Recent activities on microwave radiance data assimilation at JMA  
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**JMA global NWP system and satellite radiance data**

**Forecast model and data assimilation**
- Outer model: TL959L100 (horizontal resol. 20km, top 0.01hPa)
- Inner model: TL319L100 (horizontal resol. 55km, top 0.01hPa)
- 6-hr assimilation window, incremental 4D-Var
- Analysis variables: (Wind, surface pressure, specific humidity and temperature)
- 11 day forecast from 00, 06, 12, 18 UTC initials.
- Radiative Transfer Model
  - RTTOV-10.2 (planned to use RTTOV-11 in the next year)
- Bias correction Method
  - VarBC for radiance data

**Satellite radiance data for operational use (clear-sky)**
- Microwave data: AMSR2/GOCOM-W, AMSU/Aqua, AMSU/Metop, MHS/NOAA, MHS/Metop, SSMS/DMSP, SAPHIR/Megha-Tropiques
- Infrared radiance: AIRS/Aqua, IASI/Metop, CSR/GOES, CSR/MTSAT, CSR/Meteosat

**Monitored and evaluated radiance data**
-CSR/Himawari-8, GMI/GPM, ATMS/S-NPP, CrIS/S-NPP

**Under preparation for monitoring**
- SSMS/DMSP F19, MWHS/FY-3B, MWHS2/FY-3C, MWRI/FY-3B

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**Assimilation of SAPHIR Tb data in JMA global DA system**

**Used data coverage of MHS and SAPHIR**

**In operational use since 25 June 2015**
- Clear-sky and oceanic data assimilation (6 channels)
- Cloud-screening is based on adjacent channel’s FG departure
- High frequent observation in Tropics e.g. 4 time observation for TC in 6-hr assimilation window

**Assimilation experiment**
- **Control**: Same as JMA operational global DA system as of Sep. 2014
- **Test**: Control + SAPHIR radiance (clear-sky and oceanic data, 6 ch.)

**Results**
- Positive impacts for typhoon track prediction
- Improved waver vapor field in AN and FG in Tropics (not shown here)

**Figures**
- (a) Typhoon track forecast errors averaged for equalized samples (Test, Control)
- (b) Difference of Typhoon track forecast error between Test and Control
- (c) An example case of improved track forecast in Test run.

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**Development of all-sky microwave imager radiance assimilation in JMA global DA system**

**All-sky assimilation of AMSR2, GMI, SSMIS F16, F17, F18**

- Clear-sky MW Imager radiance assimilation
  - RTM: RTTOV-10
  - Input profile: Temperature, Water vapor
  - Data thinning: 200 km grid-box thinning
  - Used MW Imager: AMSR2, SSMS (F16, F17, F18), TMI
  - Used channels: 19V, 23V, 37V, 89V clear-sky oceanic data

- Data assimilation experiment for comparison
  - DA system: JMA global 4D-Var DA system
  - Period: From 10 June to 11 August, 2014
  - 11-day forecast from 12 UTC initial every day

**Results**
- Improved fits in FG departure
- Negative value indicates improvement

**Realistic analyzed TPW in cloudy condition**

**Summary and plans**

**Operational use of clear-sky SAPHIR radiance since 25 June 2015**
- Positive for moisture analysis in Tropics and TC track prediction

**Development of all-sky microwave radiance assimilation**
- Promising results from the initial experiment
- Need to study forecast model biases related to cloud physics and precipitation process

**Preparation for new radiance (GMI, ATMS, CrIS, Himawari-8)**