Recent Developments in Satellite Data Assimilation at CMA

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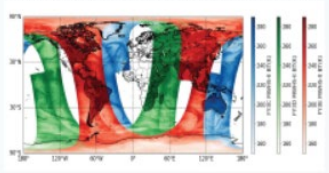
CEMC/CMA

March 15–23, 2023, Tromsø, Norway

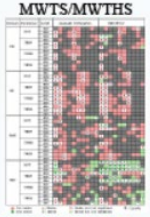
New sensors

1. FY-3E

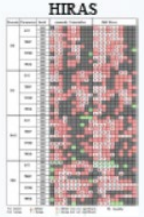
FY3E is the world's first early-morning-orbit meteorological satellite for civil use([5])



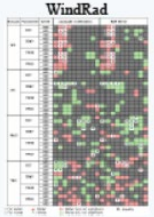
MWTS/MWTHS



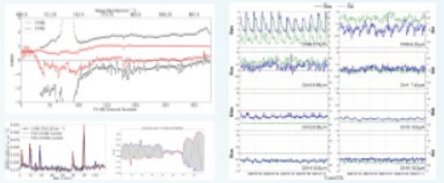
HIRAS



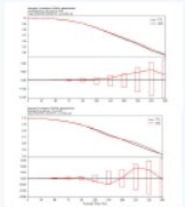
WindRad



2. FY-4B



GIIRS



AGRI

3. HY-2B

HY-2B SMR covers the gap between FY3C/D MWRI

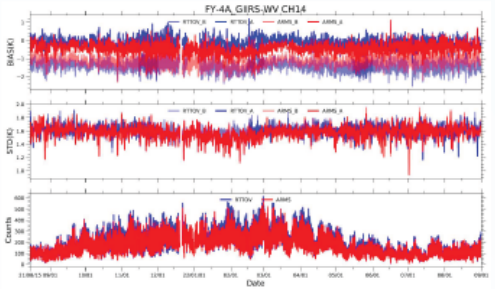
4. Aeolus ALADIN winds

Observation Number

Forecast Score Card

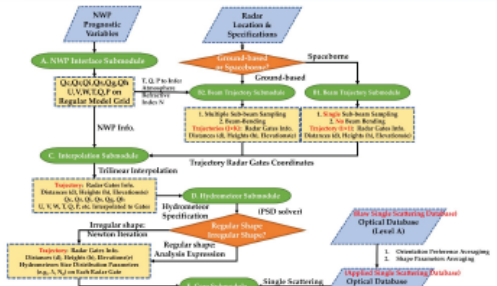
Observation Operators

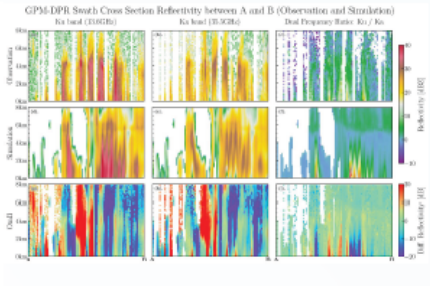
1. ARMS (Advanced Radiative transfer Modelling System)



- ARMS([2]) has been integrated into CMA-GFS, and one-year test has shown that its assimilation and forecasting capabilities are comparable to RTTOV
- The OmB bias, STD and counts for FY-4A GIIRS water vapor channel No.14, by radiative transfer model ARMS / RTTOV
- Improvements was found by using ARMS in current DA system of GRAPES

2. Radar operator for spaceborne radar onboard FY3G(RM)



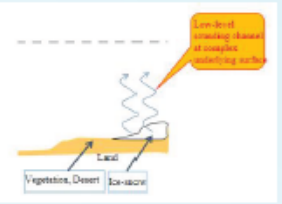


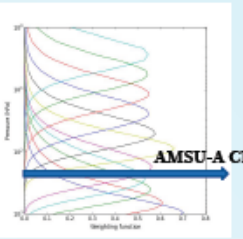
New Techniques

1. Progress in all-surface DA

- **Surface emissivity retrieval for lower tropopause sounding channels**

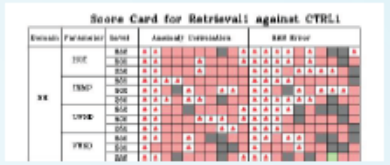
$$\varepsilon_{(p,v)} = \frac{R_{(p,v)} - R\uparrow - R\downarrow\Gamma}{\Gamma\left(R_s - R\downarrow\right)},$$





AMSU-A by Traditional TELSEM2

AMSU-A by Window Channel Retrieval



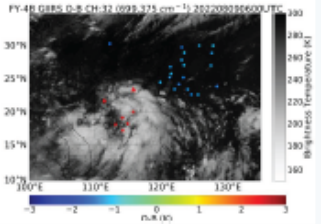
- **Scores was significantly improved by all-surface techniques and window channel retrieval methodology applied for AMSU-A channels 5&6, especially in N.H. with wider coverage of land surface**

2. Progress in all-sky DA

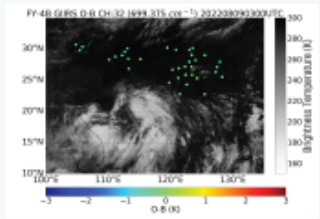
- **FY3D-MWRI 37GHz V pol. OmB (Simulated by RTTOV-SCATT v12.3)**

3. Progress in Targeted Observation DA

Radiosonde thrown by aircrafts

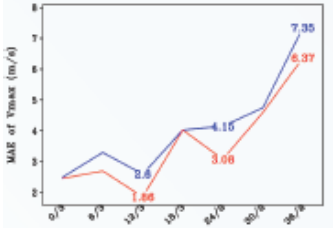


FY-4B GIIRS

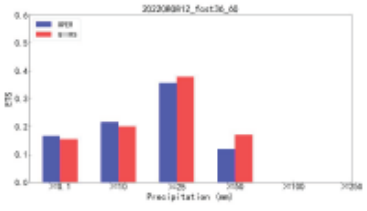


- Ground–space–sky observing system experiment during tropical cyclone Mulan in August 2022([4])
- Clear regions: FY-4B GIIRS observations of high temporal frequency
- Cloud regions: using observations of Radiosonde thrown by aircrafts

Typhoon intensity forecast scores



Precipitation forecast scores



- Ground-space-sky targeted observations was assimilated into CMA-GFS 4DVar system
- Significant improvements were found for typhoon intensity and precipitation forecasts scores