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Assessment of FY-3A and FY-3B/MWHS observations

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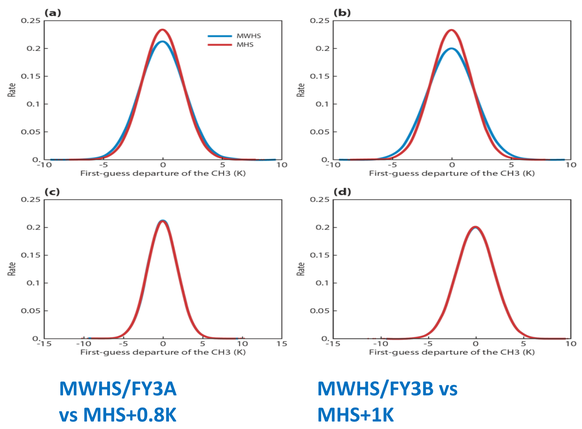
Abstract

The FY-3 series began in May 2008 with the launch of the FY-3A satellite. The Microwave Humidity Sounders (MWHS) provide vertical information about water vapour, which is important for numerical weather prediction (NWP). The Noise Equivalent Delta Temperature (NEDT) of the MWHS is higher than that of the Microwave Humidity Sounder (MHS) instrument (e.g. on MetOp-B) but lower than that of the older AMSU-B instruments (on NOAA-15, 16 and 17). Assimilation of MWHS observations into the ECMWF Integrated Forecasting System (IFS) improved the fit of short-range forecasts to other observations, notably MHS, and also slightly improved the longer-range forecast scores verified against analyses. Also, assimilating both the MWHS/FY-3A and the MWHS/FY-3B gave a larger impact than either instrument alone. Furthermore when MWHS and MHS were added separately to a baseline using neither, the MWHS impact was found to be comparable to MHS. Consequently, ECMWF have been assimilating the FY-3B MWHS data in the operational forecasting system since September 24th, 2014. This is the first operational use of Chinese polar orbiter satellite data by an NWP centre outside China.



MWHS/FY3A vs MHS+0.8K

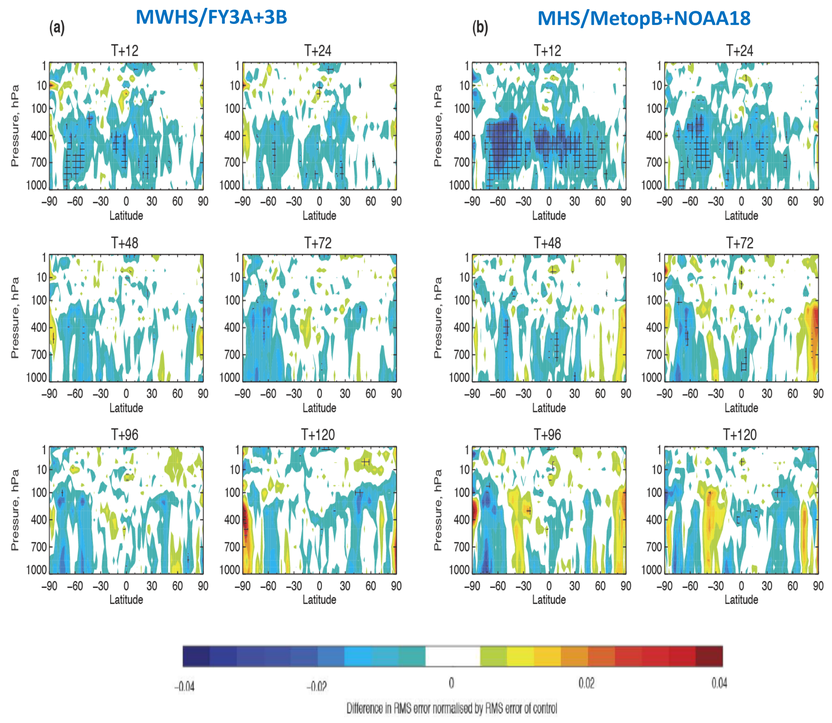
MWHS/FY3B vs MHS+1K

Two Months Experiments setup

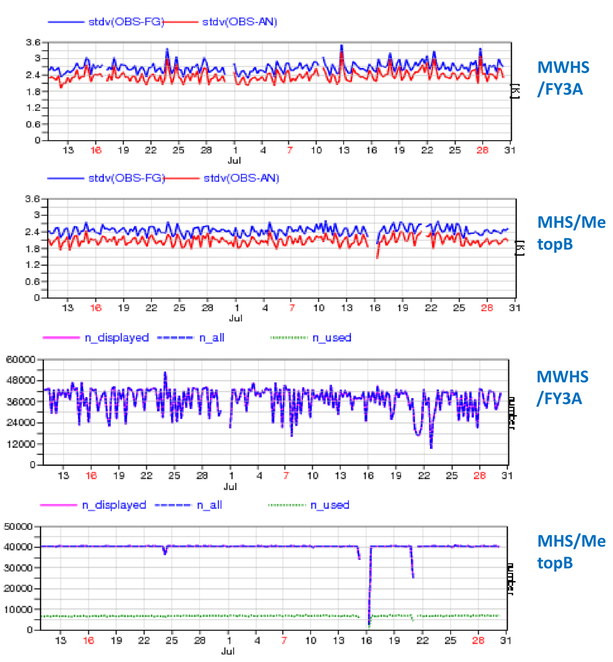
Experiment I, 2013071000Z-091012Z, with MWHS/FY3A,forecast time 00Z,12Z (control run:no MWHS,38R2,40km)

Experiment II, 2013070700Z-090712Z, with MWHS/FY3B, forecast time 00Z,12Z (control run:no MWHS,38R2,40km)

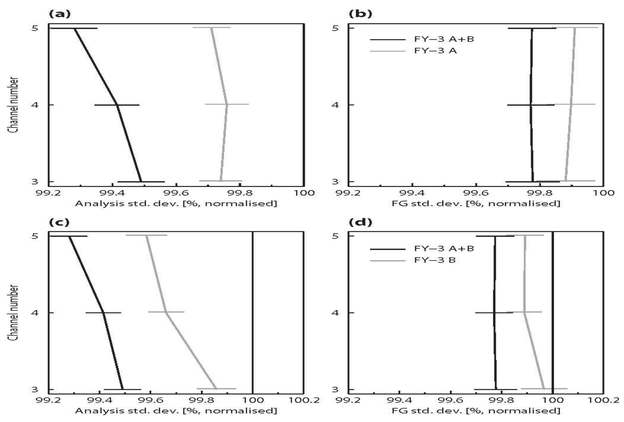
Experiment III, 2013071000Z-091012Z, with MWHS/FY3A+3B,forecast time 00Z,12Z (control run: no MWHS,38R2,40km)



All data comparison between MWHS and MHS

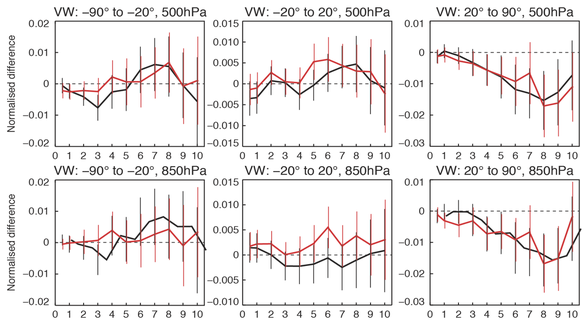


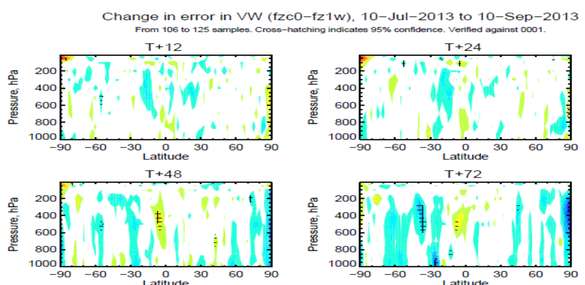
Assimilation Impacts



Forecasting Impacts

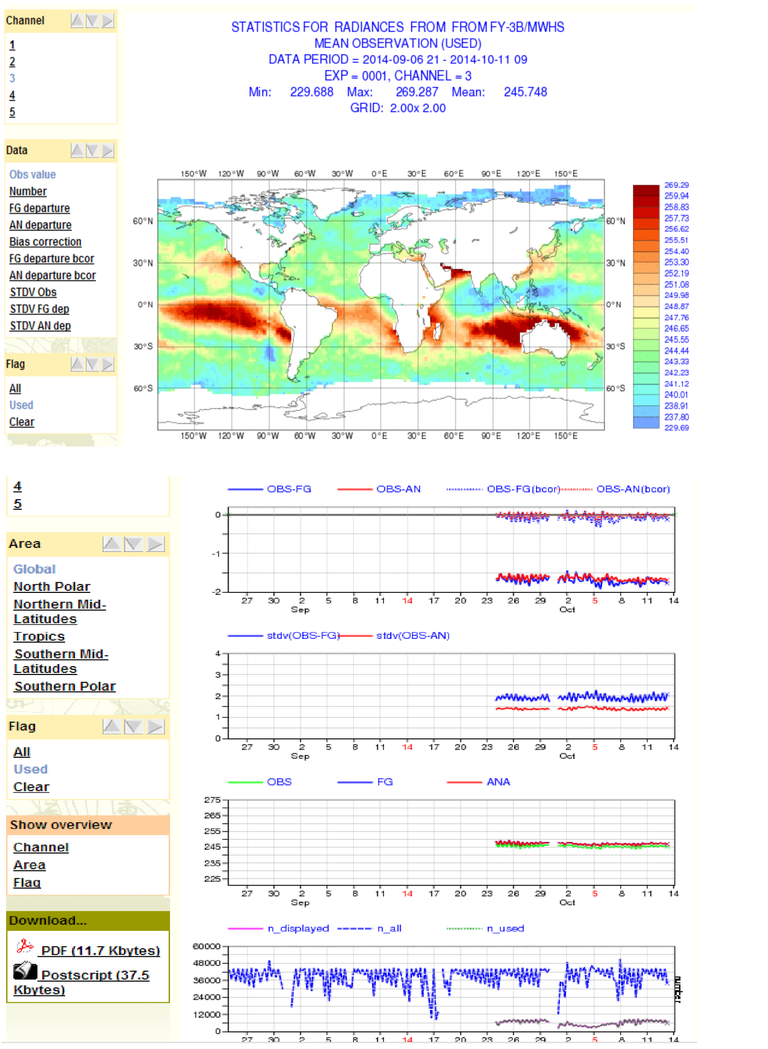
Positive



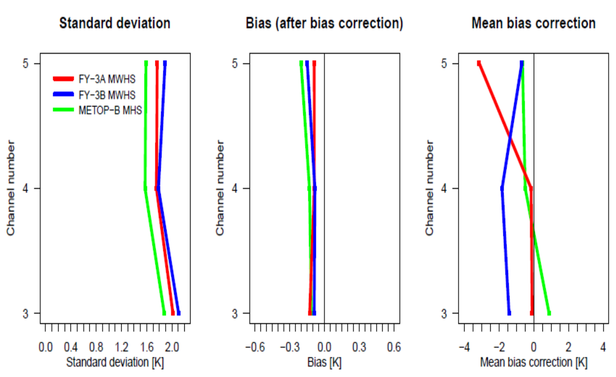


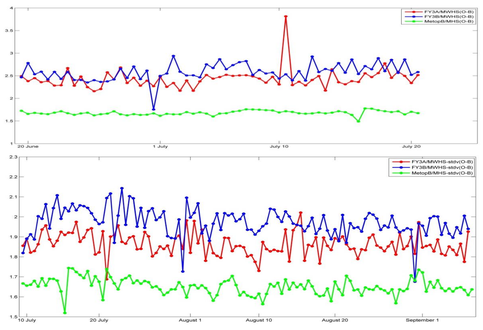
Positive

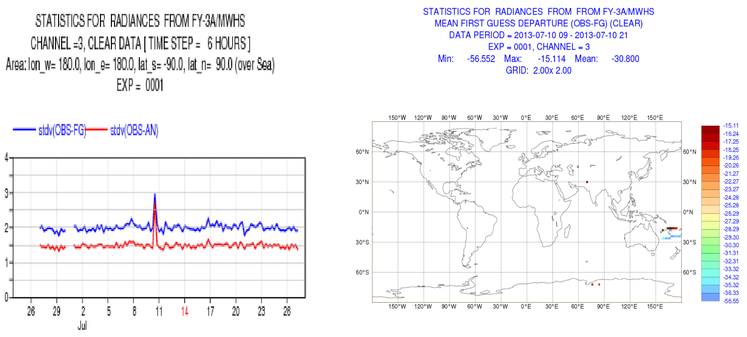
Operational Use in ECMWF



MWHS Clear data VS. MHS Used data

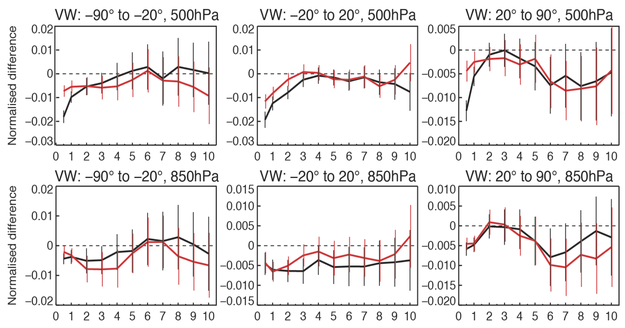






Independent Forecasting Impacts

Satellite	ECT	Satellite	ECT
FY-3A	10:15 desc	Metop-B	09:30 desc
FY-3B	13:40 asc	NOAA-18	15:23 asc



Conclusions:

1. MWHS data is more noisy than MHS;

2.After MWHS data assimilated into the system, it shows positive impact on MHS and improved the forecast scores.

3.Assimilation with MWHS/3A+3B shows better results than only 3A or 3B assimilated.

4. The independent assimilating and forecasting impacts of MWHS are comparable to those of the MHS.

5. ECMWF actively use MWHS/FY-3B in operational since the September 24th,2014.

Ref: Chen,K., English,S., Bormann,N., Zhu,J., 2015. Assessment of FY-3A and FY-3B/MWHS observations. *Weather and Forecasting.* Vol. 30, No. 5.