in Percent

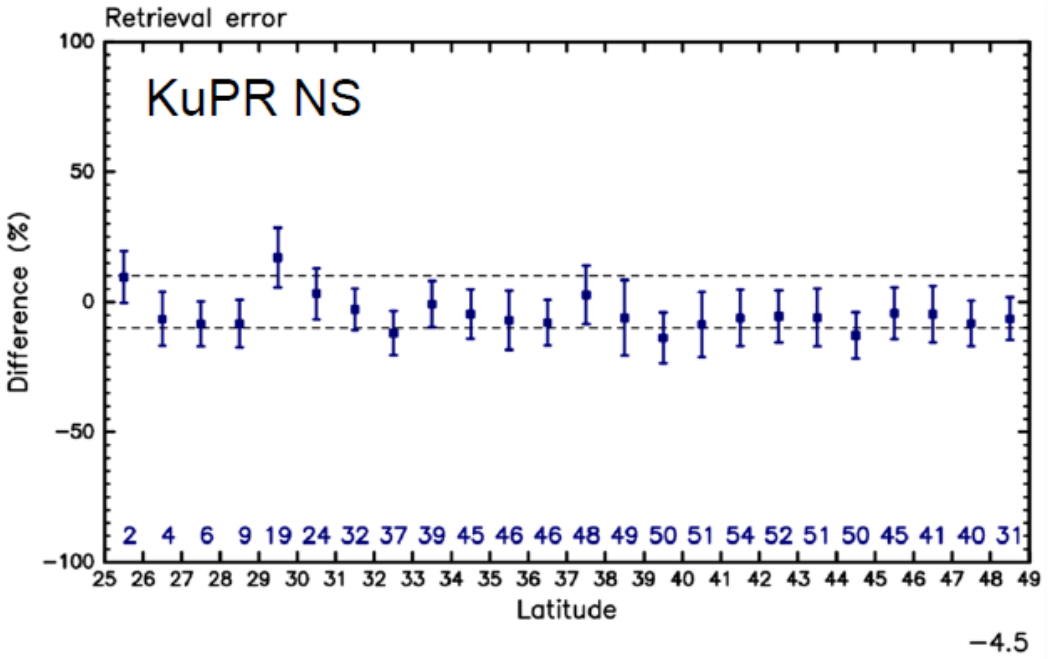


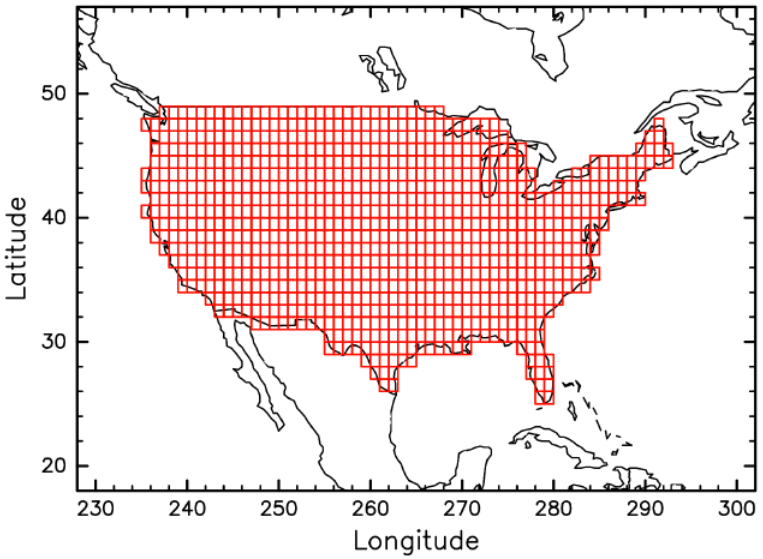
(DPR – GPCP)/GPCP

Comparison with NSSL's Multi-Radar/Multi-Sensor (MRMS) data

$$\frac{\text{DPR - MRMS}}{\text{MRMS}}$$

Priod: April 2014-March 2015
Data: Only satellite overpass time
871 1 deg x 1 deg boxes
1-deg. zonal means





(N. Kawamoto)

Summary

- Several improvements have been introduced into the DPR algorithm since V3.
  - Sidelobe clutter is now reasonably well removed.
  - New classification module with DFRm method works well.
  - DF Solver module adopts conservative method in V04.
  - Rain estimates from KaPR have been improved substantially.
- ready to propose current algorithm as V4.

- There are future issues and possible improvements.
  - ✓ Absolute calibration of radar
  - ✓ Effect of NUBF and multiple scattering
  - ✓ Regional and seasonal characteristics of the R-D_m relationship
  - ✓ Increase the reliability of PIA estimates with SRT
  - ✓ snow/rain separation using information from DFRm, Z(Ku) and other infomation (ex. storm depth)
    - DFRm and calibration are important components.