Use of the reprocessed GMS/MTSAT data in JRA-55

Shinya Kobayashi[1]

Y. Ota[1], R. Oyama[2*], K. Shimoji[2], D. Uesawa[2*], T. Imai[2], A. Okuyama[2**],

Y. Harada[1], M. Moriya[1], S. Yasui[1], K. Onogi[1], A. Ebita[1]

[1]Japan Meteorological Agency (JMA)

[2]Meteorological Satellite Center (MSC) / JMA

present affiliations;

[*] Meteorological Research Institute (MRI) / JMA

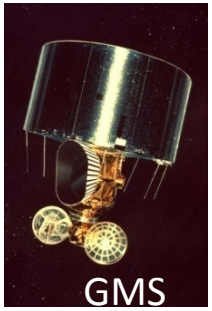
[**]Earth Observation Research Center (EORC) / Japan Aerospace Exploration Agency (JAXA)

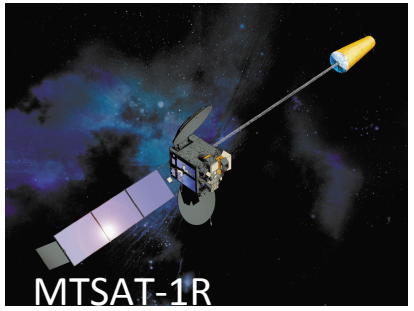
Outline

- Satellite meteorological products for climate monitoring at JMA/MSC
  - Atmospheric Motion Vector (AMV)
  - Clear Sky Radiance (CSR)
- Correction of Spectral Response Function (SRF) of the GMS-5 water vapor channel
- Observing System Experiments (OSEs) for the reprocessed AMV/CSR data
- Summary

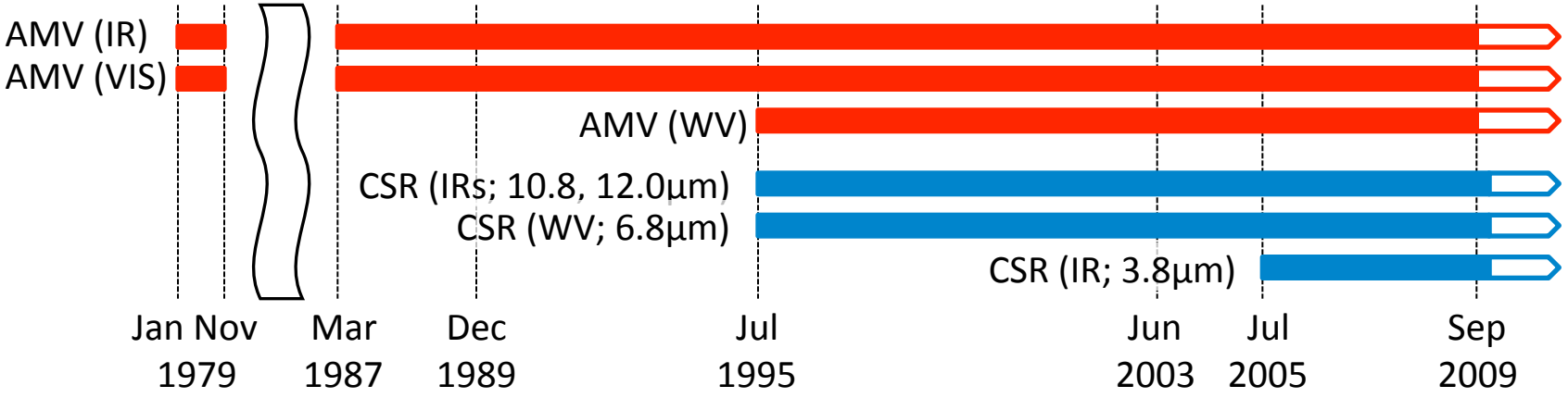
Satellite meteorological products for climate monitoring at JMA/MSC

- JMA's contribution to SCOPE-CM and reanalysis
  - **SCOPE-CM**: Sustained, Coordinated Processing of Environmental Satellite Data for Climate Monitoring





GOES-9

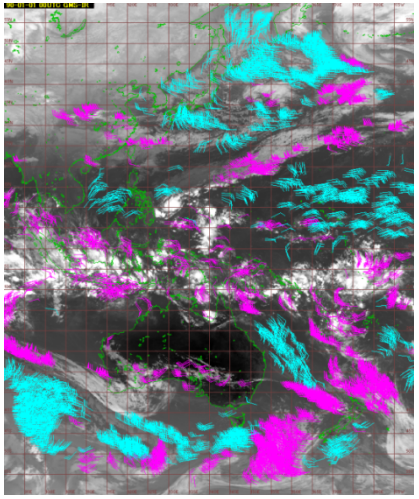


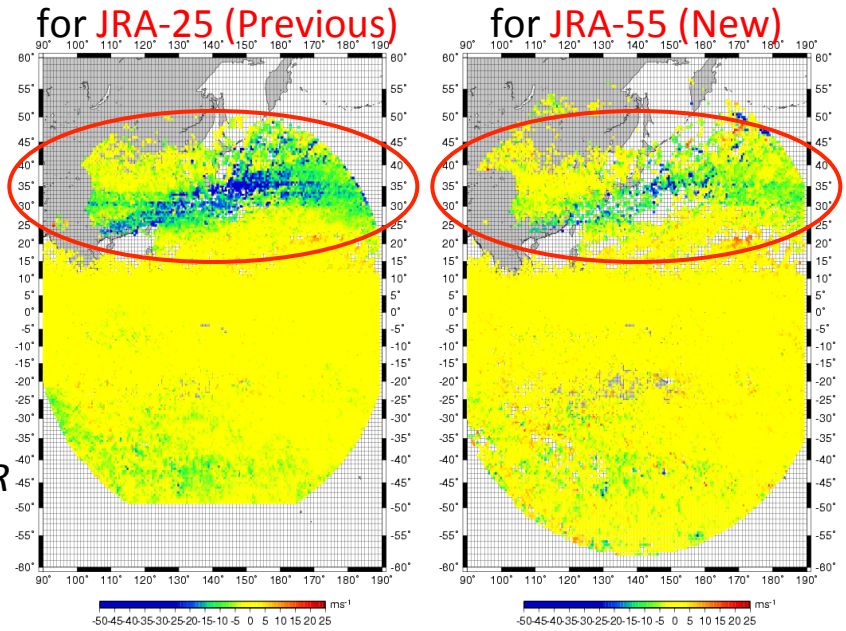
- The reprocessed AMVs and CSRs are provided to the Japanese 55-year Reanalysis (JRA-55)

Reprocessed Atmospheric Motion Vectors (AMV) from GMS, GOES-9 and MTSAT-1R

- JMA/MSC has reprocessed AMVs from GMS, GOES-9 and MTSAT-1R using the latest algorithms as of Sep. 2009, which incorporates;
  - improvement of the height assignment scheme
  - optimally resized image segment for tracking clouds and water vapor pattern
  - expansion of the derivation area from 50S-50N to 60S-60N

Example of AMVs for GMS-4 at 00UTC 1 Jan. 1990 (pink) above 700hPa (aqua) below 700hPa





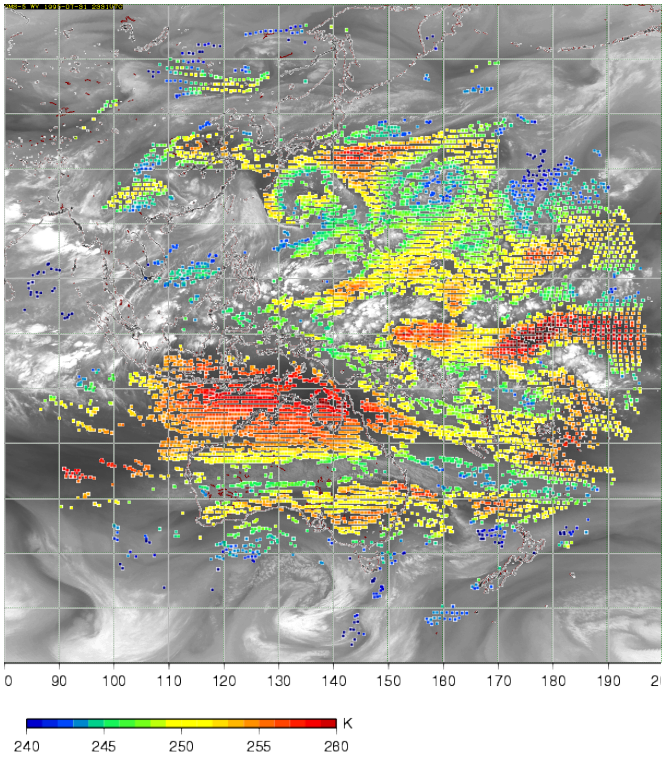
Wind speed bias of high-level IR AMVs w.r.t. JRA-25 (Jan. 1990)

For more information;
http://mscweb.kishou.go.jp/product/reprocess/index.htm

Ryo Oyama

Reprocessed Clear Sky Radiance (CSR) from GMS-5, GOES-9 and MTSAT-1R

- The CSR provides area average radiances for cloud-free pixels,
  - with a spatial resolution of
    - 80 x 80 km^2 for GMS-5
    - 60 x 60 km^2 for GOES-9 and MTSAT-1R
  - with a time resolution of 1 hour
  - providing information not only on the upper-tropospheric humidity but also on the upper-tropospheric wind field
- available from 1995, extending by 11 years from the time when the production became operational at MSC.



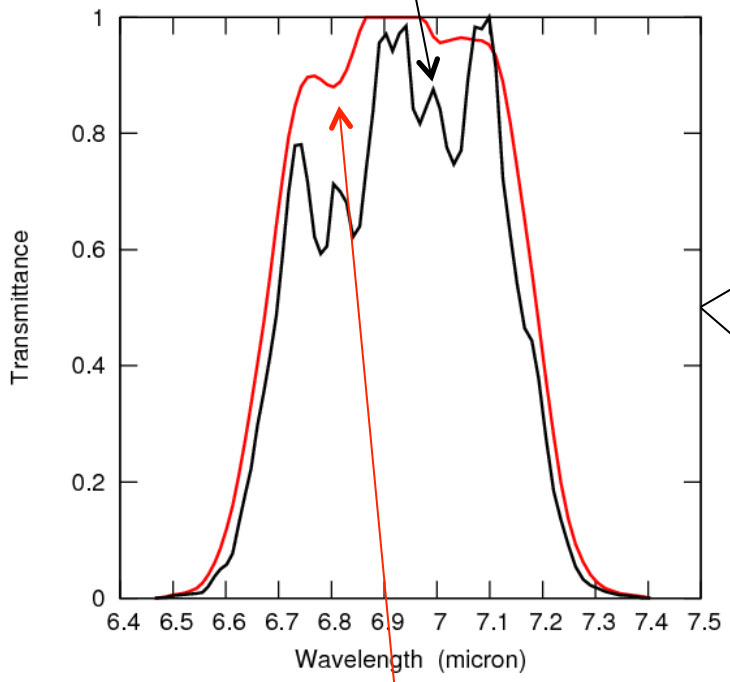
Example of CSRs for the GMS-5 WV channel at 00UTC 1 Aug. 1995

For more information;
http://mscweb.kishou.go.jp/product/reprocess/index.htm

Takahito Imai

Correction of Spectral Response Function (SRF) of the GMS-5 water vapor channel

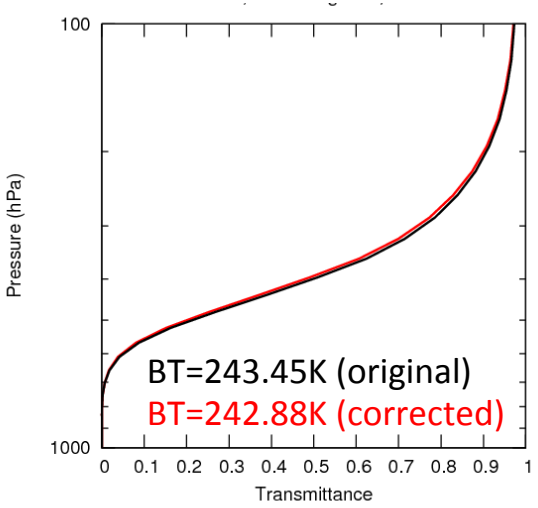
Original SRF measurement was contaminated by atmospheric water vapor absorption



SRF of the GMS-5 WV channel

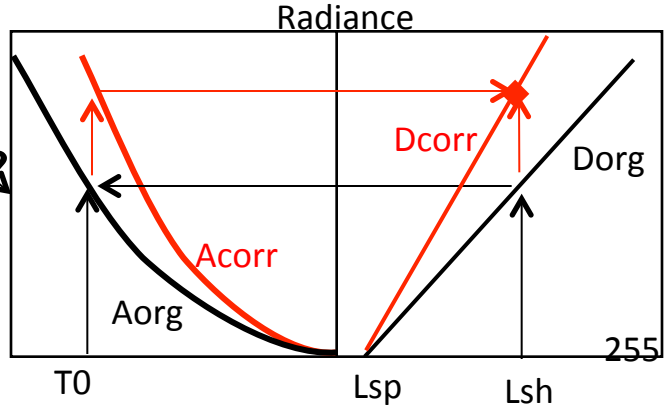
Corrected SRF proposed by Breon et al. (1999)

Correction to RT



Transmittance for a mid-latitude profile computed using RTTOV-10 (Saunders et al., 2012)

Correction to calibration



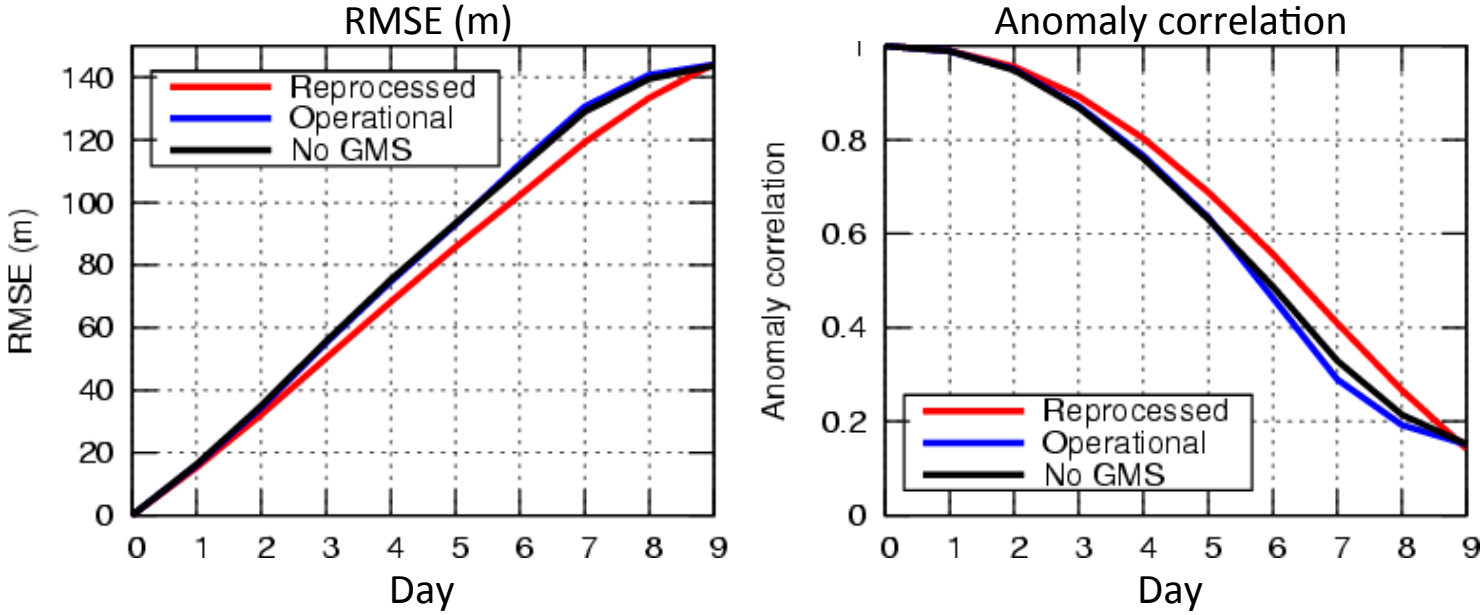
References

Breon et al., 1999: Evidence of atmospheric contamination on the measurement of the spectral response. *J. Atmos. Oceanic. Technol.*, **16**, 1851-1853.

Saunders et al., 2012: '*RTTOV-10 science and validation report*'. 31pp.

Observing System Experiments (OSEs) for the reprocessed AMVs

- OSEs using the JRA-55 data assimilation system (TL319L60)
  - low resolution version of the JMA operational system as of Dec. 2009
  - period: Jun. 1990
  - Exp1: no AMVs from GMS-4
  - Exp2: operational AMVs from GMS-4
  - Exp3: reprocessed AMVs from GMS-4

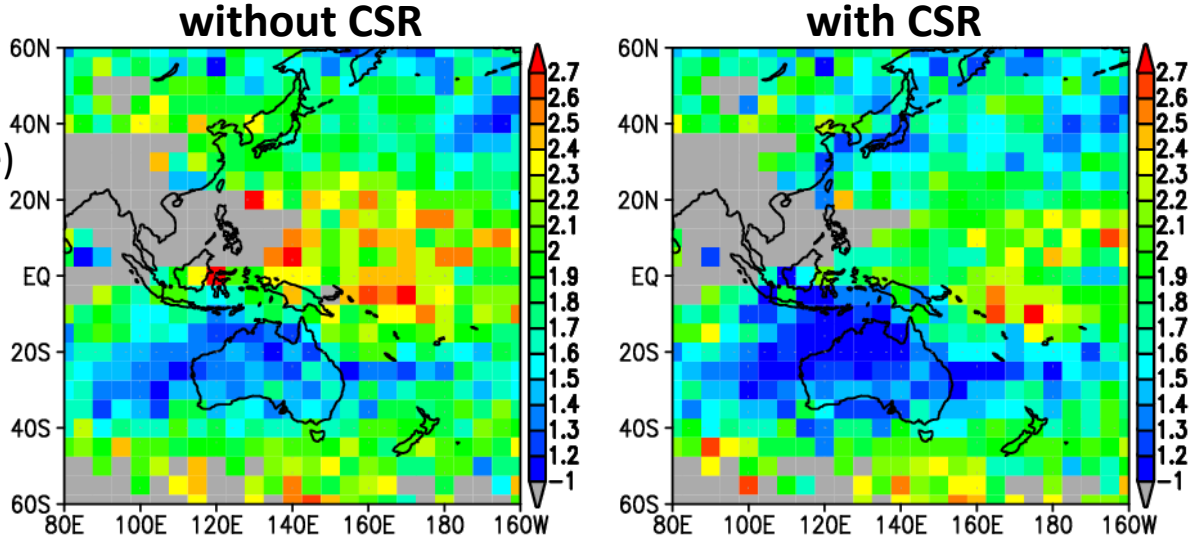


Z500 forecast scores for the extra tropical southern hemisphere for Jun. 1990

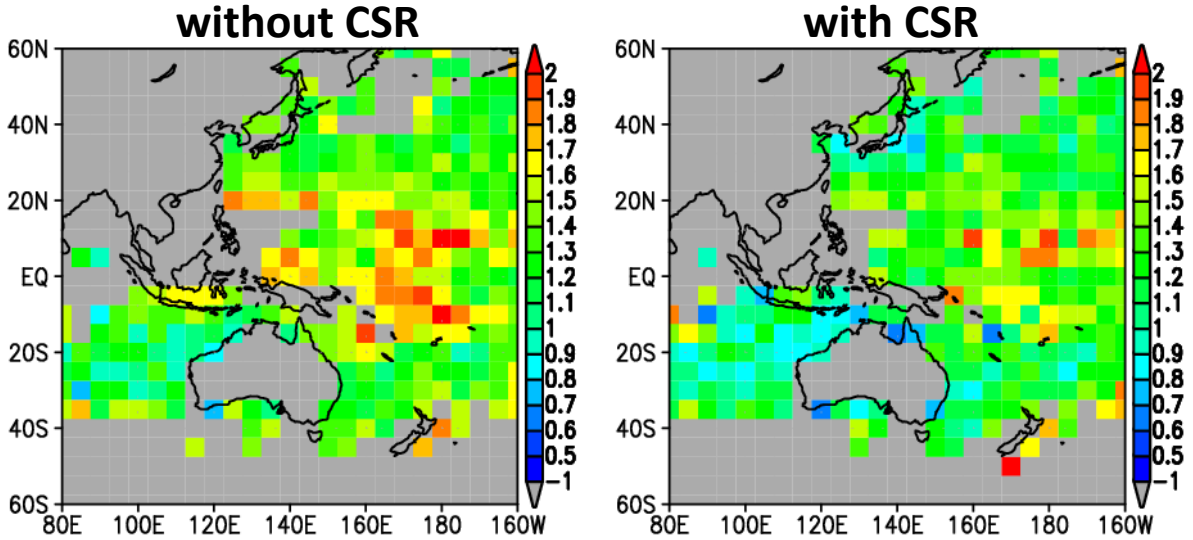
Observing System Experiments (OSEs) for the reprocessed CSRs

RMS first guess departures of the NOAA-12 HIRS humidity channels for Aug. 1995

Channel 12 (upper-troposphere)

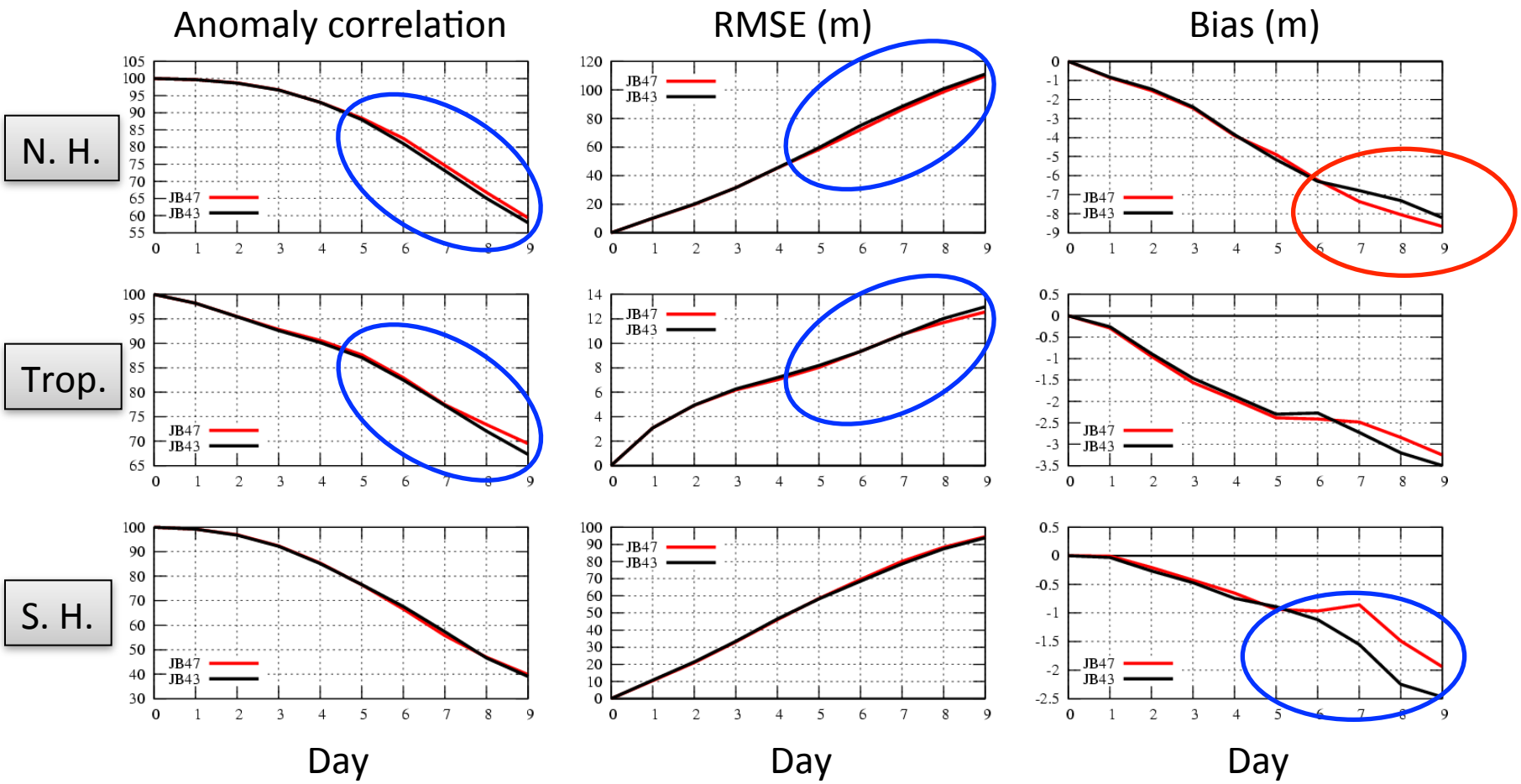


Channel 11 (mid-troposphere)



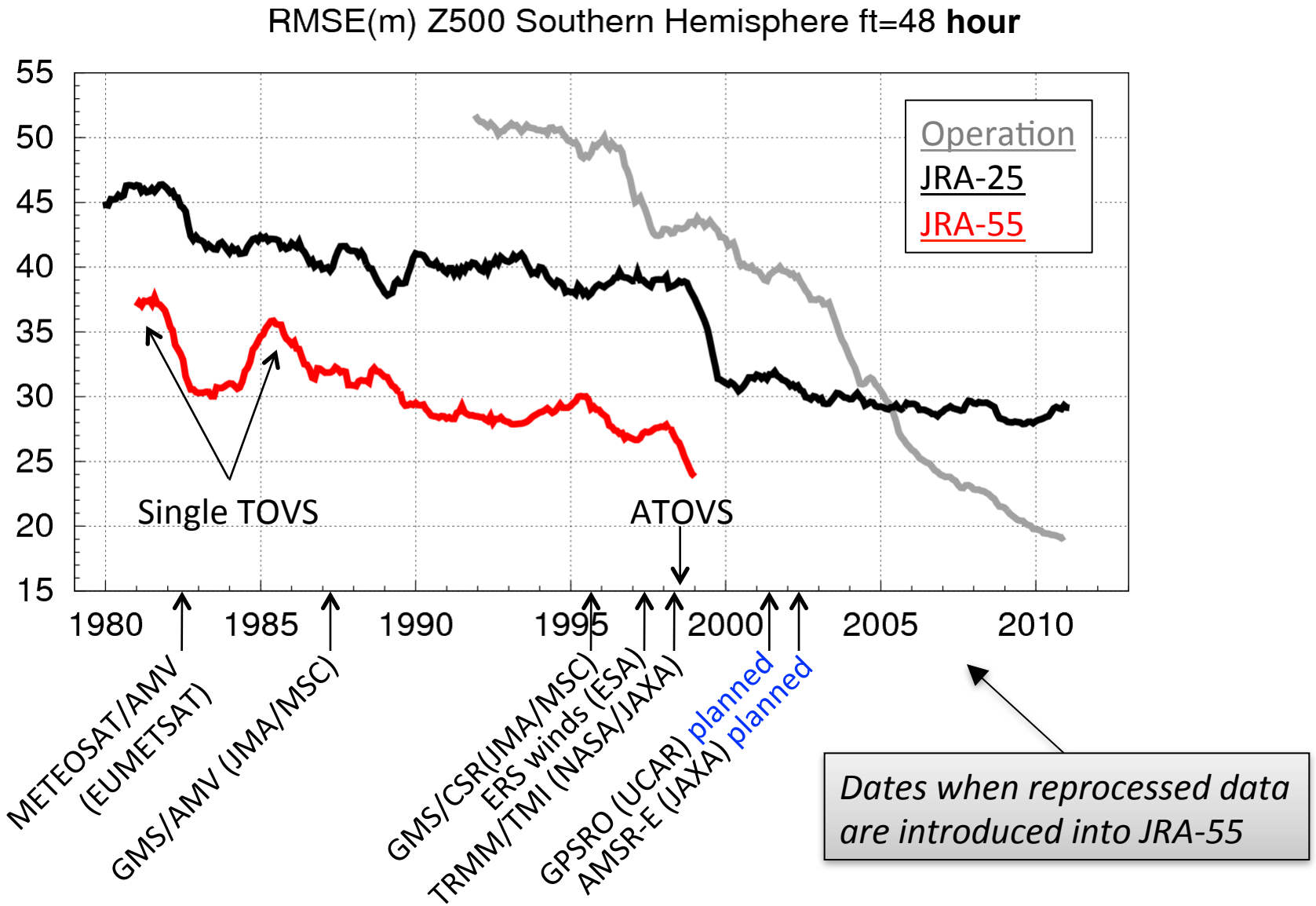
Impact of SRF correction on forecast accuracy

500hPa geopotential height forecast scores for January 1996



Original SRF Corrected SRF

Use of reprocessed satellite data in JRA-55



Summary

- JMA/MSC has reprocessed AMV/CSR from GMS, GOES-9 and MTSAT as a pilot project within the framework of SCOPE-CM
- OSEs using the JRA-55 system demonstrate the newly reprocessed data have high quality and these data are expected to improve reanalysis products
- To better use reprocessed satellite data, our abilities to simulate those data also need to be improved, e.g. using correct SRFs, improving RT models and so on
- For further improvement of reanalysis products, reprocessing past satellite observations and its continuation is essential

Thank you!