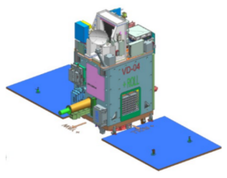
Preparedness of the DA system for the assimilation of Microsat-2B MHS radiances at NCMRWF (15p.13)

S. Indira Rani, Achintya Paliwal, Sumit Kumar, John P. George and V.S. Prasad

indirarani.s@gov.in, indira@ncmrwf.gov.in

Mm Wave Humidity Sounder (Microsat-2B) on SSLV-D2

- Experimental mission , launched on 10 February 2023
- 3-D humidity profiling from surface to 12km; follow-on to SAPHIR.
- Vertical resolution < 2km and spatial resolution of 10 km @nadir.
- Analysis of the diurnal cycle of water vapour distribution.
- To aid in improving operational forecasts including Tropical cyclone.

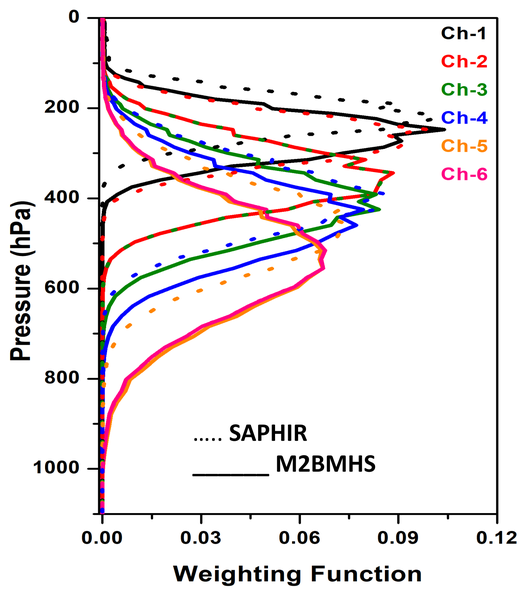


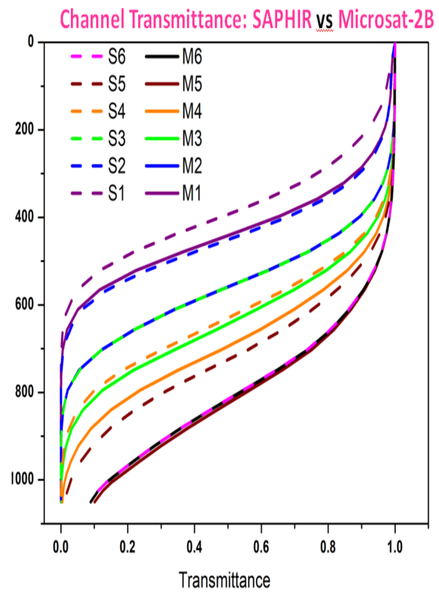
Mm Wave Humidity Sounder (MHS) on MICROSAT-2B

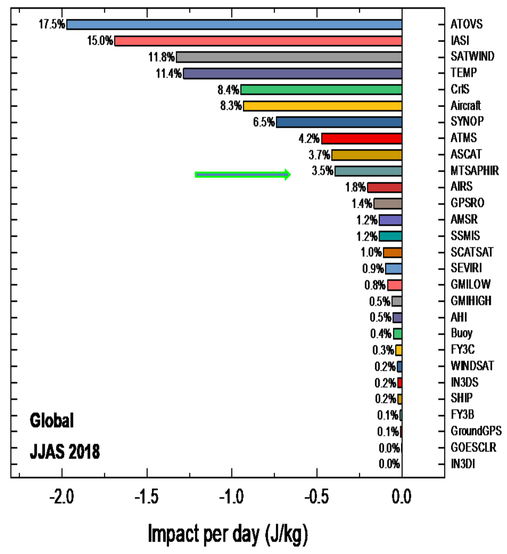
Parameter	Specifications
Orbit	Circular, 37° inclination
Altitude	450 km
Swath	1050 km
Frequency band	183.31±16.25 GHz
Spatial resolution @ Nadir, Swath Edge	10 km, 20 km
Dwell/ Integration time	4msec
Scan Rate	50 rpm
Mission Life	12 months

Channel Specifications

No.	Frequency (in GHz)	Noise (dB)	risation	BW (in MHz)	NEDT (K) at 300 K at 4ms
1	183.31±0.96	7	QH	300	1.5
2	183.31±2.8	6	QH	600	0.85
3	183.31±4.5	7	QH	1000	0.85
4	183.31±5.8	7	QH	700	1
5	183.31±11.56	8	QH	900	1
6	183.31±15.75	6.8	QH	1000	0.8



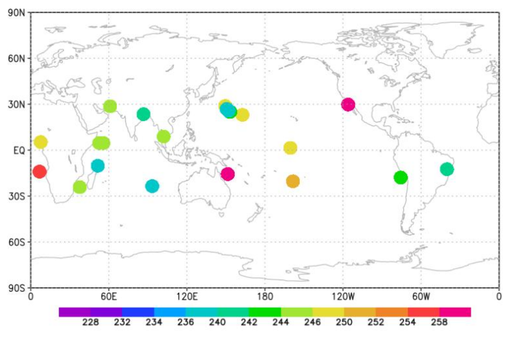




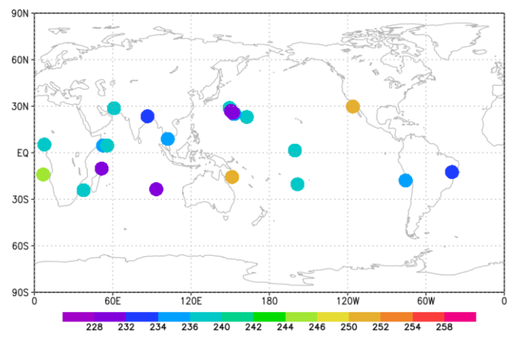
Channel no.	M2BMHS (Frequency GHz)	NEdt (K)	SAPHIR (Frequency GHz)	NEdt (K)
1	183.31 ± 0.96	1.5	183.31 ± 0.2	1
2	183.31 ± 2.8	0.85	183.31 ± 1.1	1.3
3	183.31 ± 4.5	0.85	183.31 ± 2.7	1.3
4	183.31 ± 5.8	1	183.31 ± 4.2	1.5
5	183.31 ± 11.56	1	183.31 ± 6.6	1.5
6	183.31 ± 15.75	0.8	183.31 ± 11	2

Standalone Radiative Transfer model simulation (selected profiles from ECMWF diverse dataset)

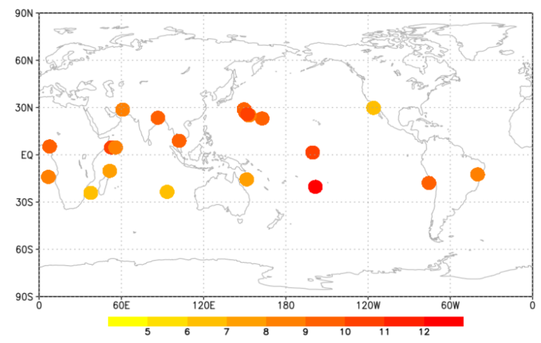
Channel-1 M2BMHS



Channel-1 SAPHIR



Differences (M-S)

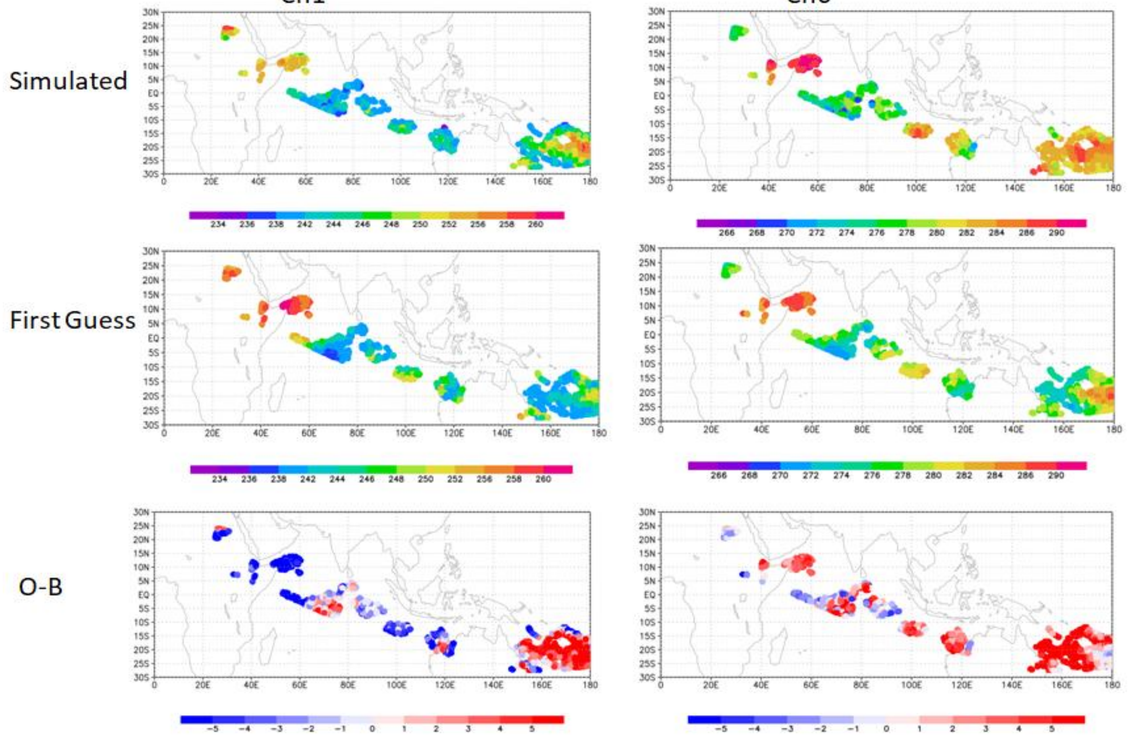


Design of a simplified OSSE for the assimilation Microsat-2B : preliminary results

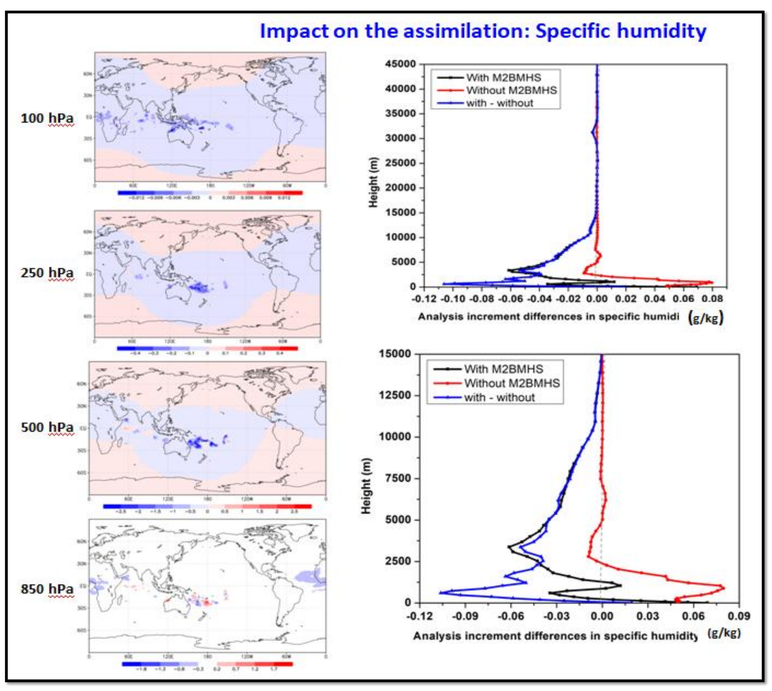
- NCMRWF operationally runs two global models, NGFS and NCUM
- Used profiles (temperature and humidity) and surface parameters from NGFS analysis/forecast to simulate the M2BMHS radiances
- Designed a simple OSSE to assimilate the simulated radiances/BT in the NCUM system

Channel No.	Frequency	Observation error (K)	Mean		RMSE	
			O-B (K)	O-A (K)	O-B (K)	O-A (K)
1	183.31 ±0.96	1.5	2.92	0.30	4.67	2.10
2	183.31 ±2.8	1.5	4.39	0.70	5.92	2.31.
3	183.31 ±4.5	1.5	6.15	1.17	7.40	2.62
4	183.31 ±5.8	1.5	7.13	1.24	8.28	2.82
5	183.31 ±11.56	1.5	8.75	1.69	9.82	3.33
6	183.31 ±15.75	1.5	9.31	1.62	10.67	3.70

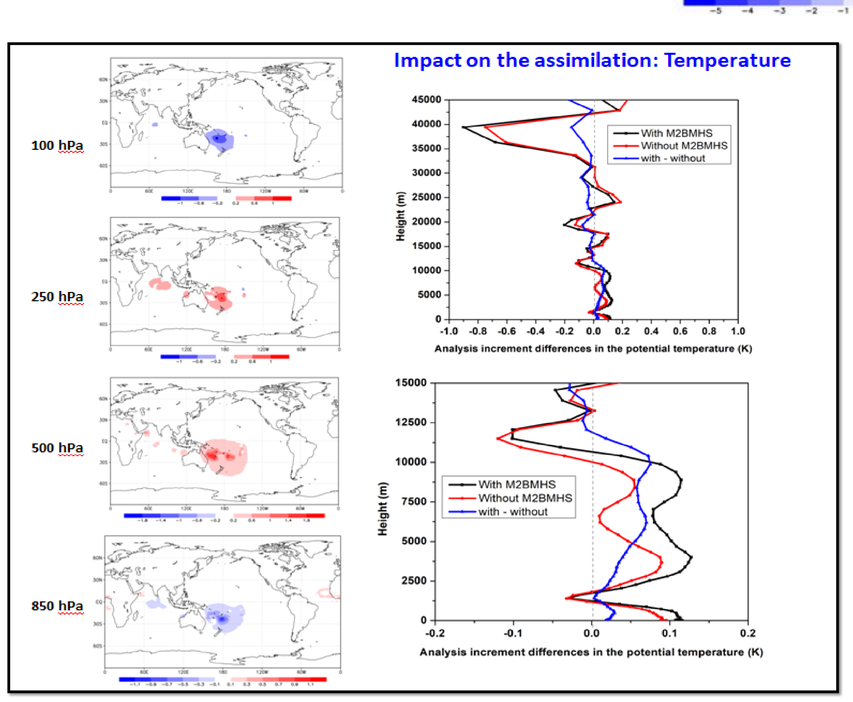
Background innovations (O-B)



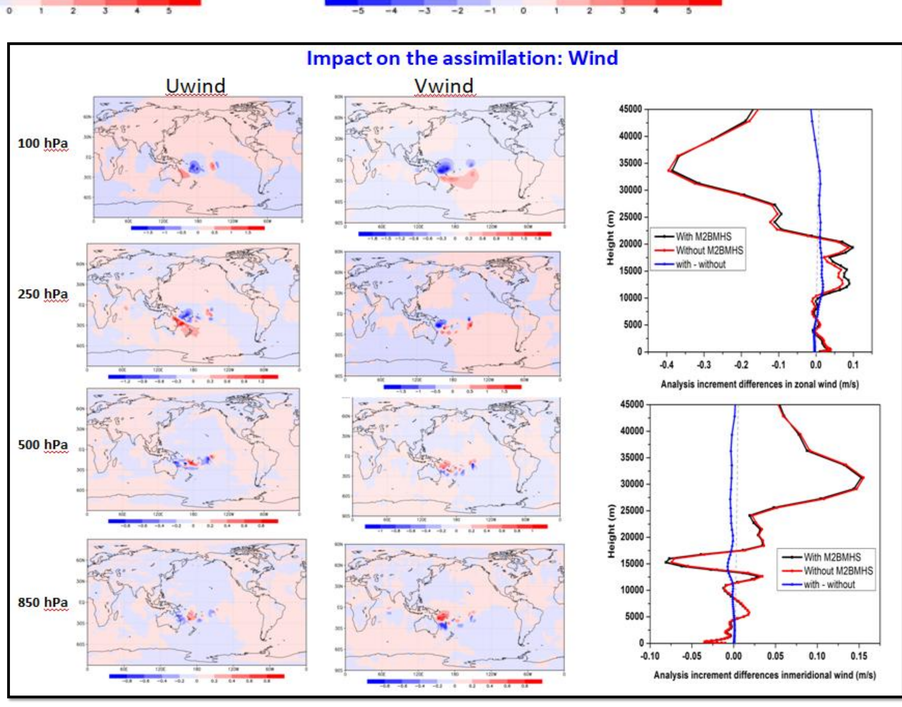
Impact on the assimilation: Specific humidity



Impact on the assimilation: Temperature



Impact on the assimilation: Wind



Way Forward

- Extending the stand alone simulation to long period using RT models like RTTOV and CRTM and there intercomparison
- OSSE in the global and regional domains with complementary simulations from NCMRWF models
- 1D-VAR simulations
- Design of OSE with M2BMHS: After the availability of data from ISRO