DBNet data assimilation during cyclone events- Advantage of timeliness

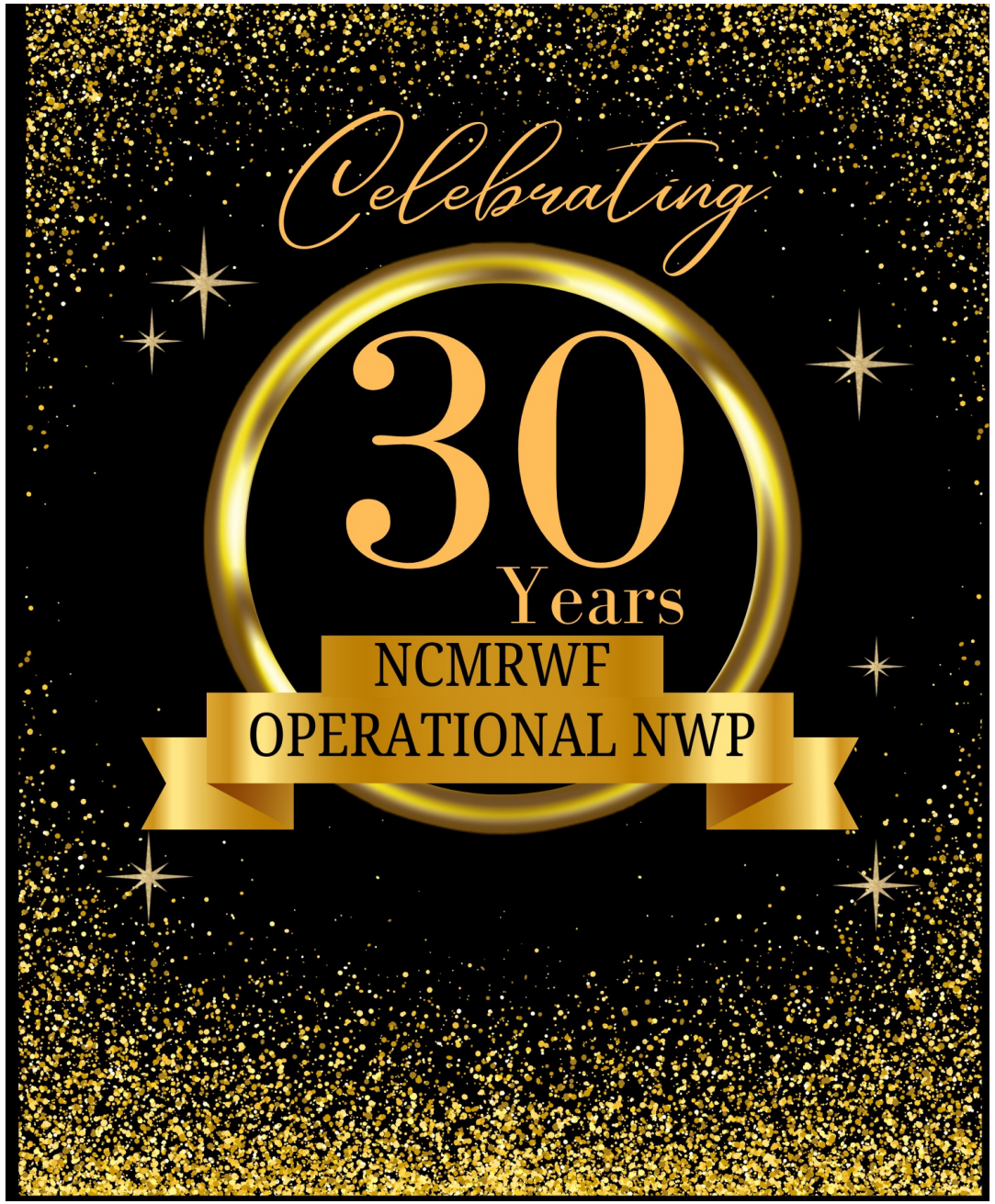
Dr.Desamsetti Srinivas

Hari Prasad K, Upal Saha, Indira Rani S, John P George, and V.S.Prasad

National Centre for Medium Range Weather Forecasting (NCMRWF)

MoES, Noida, India

25th International TOVS Study Conference (ITSC-25), at Resort Rio, Goa, India during 8th - 14th May 2025



Big Thank You All
Who have been supporting continuously

The Director, with a forward-looking vision to contribute meaningfully to the global DBNet and NWP communities, initiated discussions with ISRO to enable the sharing of Level-0 data. Following his guidance and support, we began processing the data, taking a significant step toward strengthening collaborative efforts and advancing weather forecasting capabilities.

Acknowledgements

DBNet Data Partners

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Dr. N. Srinivasa Rao, Scientist-E
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National Remote Sensing Centre (NRSC), ISRO

Government of India
National Remote Sensing Centre
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ISO 9001:2015

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Dr. Shankar Nath, Scientist-E
India Meteorological Department (IMD)

Mr. Nigel Atkinson
Dr. Liam Gumley
Ms. Anna Booton
Dr. Simon
Dr. Ruth
Dr. Erdeem Erdi
…
…

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Satellites and instruments

Data Provider	Satellites	Sounders
INCOIS	NOAA-18/19	AMSU-A, MHS, HIRS
	Metop-B	AMSU-A, MHS, HIRS, IASI
NRSC	SNPP, NOAA-20	ATMS, CrIS
	NOAA-19	AMSU-A, MHS, HIRS
	Metop-B	AMSU-A, MHS, HIRS, IASI

Upgraded the station recently

Data Provider	Satellites	Sounders
INCOIS	NOAA-18/19	AMSU-A, MHS, HIRS
	Metop-B, Metop-C	AMSU-A, MHS, HIRS, IASI
	SNPP, NOAA-20, NOAA-21	ATMS, CrIS
	FY-3D/3E	MWTS, MWHS
	Near future METOP-G satellites	

INCOIS established a new 2.4m X/L band polar ground station at INCOIS Hyderabad

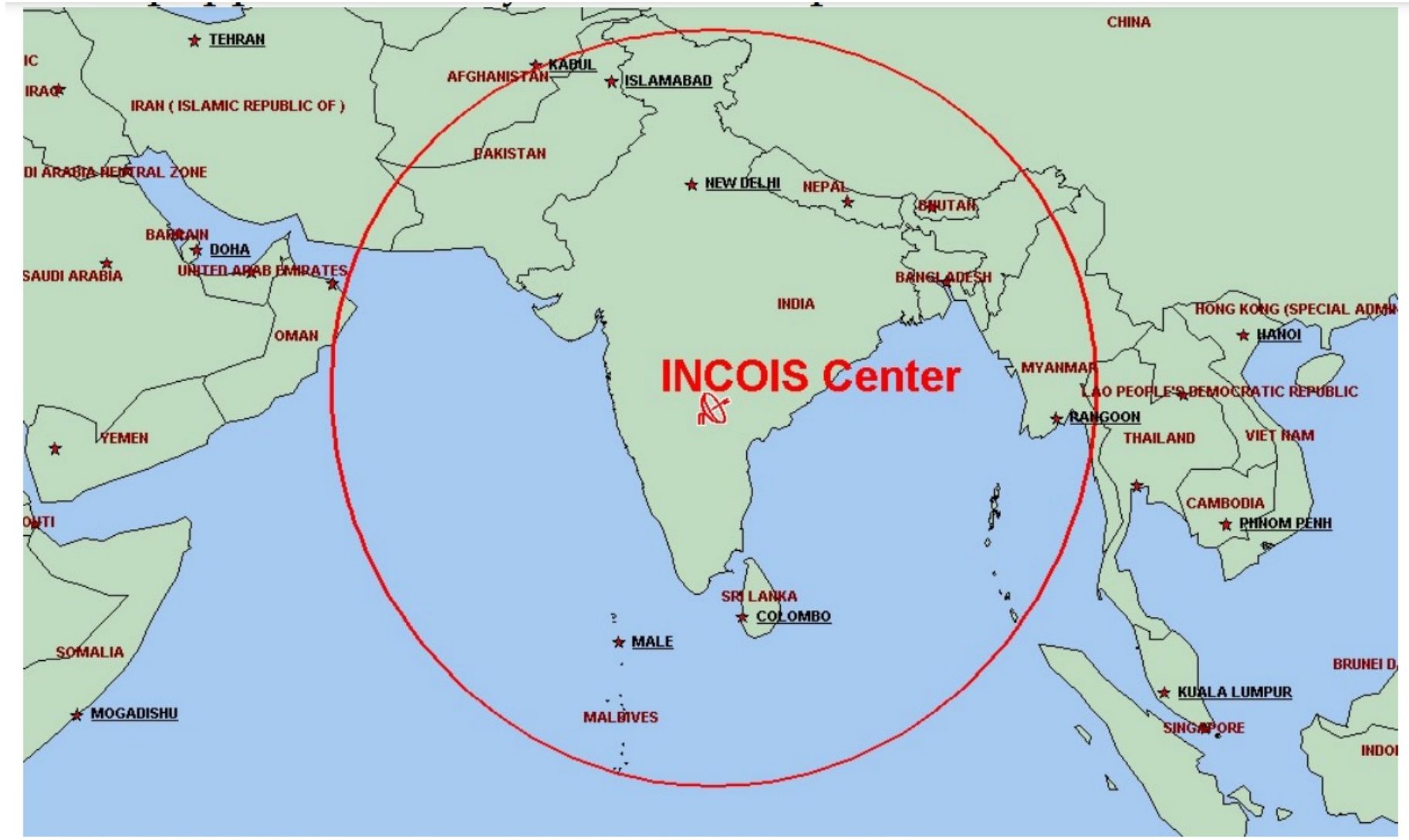
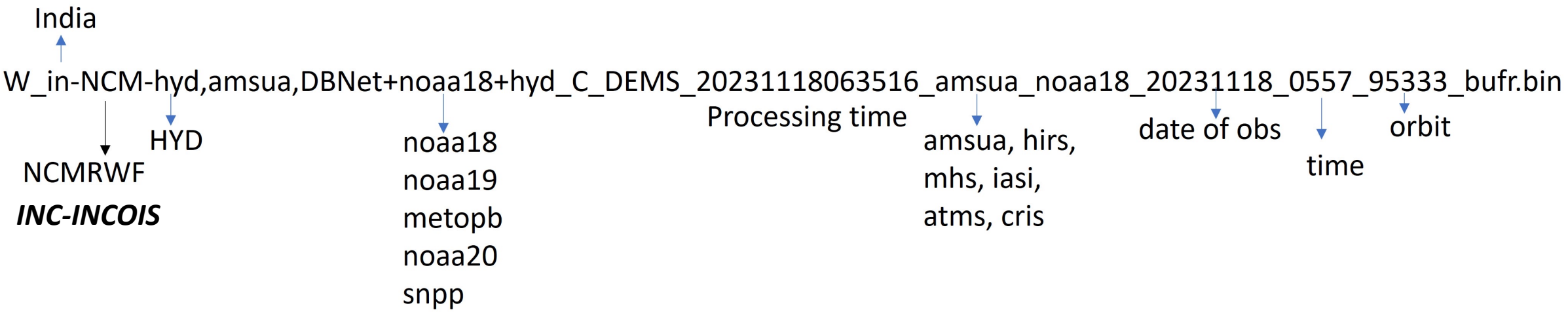


Fig.1 INCOIS location (78.38/17.52) and Antenna coverage

GTS Data transmission naming convention



DBNet data feeds
https://nwp-saf.eumetsat.int/site/monitoring/dbnet/feeds-of-dbnet-data-from-gts/

DBNet station status
https://nwp-saf.eumetsat.int/monitoring/ears_mon/DBNet_station_status.html

NCMRWF DBNet DATA Sample files

```
W_in-NCM-hyd,AMSUA,DBNet+M01+hyd_C_DEMS_20230404045500_bufr.bin
W_in-NCM-hyd,AMSUA,DBNet+M01+hyd_C_DEMS_20230404160340_bufr.bin

W_in-NCM-hyd,AMSUA,DBNet+NOAA18+hyd_C_DEMS_20230404035830_bufr.bin
W_in-NCM-hyd,AMSUA,DBNet+NOAA18+hyd_C_DEMS_20230404053700_bufr.bin
W_in-NCM-hyd,AMSUA,DBNet+NOAA18+hyd_C_DEMS_20230404164950_bufr.bin

W_in-NCM-hyd,AMSUA,DBNet+NOAA19+hyd_C_DEMS_20230404030400_bufr.bin
W_in-NCM-hyd,AMSUA,DBNet+NOAA19+hyd_C_DEMS_20230404141750_bufr.bin
W_in-NCM-hyd,HIRS,DBNet+M01+hyd_C_DEMS_20230404045500_bufr.bin
W_in-NCM-hyd,HIRS,DBNet+M01+hyd_C_DEMS_20230404160340_bufr.bin

W_in-NCM-hyd,HIRS,DBNet+NOAA18+hyd_C_DEMS_20230404035830_bufr.bin
W_in-NCM-hyd,HIRS,DBNet+NOAA18+hyd_C_DEMS_20230404053700_bufr.bin
W_in-NCM-hyd,HIRS,DBNet+NOAA18+hyd_C_DEMS_20230404164950_bufr.bin
W_in-NCM-hyd,HIRS,DBNet+NOAA19+hyd_C_DEMS_20230404030400_bufr.bin
W_in-NCM-hyd,HIRS,DBNet+NOAA19+hyd_C_DEMS_20230404141750_bufr.bin

W_in-NCM-hyd,MHS,DBNet+M01+hyd_C_DEMS_20230404045500_bufr.bin
W_in-NCM-hyd,MHS,DBNet+M01+hyd_C_DEMS_20230404160340_bufr.bin

W_in-NCM-hyd,MHS,DBNet+NOAA19+hyd_C_DEMS_20230404030400_bufr.bin
W_in-NCM-hyd,MHS,DBNet+NOAA19+hyd_C_DEMS_20230404141750_bufr.bin
```

INCOIS DBNet DATA Sample files

INCOIS has been receiving the DBNet station data and processing for
NOAA-15, NOAA-18, NOAA-19, NOAA-20, NOAA-21 / Metop-B, Metop-C / FY-3D, FY-3E.

NOAA-15

W_in-INC-hyd,amsua,DBNet+noaa15+hyd_C_DEMS_20250302013728_amsua_noaa15_20250302_0127_39421_bufr.bin

NOAA-18

W_in-INC-hyd,hirs,DBNet+noaa18+hyd_C_DEMS_20250302064330_hirs_noaa18_20250302_0630_1964_bufr.bin
W_in-INC-hyd,amsua,DBNet+noaa18+hyd_C_DEMS_20250302064330_amsua_noaa18_20250302_0630_1964_bufr.bin

NOAA-19

W_in-INC-hyd,hirs,DBNet+noaa19+hyd_C_DEMS_20250302030324_hirs_noaa19_20250302_0258_82780_bufr.bin
W_in-INC-hyd,amsua,DBNet+noaa19+hyd_C_DEMS_20250302030324_amsua_noaa19_20250302_0258_82780_bufr.bin
W_in-INC-hyd,mhs,DBNet+noaa19+hyd_C_DEMS_20250302030324_mhs_noaa19_20250302_0258_82780_bufr.bin

NOAA-20

W_in-INC-hyd,atms,DBNet+noaa20+hyd_C_DEMS_20250302073614_atms_noaa20_20250302_0732_37753_bufr.bin
W_in-INC-hyd,cris,DBNet+noaa20+hyd_C_DEMS_20250302073839_cris_noaa20_20250302_0734_37753_bufr.bin

INCOIS DBNet DATA Sample files

NOAA-21

W_in-INC-hyd,atms,DBNet+noaa21+hyd_C_DEMS_20250302065651_atms_noaa21_20250302_0646_11960_bufr.bin
W_in-INC-hyd,cris,DBNet+noaa21+hyd_C_DEMS_20250302070105_cris_noaa21_20250302_0647_11960_bufr.bin

S-NPP

W_in-INC-hyd,atms,DBNet+snpp+hyd_C_DEMS_20250302072244_atms_snpp_20250302_0710_69149_bufr.bin
W_in-INC-hyd,cris,DBNet+snpp+hyd_C_DEMS_20250302072547_cris_snpp_20250302_0712_69149_bufr.bin

MetOp-B

W_in-INC-hyd,amsua,DBNet+metopb+hyd_C_DEMS_20250302024449_amsua_metopb_20250302_0235_64619_bufr.bin
W_in-INC-hyd,iasi,DBNet+metopb+hyd_C_DEMS_20250302024453_iasi_M01_20250302_0236_64619_bufr.bin
W_in-INC-hyd,mhs,DBNet+metopb+hyd_C_DEMS_20250302024453_mhs_metopb_20250302_0235_64619_bufr.bin

MetOp-C

W_in-INC-hyd,amsua,DBNet+metopc+hyd_C_DEMS_20250302034209_amsua_metopc_20250302_0326_32777_bufr.bin
W_in-INC-hyd,iasi,DBNet+metopc+hyd_C_DEMS_20250302034214_iasi_M03_20250302_0326_32777_bufr.bin
W_in-INC-hyd,mhs,DBNet+metopc+hyd_C_DEMS_20250302034216_mhs_metopc_20250302_0326_32777_bufr.bin

INCOIS DBNet DATA Sample files

FY-3D

W_in-INC-hyd,mwhs,DBNet+fy3d+hyd_C_DEMS_20250302085030_mwhs_fy3d_20250302_0842_0_bufr.bin
W_in-INC-hyd,mwts,DBNet+fy3d+hyd_C_DEMS_20250209104829_mwts_fy3d_20290601_1017_27341_bufr.bin

FY-3E

W_in-INC-hyd,mwts,DBNet+fy3e+hyd_C_DEMS_20250302004601_mwts_fy3e_20250302_0040_0_bufr.bin
W_in-INC-hyd,mwhs,DBNet+fy3e+hyd_C_DEMS_20250302004601_mwhs_fy3e_20250302_0040_0_bufr.bin

The Headers are as follows:

INAX[01-02] DEMS W_in-INC-???,amsua,*_C_DEMS_*.bin
INMX[01-05] DEMS W_in-INC-???,mhs,*_C_DEMS_*.bin
INHX[01-02] DEMS W_in-INC-???,hirs,*_C_DEMS_*.bin
INQX[01-08] DEMS W_in-INC-???,iasi,*_C_DEMS_*.bin
INSX[01-08] DEMS W_in-INC-???,atms,*_C_DEMS_*.bin
INCX[01-08] DEMS W_in-INC-???,cris,*_C_DEMS_*.bin
INKX[01-05] DEMS W_in-INC-???,mwhs,*_C_DEMS_*.bin
INTX[01-03] DEMS W_in-INC-???,mwts,*_C_DEMS_*.bin

Feeds of DBNet data from GTS

Table of station codes

This table links centre/subcentre codes to station identifier. Taken from the AAPP script *prepare_dbnet_bufr_for_gts*. It includes some planned stations and some that are not currently active.

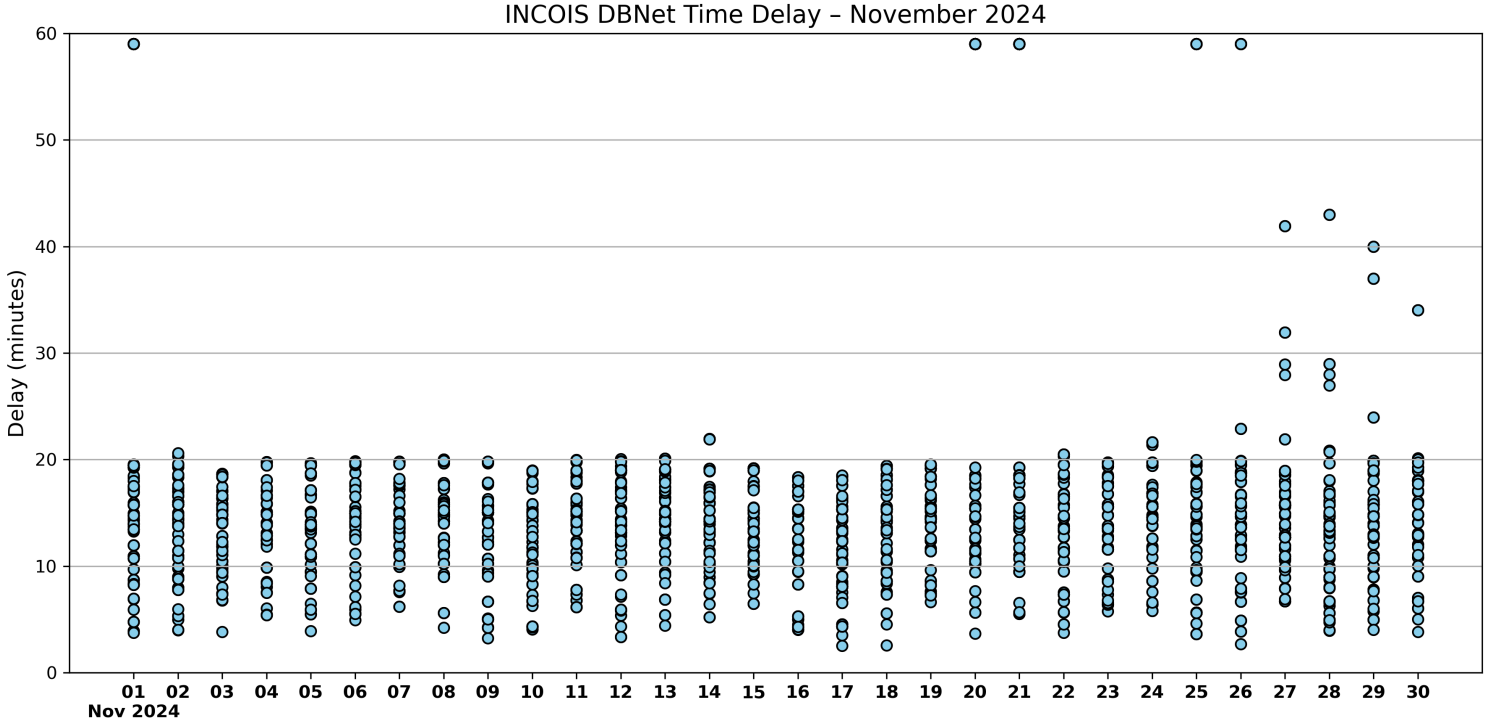
Centre_subcentre	Originator	CCCC	station abbreviation
28_10	in-IMD-del	DEMS	del
28_20	in-IMD-guw	DEMS	guw
28_30	in-IMD-che	DEMS	che
28_40	in-IMD-hyd	DEMS	hyd
28_41	in-INC-hyd	DEMS	hyd

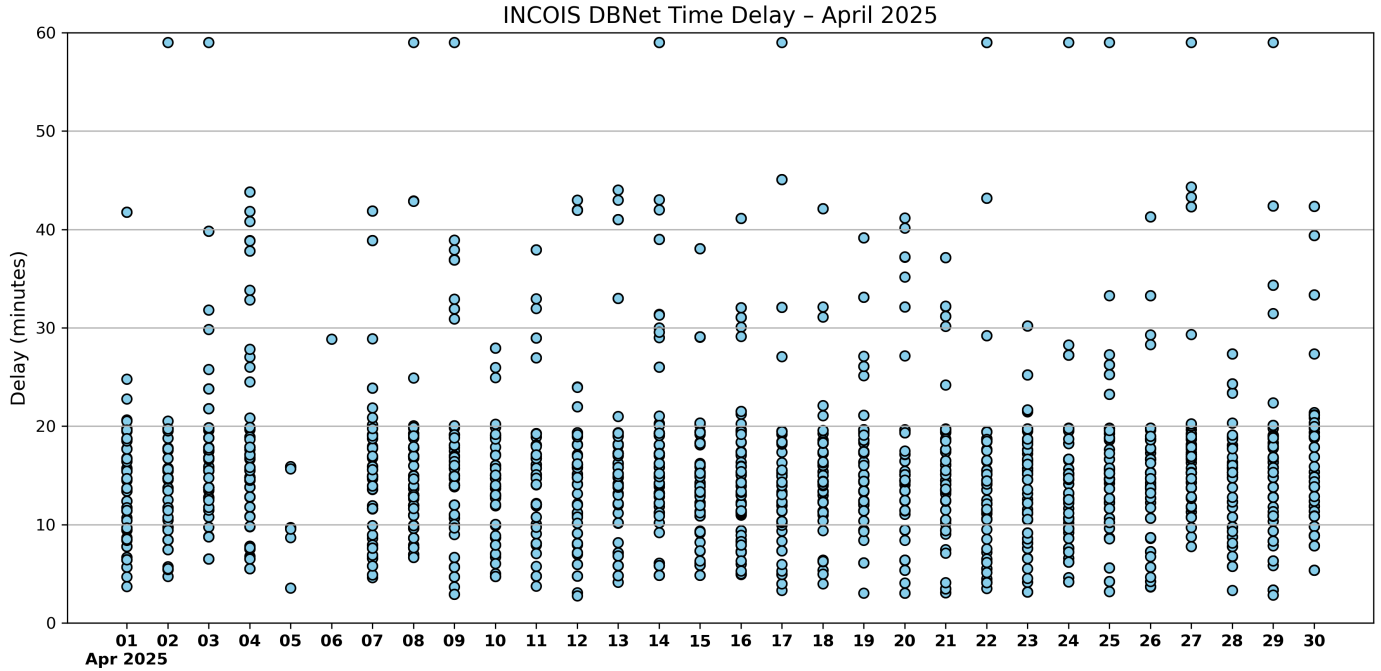
India

Bulletin	File names
INAX[01-02] DEMS	W_in-[NCM,INC]-???,amsua,*_C_DEMS_*.bin
INMX[01-05] DEMS	W_in-[NCM,INC]-???,mhs,*_C_DEMS_*.bin
INHX[01-02] DEMS	W_in-[NCM,INC]-???,hirs,*_C_DEMS_*.bin
INQX[01-08] DEMS	W_in-[NCM,INC]-???,iasi,*_C_DEMS_*.bin
INSX[01-08] DEMS	W_in-[NCM,INC]-???,atms,*_C_DEMS_*.bin
INCX[01-08] DEMS	W_in-[NCM,INC]-???,cris,*_C_DEMS_*.bin

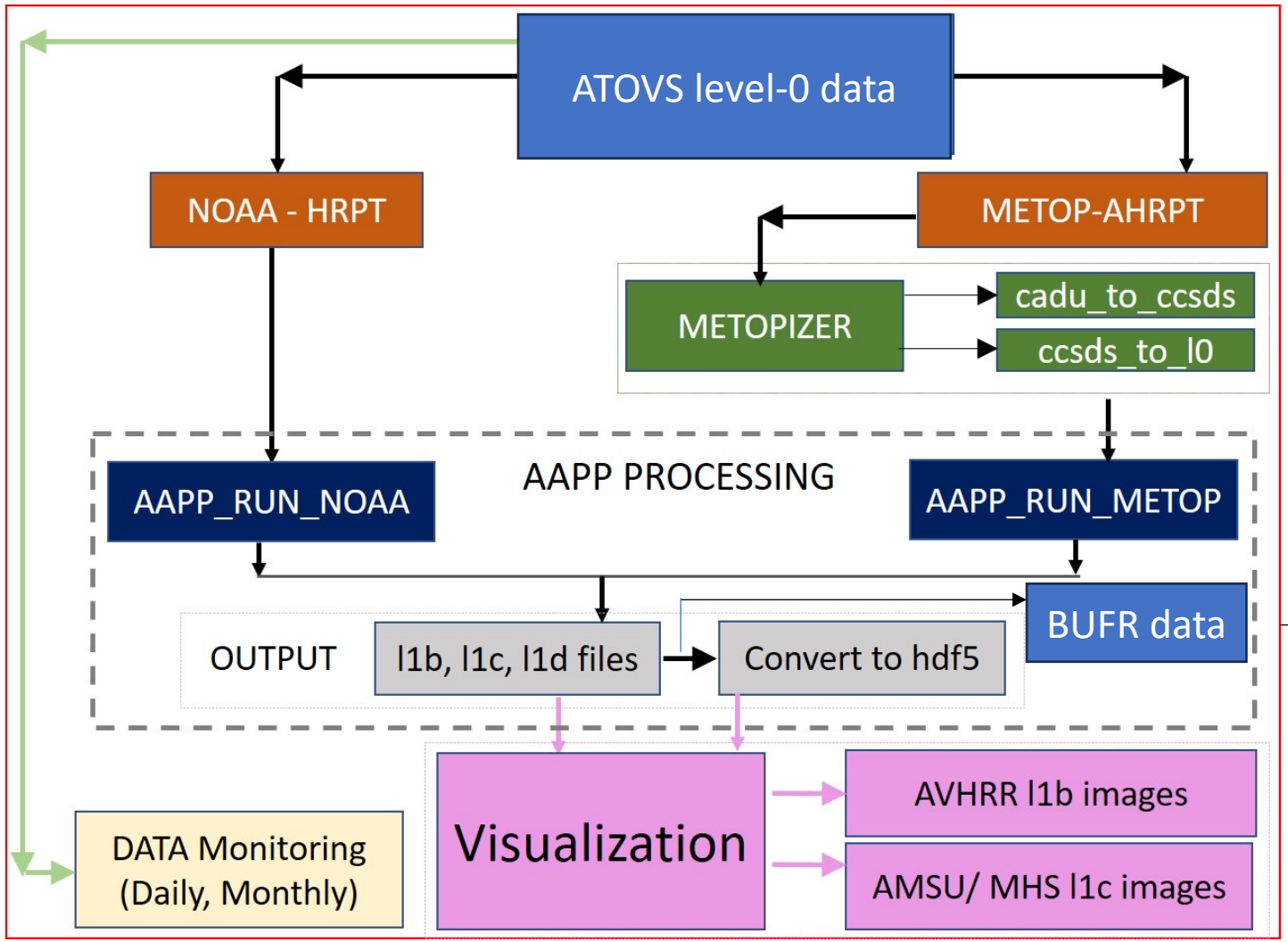
Stations: hyd (Hyderabad). Planned: del, guw, che.
Note that Hyderabad has two station codes: 40 for NRSC (National Remote Sensing Centre) data processed by NCMRWF and 41 for INCOIS (Indian National Centre for Ocean Information Services) data processed at the site (from March 2025).

https://nwp-saf.eumetsat.int/site/monitoring/dbnet/feeds-of-dbnet-data-from-gts/


INCOIS DBNet Time Delay – November 2024
Delay (minutes)
0
10
20
30
40
50
60
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Nov 2024


INCOIS DBNet Time Delay – April 2025
Delay (minutes)
0
10
20
30
40
50
60
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Apr 2025

ATOVS DBNet Data Processing at NCMRWF



In House scripts developed for processing level-0 DBNet data

GTS Dissemination

CONVERSION

NCEP DUMP

NCUM Obstore

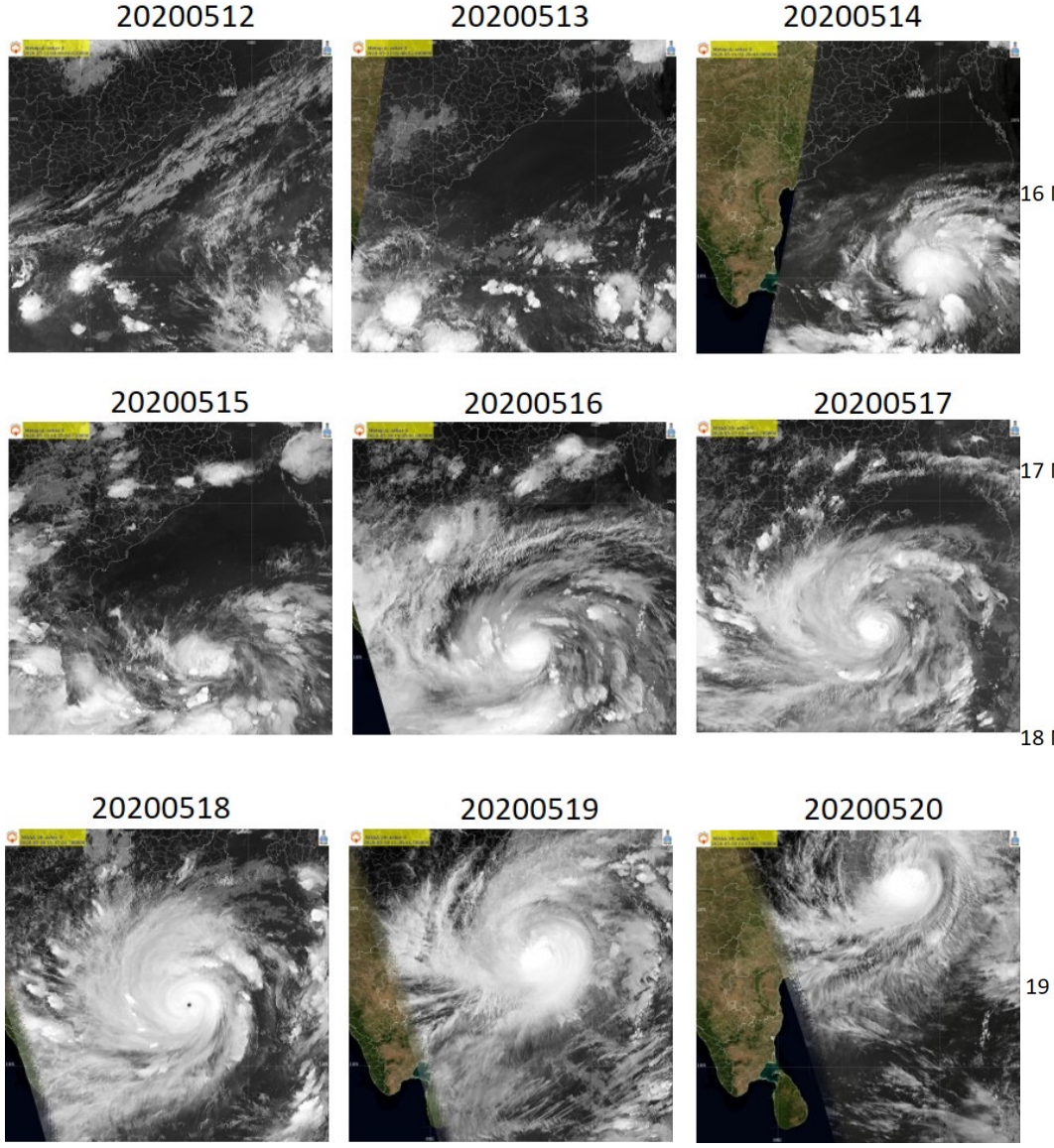
NWP DA

ATMS/ CrIS level-0 data

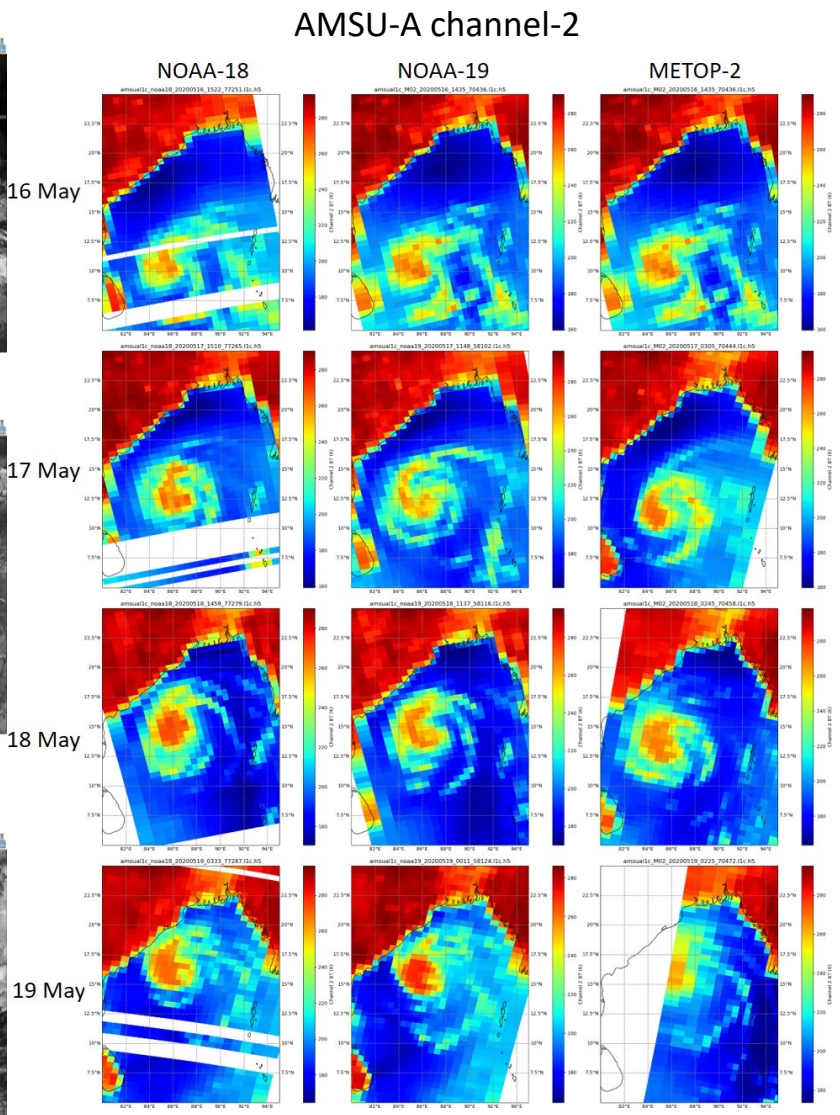
RT-STPS CSPP

AAPP

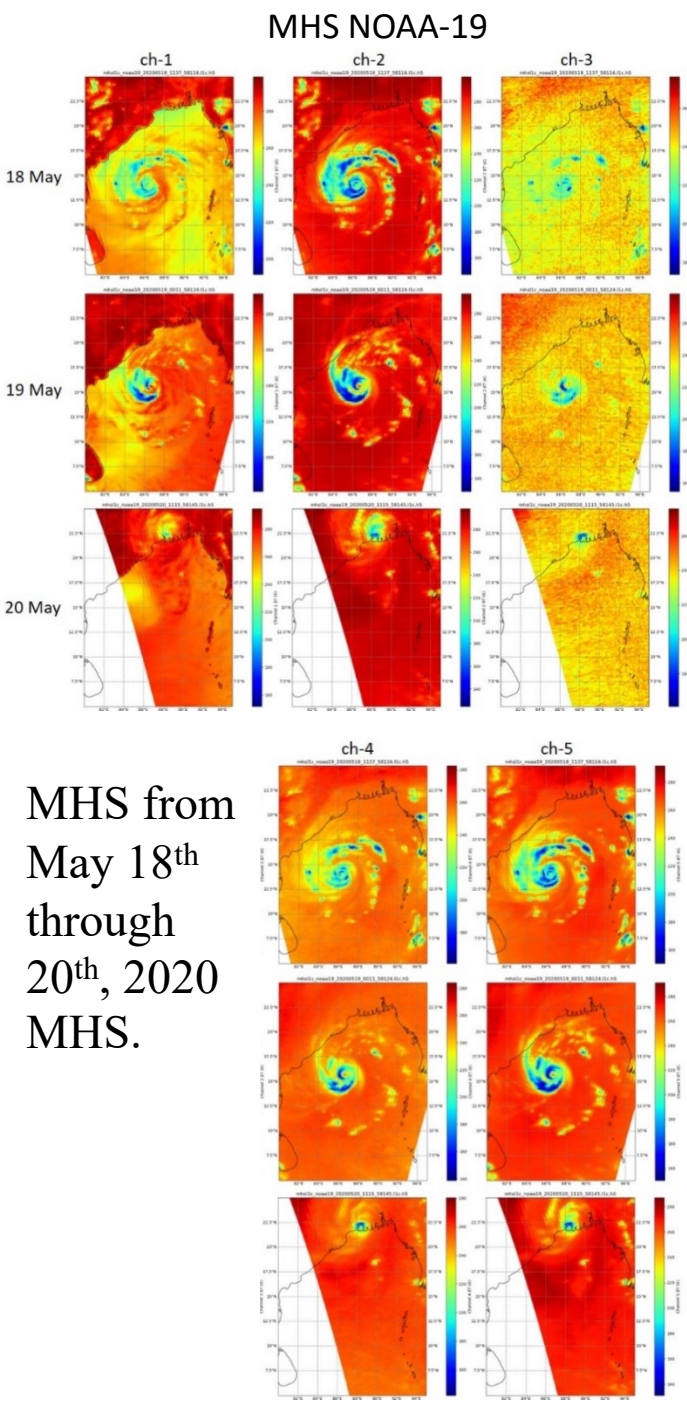
ATMS, CRIS BUFR



The cyclogenesis of TC AMPHAN as observed by AVHRR (Channel-5) onboard NOAA and METOP series of satellites, valid from 12-20 May 2020.



AMSU-A channel-2 imagery from NOAA-18, NOAA-19 and METOP-A valid on 16, 17, 18 and 19 May 2020.



MHS from May 18th through 20th, 2020 MHS.

https://www.ncmrwf.gov.in/Reports-php/Data-Processing-and-Visualisation-of-NOAA-and-MetOp-Satellite-Data.php

INCOIS DBNet Data
NOAA and MetOP-A

Data Availability

Key for table icons:	
🔴	No data received over past week
🟡	No data received over past three days
🟢	Data received during past three days
☐	Data failing consistency comparison with global feed

Network Status

All ATOVS/IASI data

NCMRWF | country | station

Regional Centre	Country	Station	AMSU-A				MHS			HIRS		IASI	
			MET-B	MET-C	N18	N19	MET-B	MET-C	N19	N18	N19	MET-B	MET-C
NCMRWF	India	Hyderabad (hyd)	🟢		🔴	🔴	🟢		🔴	🔴	🔴	🟢	

All CrIS/ATMS data

NCMRWF | country | station

Regional Centre	Country	Station	CrIS			ATMS		
			S.NPP	N20	N21	S.NPP	N20	N21
NCMRWF	India	Hyderabad (hyd)	🟢	🟢		🟢	🟢	

https://nwp-saf.eumetsat.int/monitoring/ears_mon/DBNet_station_status.html

ATMS/CrIS from NOAA-20 & S-NPP

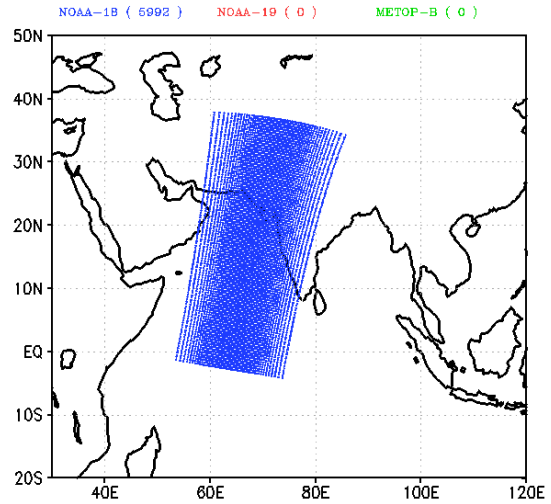
Show 10 entries | Satellite | [AP] Hyderabad (India) - hyd | Day | View overpasses with warnings: All Overpasses | Search:

Satellite	Station	Day	Overpass Time	No. of Local scanlines	No. of Common scanlines	Mean Timestamp Difference/s	Mean Navigational Difference/m	Percentage of valid BTDs	Mean BTD	Min BTD	Max BTD	STD of BTD	No. of spurious local timestamps	No. of spurious global timestamps	No. of spurious local coordinates	No. of spurious global coordinates	No. of common spurious coordinates
noaa20	hyd	Monday	2024-03-18 08:44:50.983	60	60	0	0	100 100 100	4.3e-06 4.52e-07 0	-7.08e-05 -0.000188 0	7.08e-05 0.000188 0	1.84e-05 1.36e-05 0	0	0	0	0	0
S.NPP	hyd	Monday	2024-03-18 07:54:46.984	68	68	0	0	77.8 77.8 77.8	3.07e-06 2.45e-07 0	-0.000112 -0.000188 0	0.000112 0.000188 0	2.37e-05 1.98e-05 0	0	0	0	0	0
noaa20	hyd	Monday	2024-03-18 07:05:06.983	56	56	0	0	100 100 100	3.88e-06 2.6e-07 0	-7.08e-05 -0.000188 0	7.08e-05 0.000188 0	1.71e-05 1.47e-05 0	0	0	0	0	0
noaa20	hyd	Sunday	2024-03-17 21:36:10.983	40	40	0	0	100 100 100	4.05e-06 1.02e-06 0	-7.08e-05 -0.000188 0	7.08e-05 0.000188 0	1.72e-05 1.45e-05 0	0	0	0	0	0
S.NPP	hyd	Sunday	2024-03-17 20:44:54.984	64	64	0	0	77.8 77.8 77.8	1.8e-06 5.43e-07 0	-0.000108 -0.000188 0	0.000108 0.000188 0	1.96e-05 1.73e-05 0	0	0	0	0	0
noaa20	hyd	Sunday	2024-03-17 19:54:18.983	68	68	0	0	100 100 100	4.47e-06 7.25e-07 0	-7.08e-05 -0.000188 0	7.08e-05 0.000188 0	1.79e-05 1.63e-05 0	0	0	0	0	0
S.NPP	hyd	Sunday	2024-03-17 19:06:14.984	40	40	0	0	77.8 77.8 77.8	1.62e-06 7.64e-07 0	-0.000108 -0.000188 0	0.000108 0.000188 0	2.03e-05 2e-05 0	0	0	0	0	0

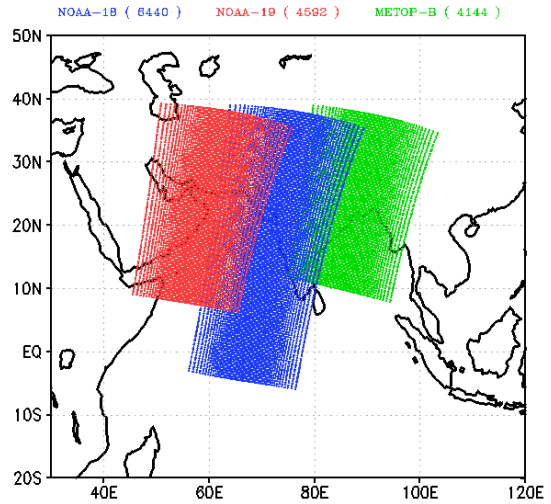
https://nwp-saf.eumetsat.int/monitoring/ears_mon/lgcomp_stats_table_cris.html

Satellite passes (06 UTC)

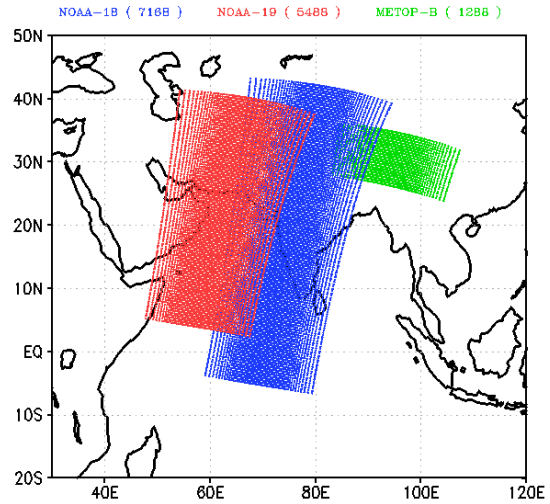
Data Coverage: INCOIS DBNet Data (20221019 0600UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 5992



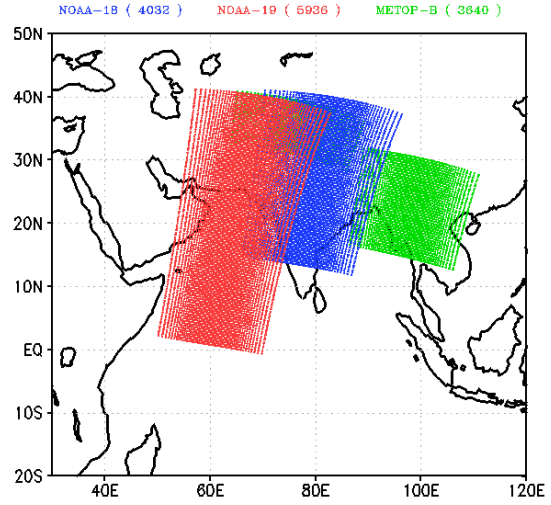
Data Coverage: INCOIS DBNet Data (20221020 0600UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 15176



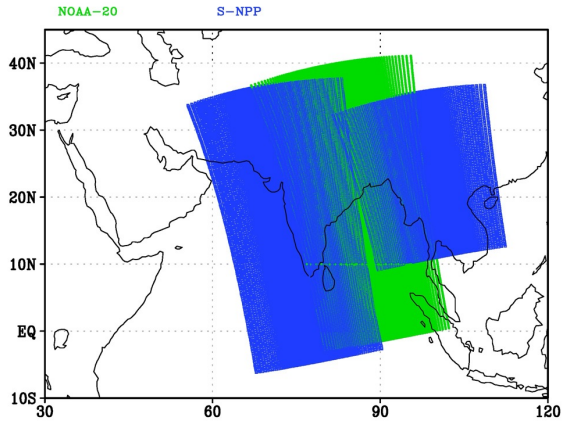
Data Coverage: INCOIS DBNet Data (20221021 0600UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 13944



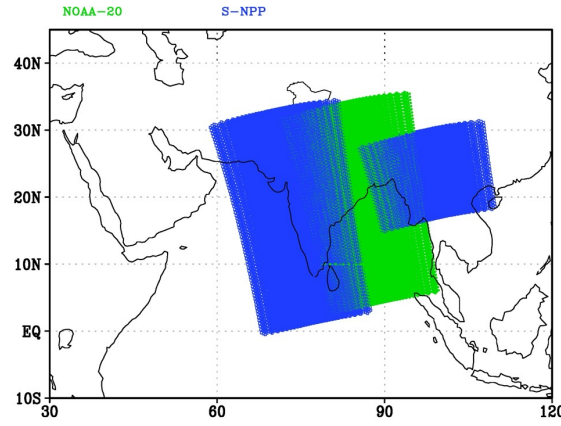
Data Coverage: INCOIS DBNet Data (20221022 0600UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 13608



Indian DBNet Coverage: ATMS (20240317 0600 UTC +/- 3 Hrs)

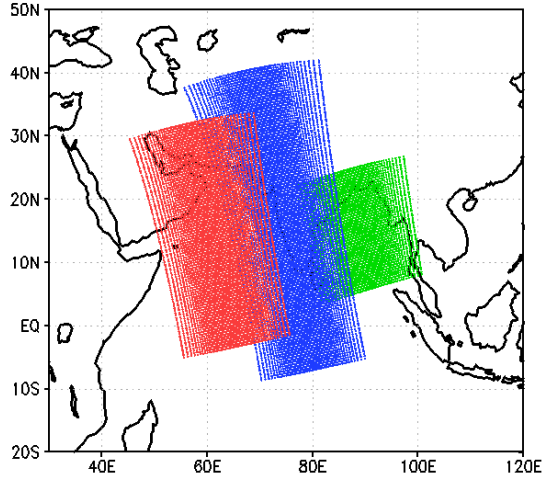


Indian DBNet Coverage: CrIS (20240317 0600 UTC +/- 3 Hrs)

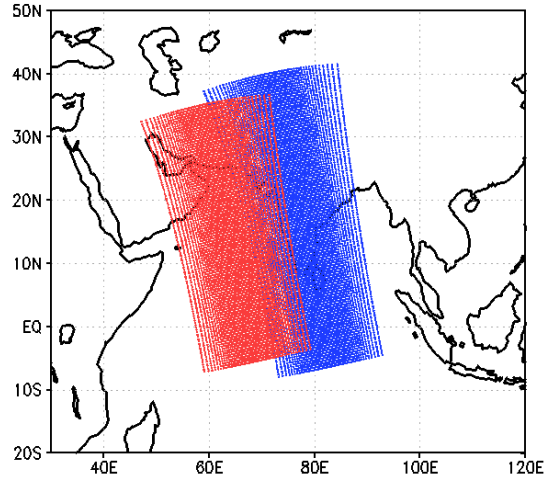


Satellite passes (18 UTC)

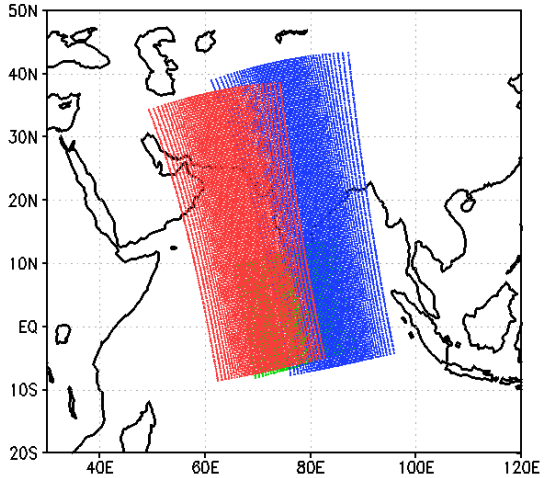
Data Coverage: INCOIS DBNet Data (20221019 1800UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 15400
NOAA-18 (7168) NOAA-19 (5376) METOP-B (2856)



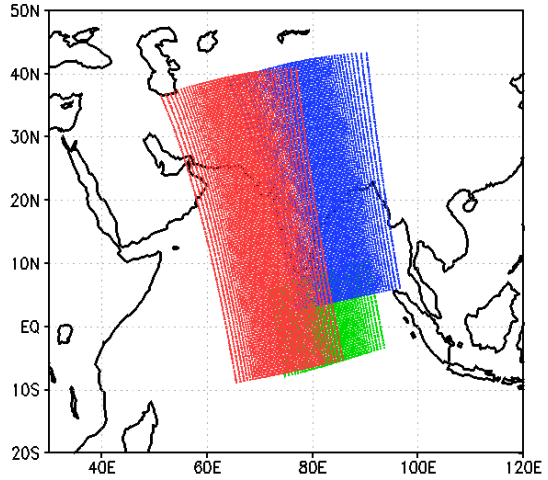
Data Coverage: INCOIS DBNet Data (20221020 1800UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 13160
NOAA-18 (7000) NOAA-19 (6160) METOP-B (0)



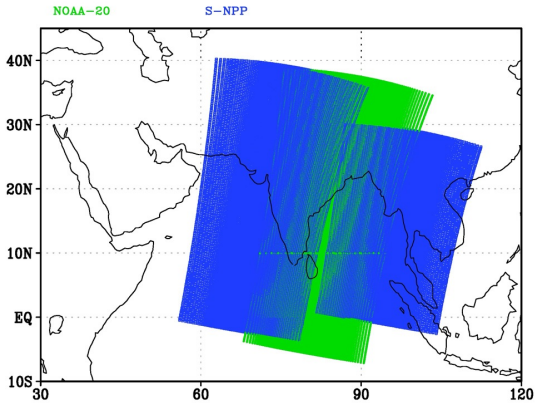
Data Coverage: INCOIS DBNet Data (20221021 1800UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 16576
NOAA-18 (7224) NOAA-19 (6664) METOP-B (2688)



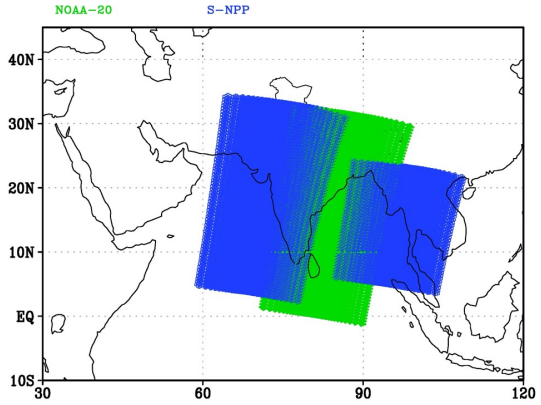
Data Coverage: INCOIS DBNet Data (20221022 1800UTC +/- 03Hrs)
Total Number of Observations Received at NCMRWF: 14840
NOAA-18 (5656) NOAA-19 (7056) METOP-B (2128)



Indian DBNet Coverage: ATMS (20240317 1800 UTC +/- 3 Hrs)
NOAA-20 S-NPP

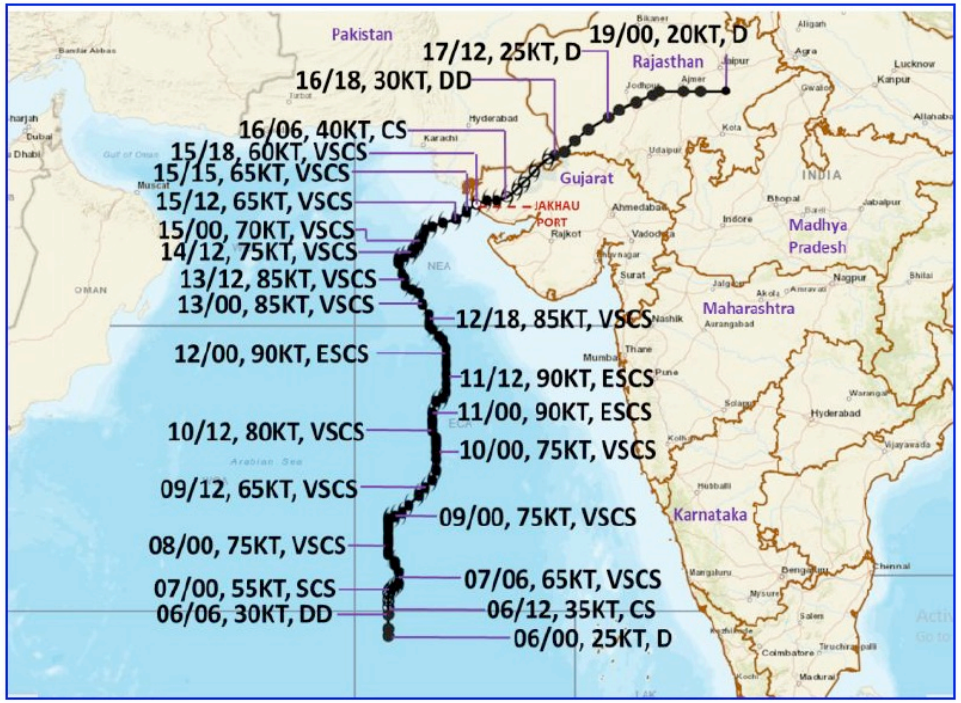


Indian DBNet Coverage: CrIS (20240317 1800 UTC +/- 3 Hrs)
NOAA-20 S-NPP



Extremely Severe Cyclonic Storm “BIPARJOY” over the ARABIAN Sea (6th-19th June, 2023)

- Upper air Cyclonic Circulation formed over Southeast Arabian Sea on June 5, 2023 and led to Low Pressure Area and Well Marked Low Pressure Area.
- Developed as Depression, then Cyclonic Storm "BIPARJOY" by June 6. Became Very Severe Cyclonic Storm by June 7, following a recurving path. Crossed coasts on June 15 as VSCS, weakened to SCS afterward. Transitioned to Cyclonic Storm on June 16 over Saurashtra & Kutch. Moved northeast, weakening into Deep Depression by June 16 midnight.
- On **June 15, it crossed Saurashtra & Kutch and adjoining Pakistan coasts as a VSCS near Jakhau Port with sustained winds of 115-125 kmph, gusting to 140 kmph**.
- Post-landfall, it weakened to an SCS over Saurashtra & Kutch.
- Moving east-northeastwards, weakened to a Cyclonic Storm (CS) on June 16 over Saurashtra & Kutch, then to a Deep Depression (DD) over Southeast Pakistan and adjoining Southwest Rajasthan and Kutch by midnight on the same day.



: LESS THAN 34 KT
: 34-47 KT
: ≥ 48 KT

D: Depression
DD: Deep Depression
CS: Cyclonic Storm
SCS: Severe Cyclonic Storm
VSCS: Very SCS
ESCS: Extremely SCS
: Observed Track

Observed track of extremely severe cyclonic storm ‘BIPARJOY” over the AS during 6-19 June, 2023 (IMD Report, 2023).

Design of experiments

Four types of numerical experiments were Designed (1) CNTL; (2) ATOVS ; (3) ATMS and (4) ATOVS & ATMS

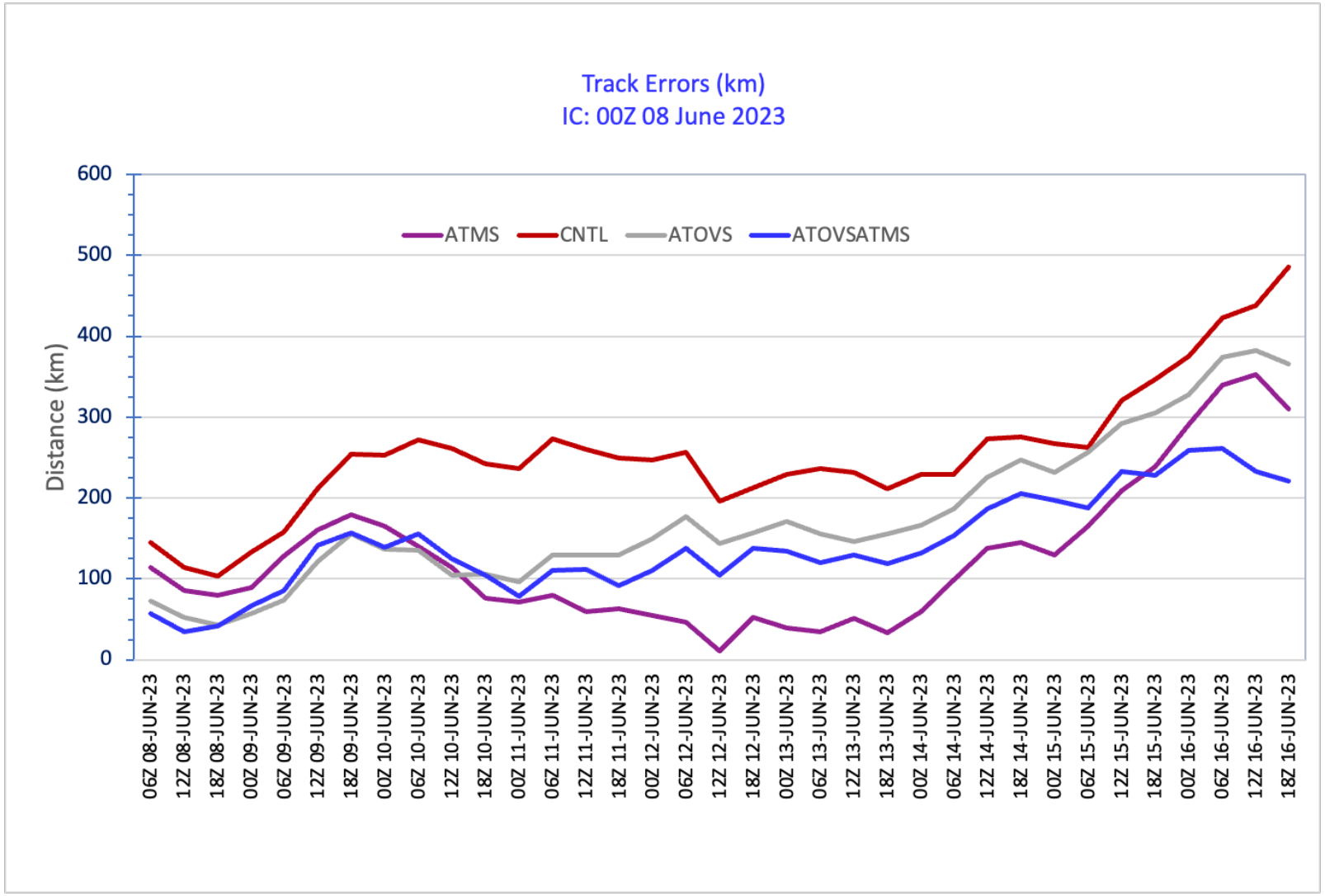
CNTL	ATOVS	ATMS	ATOVSATMS
Surface Sonde Satwind Scatwind Aircraft	CNTL + ATOVS (DBNet)	CNTL + ATMS (DBNet)	CNTL + ATOVS & ATMS (DBNet)

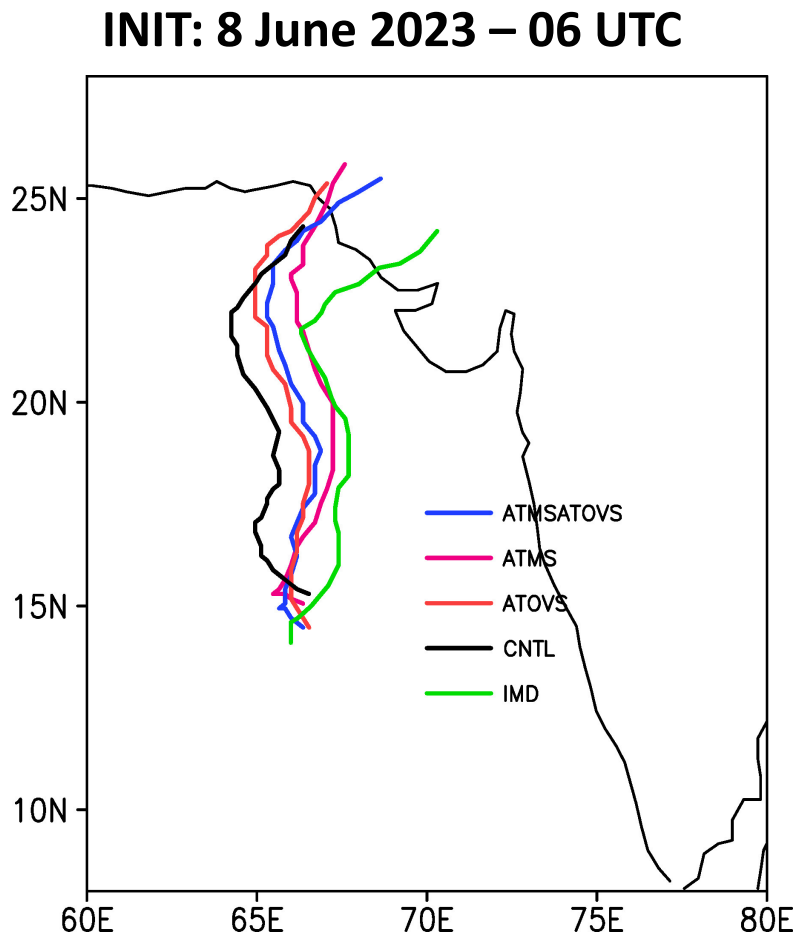
ATOVS (AMSU-A, MHS), ATMS DBNet data reception at NCMRWF at 06 and 18 UTC

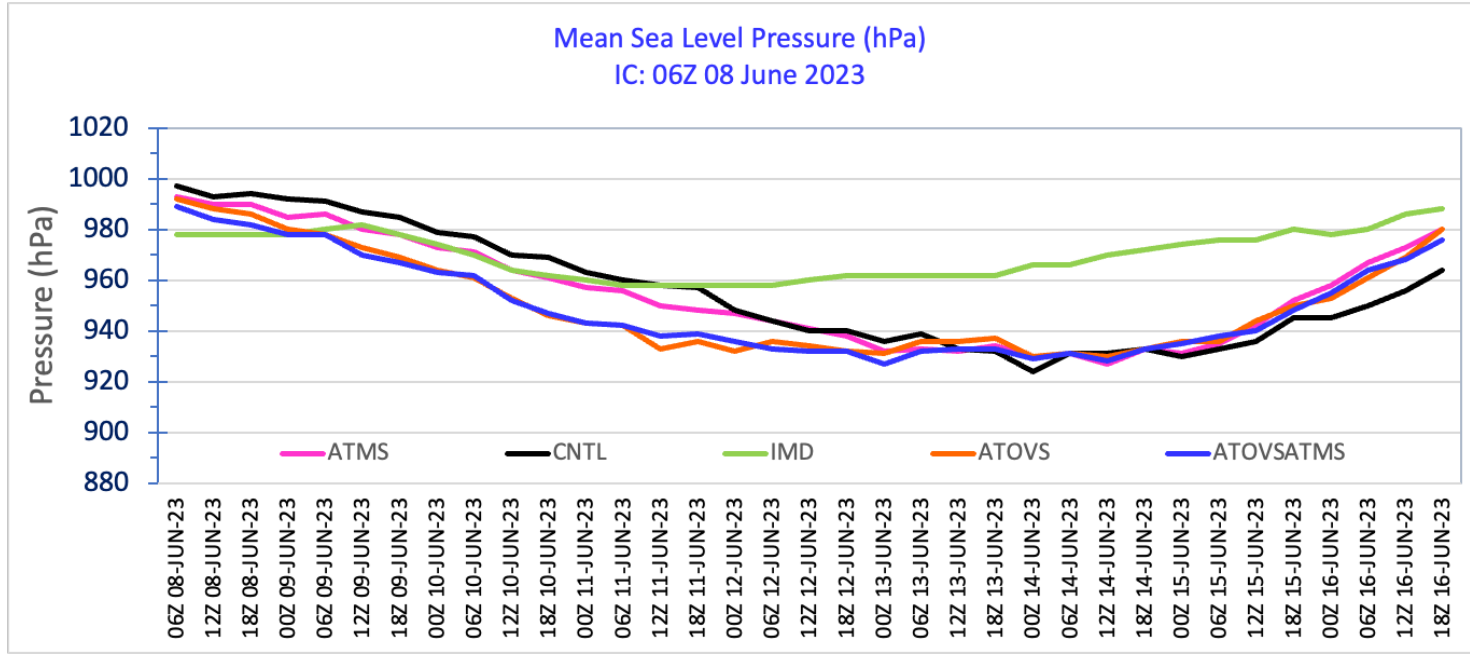
Model setup

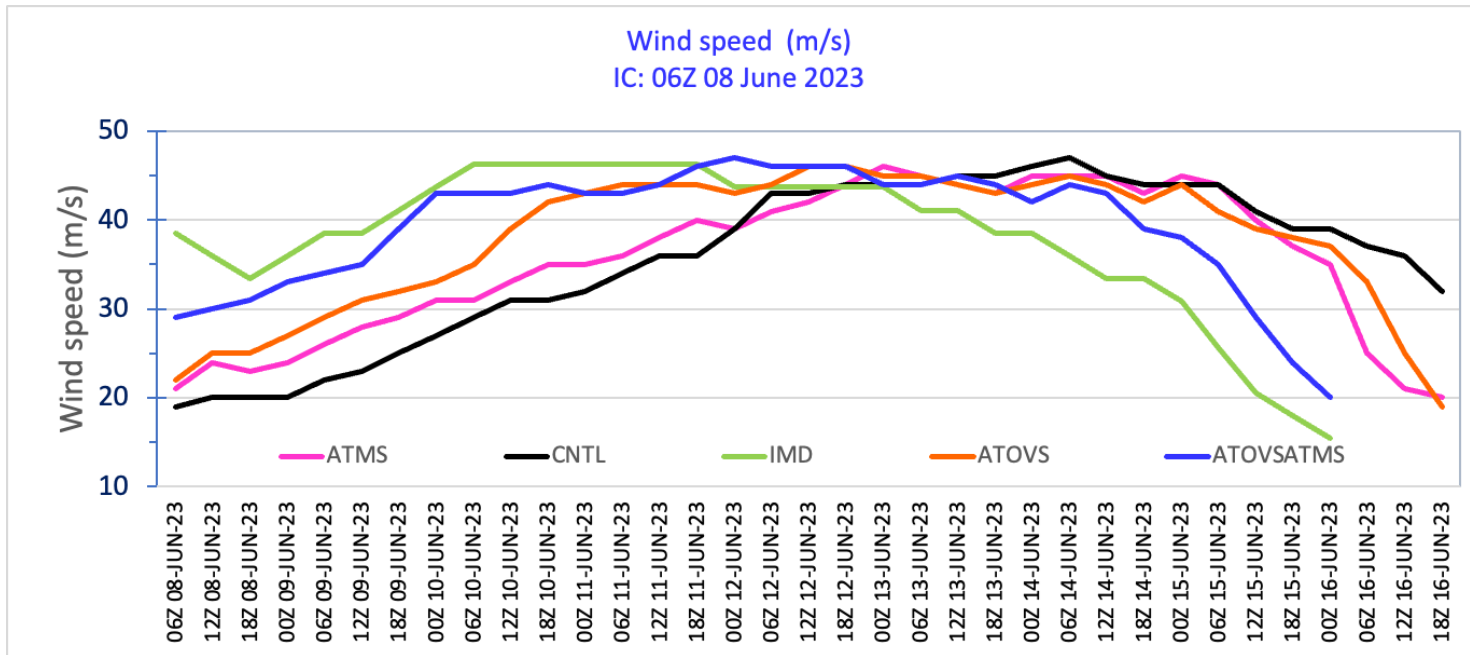
- NCUM Operational DA system with 4DVAR DA at 12 km horizontal resolution (PS44).
- The DA suite initiated at 00 UTC of 3 June 2023 and continued up to 00 UTC of 10 June 2022.
- Long forecasts (up to 10 days) are made from all 4 experiments to study the impact of Indian DBNet (ATOVS, ATMS) data.

Results


Track Errors (km)
IC: 00Z 08 June 2023
Distance (km)
600
500
400
300
200
100
0
ATMS
CNTL
ATOVS
ATOVSATMS
06Z 08-JUN-23
12Z 08-JUN-23
18Z 08-JUN-23
00Z 09-JUN-23
06Z 09-JUN-23
12Z 09-JUN-23
18Z 09-JUN-23
00Z 10-JUN-23
06Z 10-JUN-23
12Z 10-JUN-23
18Z 10-JUN-23
00Z 11-JUN-23
06Z 11-JUN-23
12Z 11-JUN-23
18Z 11-JUN-23
00Z 12-JUN-23
06Z 12-JUN-23
12Z 12-JUN-23
18Z 12-JUN-23
00Z 13-JUN-23
06Z 13-JUN-23
12Z 13-JUN-23
18Z 13-JUN-23
00Z 14-JUN-23
06Z 14-JUN-23
12Z 14-JUN-23
18Z 14-JUN-23
00Z 15-JUN-23
06Z 15-JUN-23
12Z 15-JUN-23
18Z 15-JUN-23
00Z 16-JUN-23
06Z 16-JUN-23
12Z 16-JUN-23
18Z 16-JUN-23

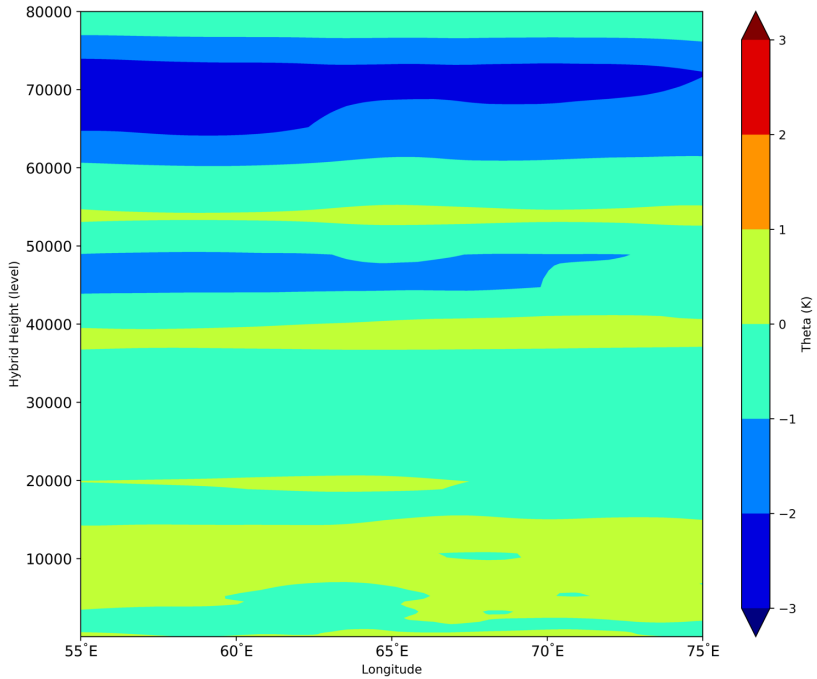

INIT: 8 June 2023 – 06 UTC
25N
20N
15N
10N
60E
65E
70E
75E
80E
ATMSATOVS
ATMS
ATOVS
CNTL
IMD


Mean Sea Level Pressure (hPa)
IC: 06Z 08 June 2023
Pressure (hPa)
1020
1000
980
960
940
920
900
880
ATMS
CNTL
IMD
ATOVS
ATOVSATMS
06Z 08-JUN-23
12Z 08-JUN-23
18Z 08-JUN-23
00Z 09-JUN-23
06Z 09-JUN-23
12Z 09-JUN-23
18Z 09-JUN-23
00Z 10-JUN-23
06Z 10-JUN-23
12Z 10-JUN-23
18Z 10-JUN-23
00Z 11-JUN-23
06Z 11-JUN-23
12Z 11-JUN-23
18Z 11-JUN-23
00Z 12-JUN-23
06Z 12-JUN-23
12Z 12-JUN-23
18Z 12-JUN-23
00Z 13-JUN-23
06Z 13-JUN-23
12Z 13-JUN-23
18Z 13-JUN-23
00Z 14-JUN-23
06Z 14-JUN-23
12Z 14-JUN-23
18Z 14-JUN-23
00Z 15-JUN-23
06Z 15-JUN-23
12Z 15-JUN-23
18Z 15-JUN-23
00Z 16-JUN-23
06Z 16-JUN-23
12Z 16-JUN-23
18Z 16-JUN-23

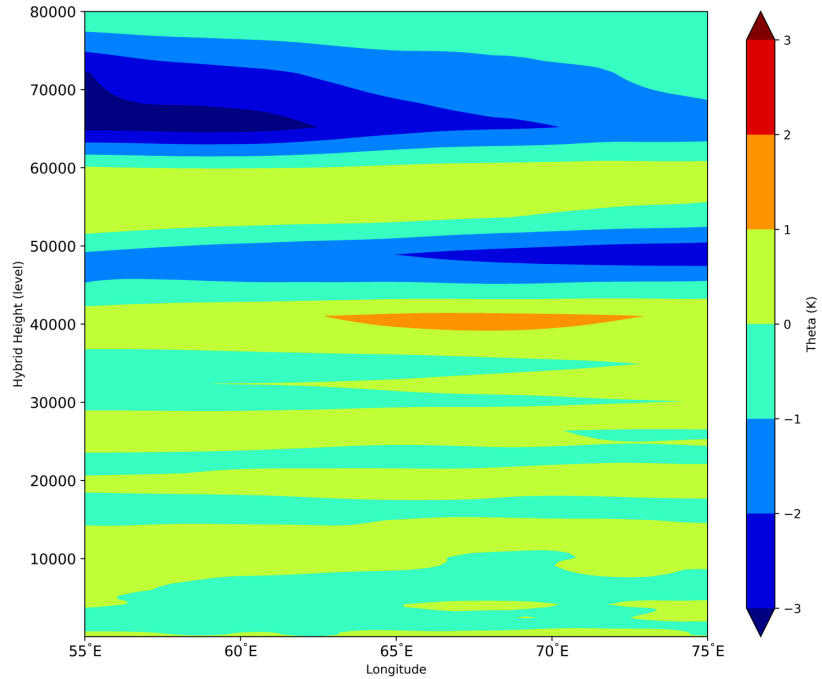

Wind speed (m/s)
IC: 06Z 08 June 2023
Wind speed (m/s)
50
40
30
20
10
ATMS
CNTL
IMD
ATOVS
ATOVSATMS
06Z 08-JUN-23
12Z 08-JUN-23
18Z 08-JUN-23
00Z 09-JUN-23
06Z 09-JUN-23
12Z 09-JUN-23
18Z 09-JUN-23
00Z 10-JUN-23
06Z 10-JUN-23
12Z 10-JUN-23
18Z 10-JUN-23
00Z 11-JUN-23
06Z 11-JUN-23
12Z 11-JUN-23
18Z 11-JUN-23
00Z 12-JUN-23
06Z 12-JUN-23
12Z 12-JUN-23
18Z 12-JUN-23
00Z 13-JUN-23
06Z 13-JUN-23
12Z 13-JUN-23
18Z 13-JUN-23
00Z 14-JUN-23
06Z 14-JUN-23
12Z 14-JUN-23
18Z 14-JUN-23
00Z 15-JUN-23
06Z 15-JUN-23
12Z 15-JUN-23
18Z 15-JUN-23
00Z 16-JUN-23
06Z 16-JUN-23
12Z 16-JUN-23
18Z 16-JUN-23

Temperature (Analysis) Incriments (after Assimilation) – 08 June 2023 – 06 UTC

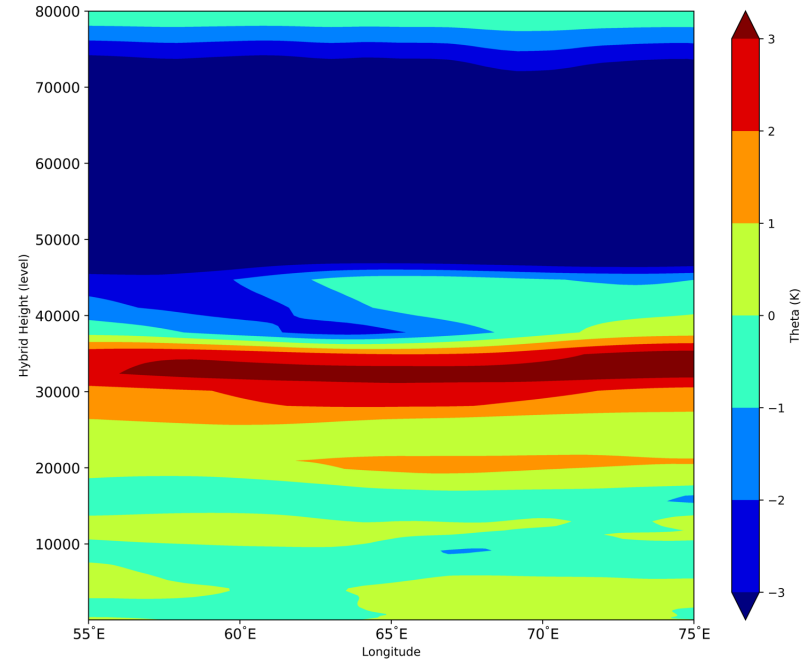
CNTL



ATMS

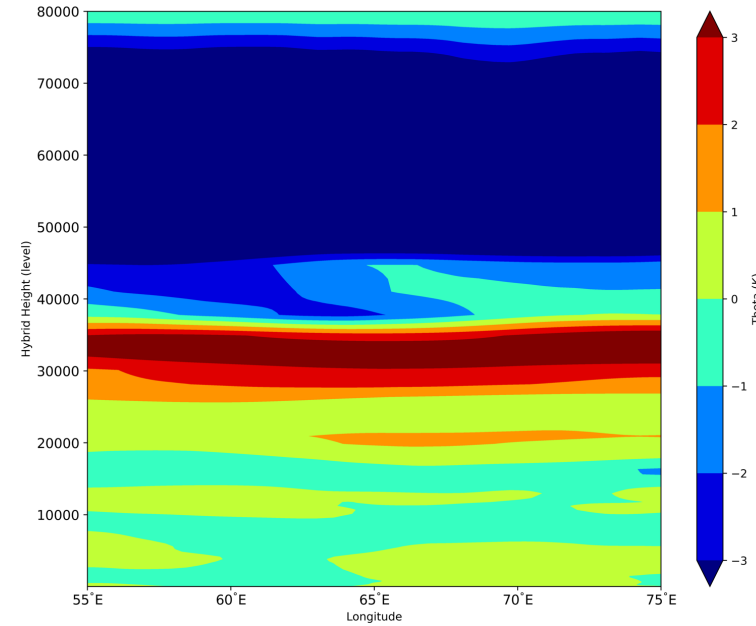


ATOVS



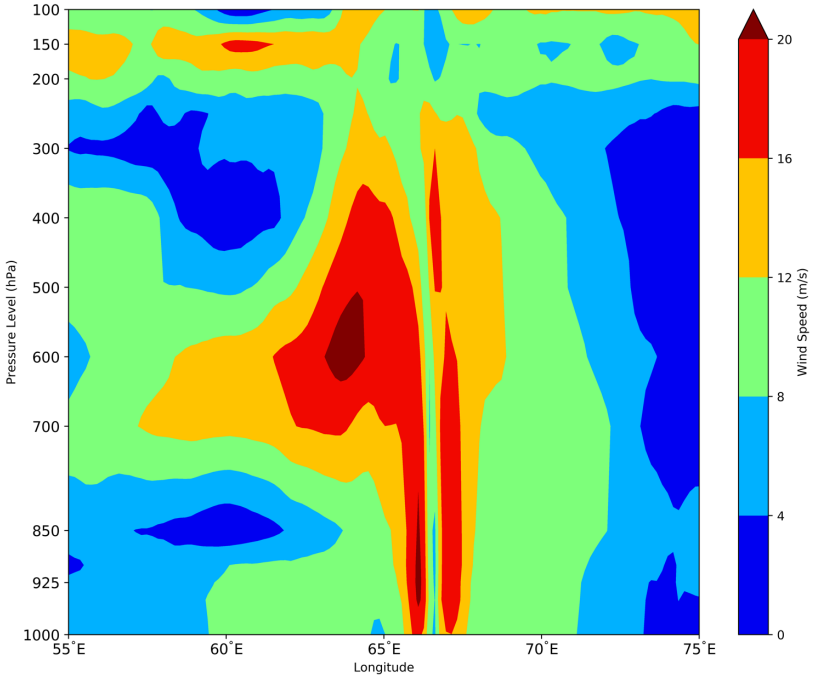
ATOVS colls the upper atmosphere and slightly warms mid troposphere; where as ATMS follows similar trend of CNTL.

ATMS+ATOVS

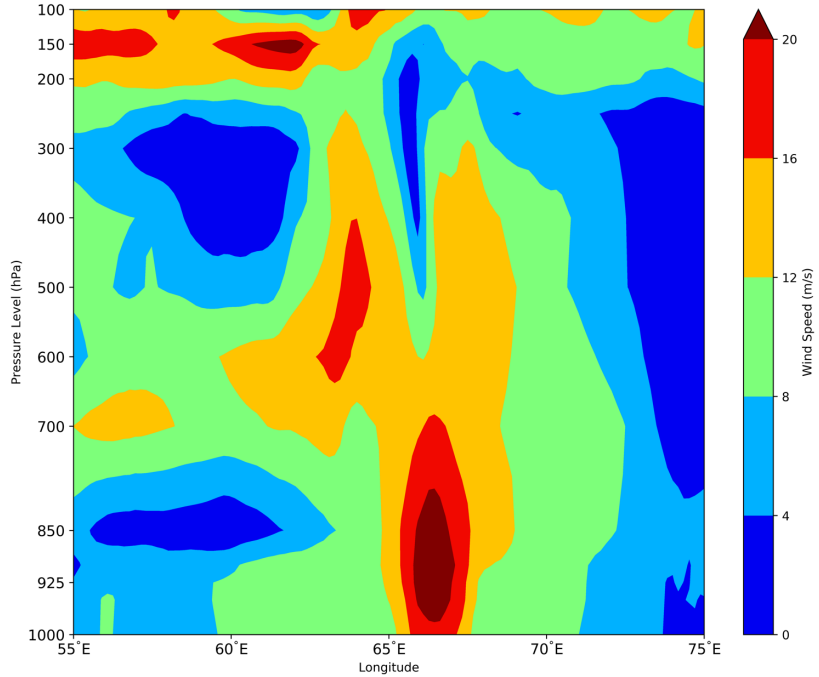


Zonal Wind speed (m/s) – 08 June 2023 – 06 UTC

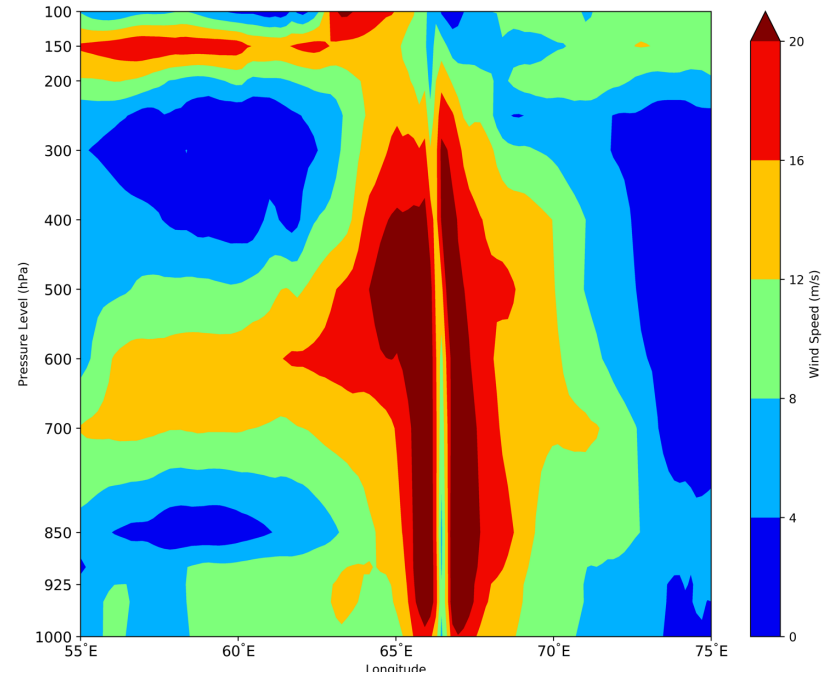
CNTL



ATMS

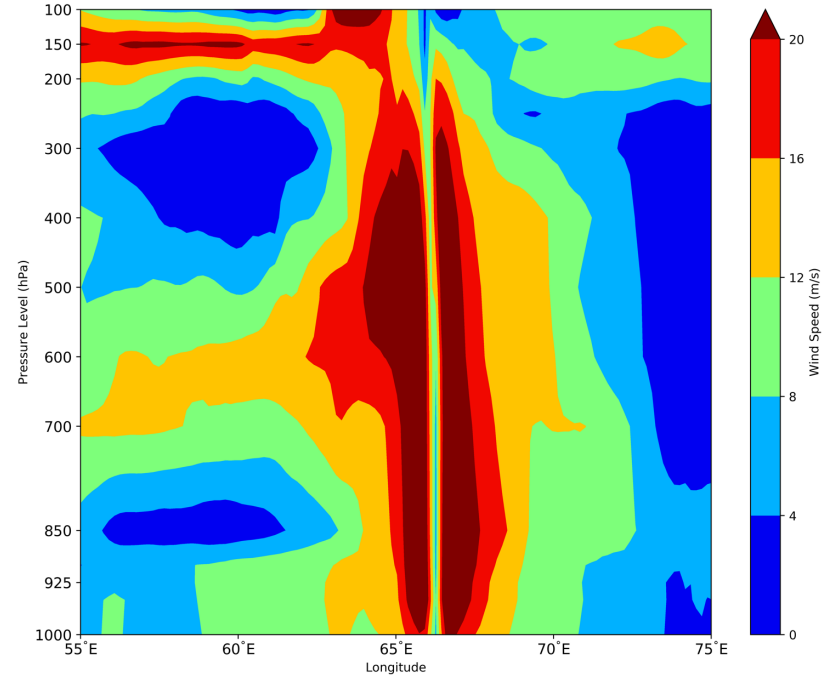


ATOVS



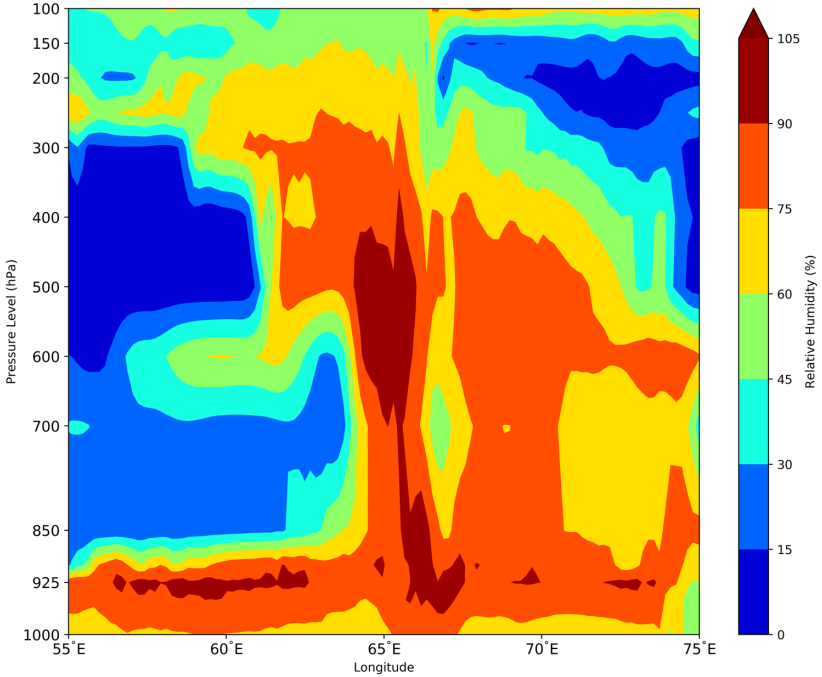
ATOVS reduces the wind speed in the mid-troposphere whereas ATOVS and ATMS+ATOVS show similar pattern with increasing wind speed whole column.

ATMS+ATOVS

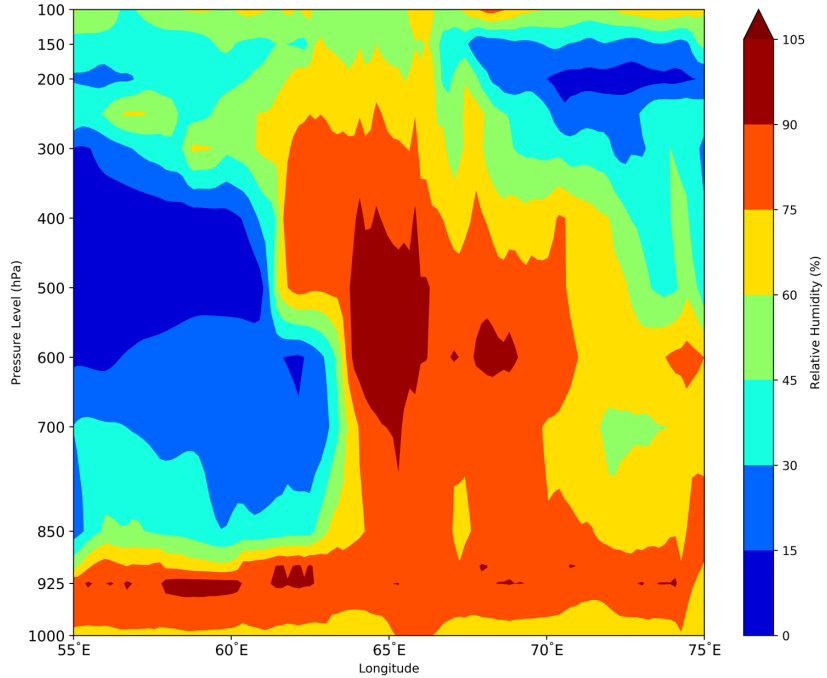


Relative Humidity (%) – 08 June 2023 – 06 UTC

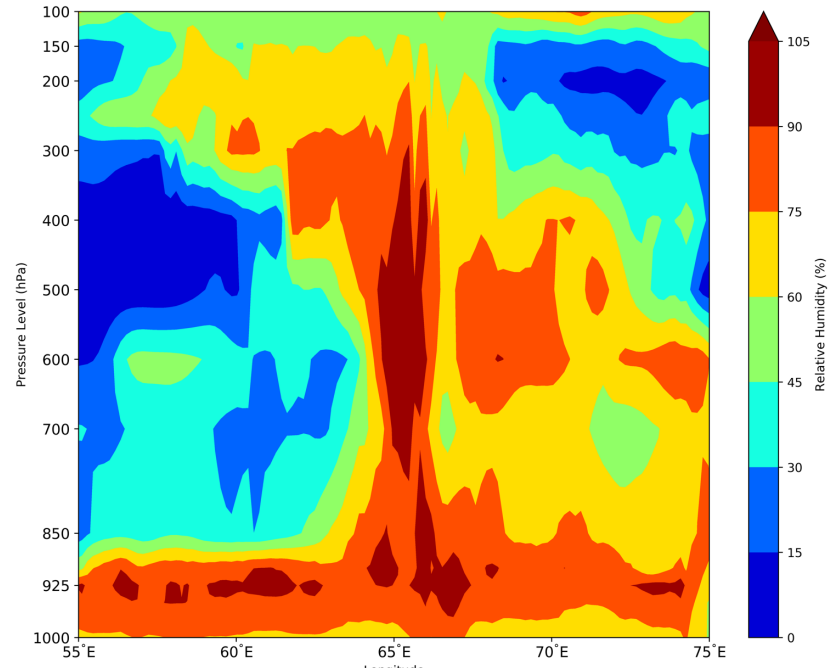
CNTL



ATMS

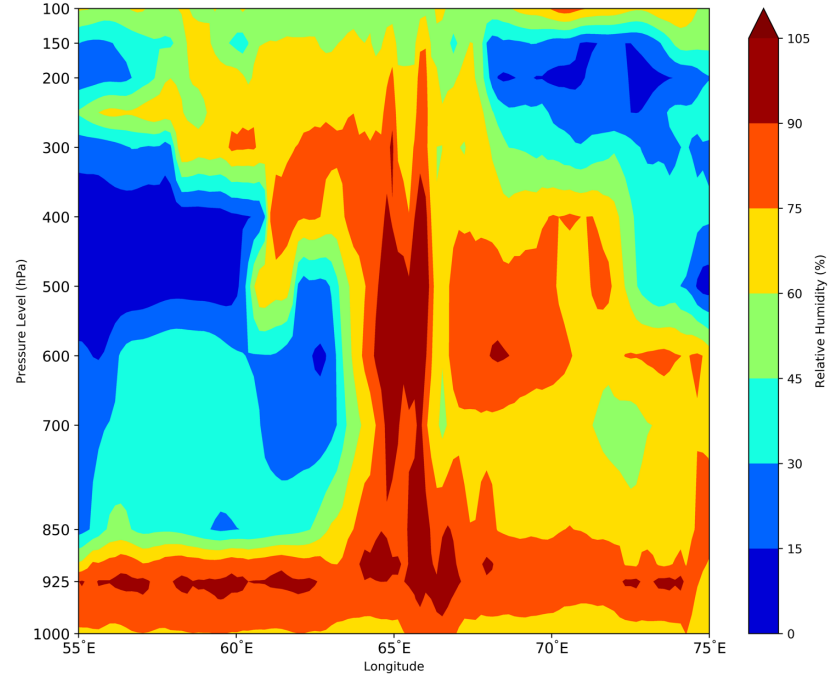


ATOVS



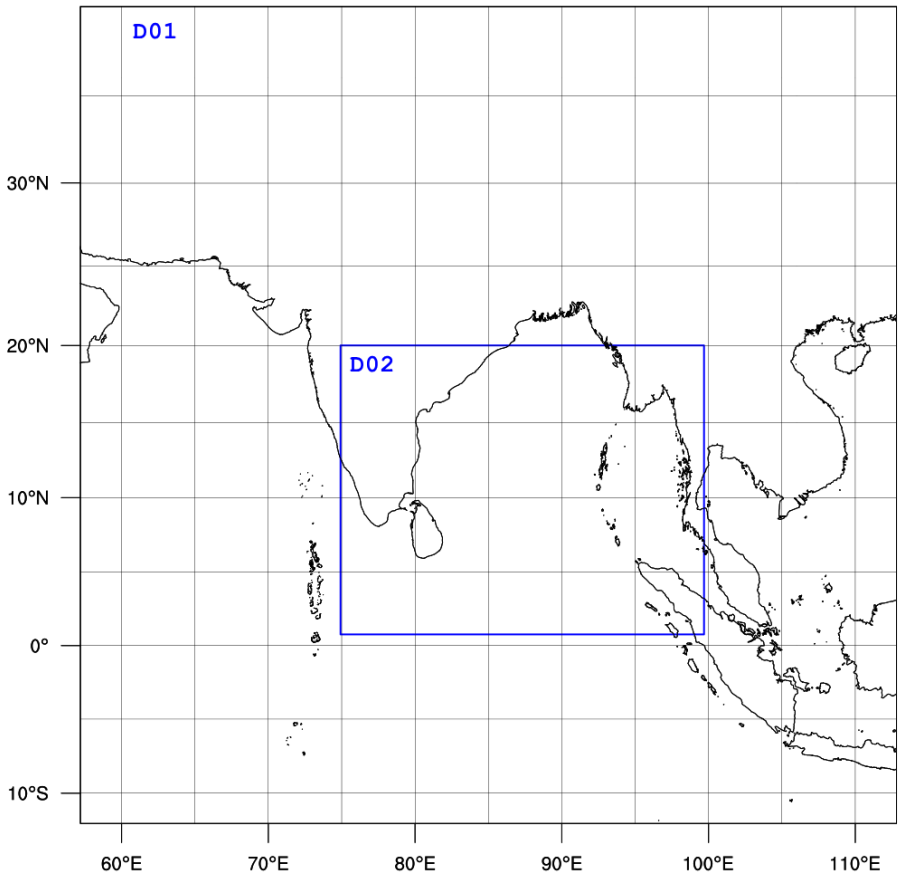
ATMS show more humid in the mid troposphere wider region.

ATMS+ATOVS



HRRR Regional System

Domain Setup



	WRFV 3.9.1
Horizontal resolution	27 & 9 km
Vertical levels	45
Model top	20 hPa
Grid points	Dom1: 230 x 230 Dom2: 307 x 244
Physical Parameterization Schemes	
Radiation	RRTMG for both short and long wave radiation
Boundary layer	YSU PBL scheme
Microphysics	Morrison (Double moments)
Convective parameterization	Kain-Fritsch (new Eta) scheme
Land surface	Noah Land surface scheme

Design of experiments

CNTL (Conventional & GPRSO)

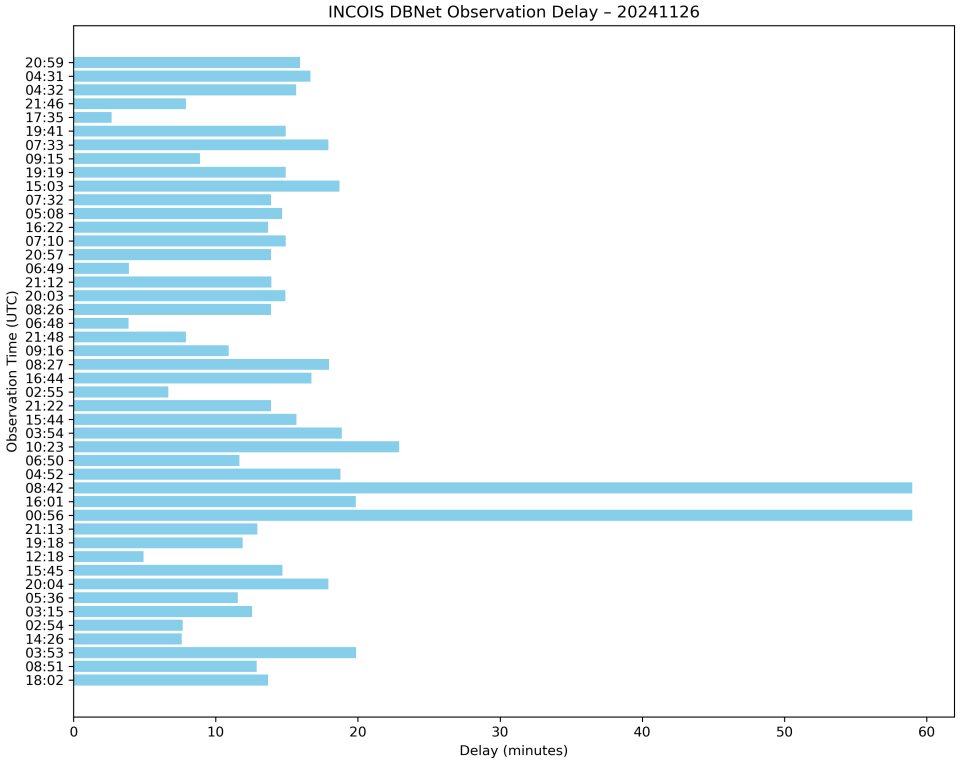
EXP (CNTL + AMSU-A+MHS+ATMS)

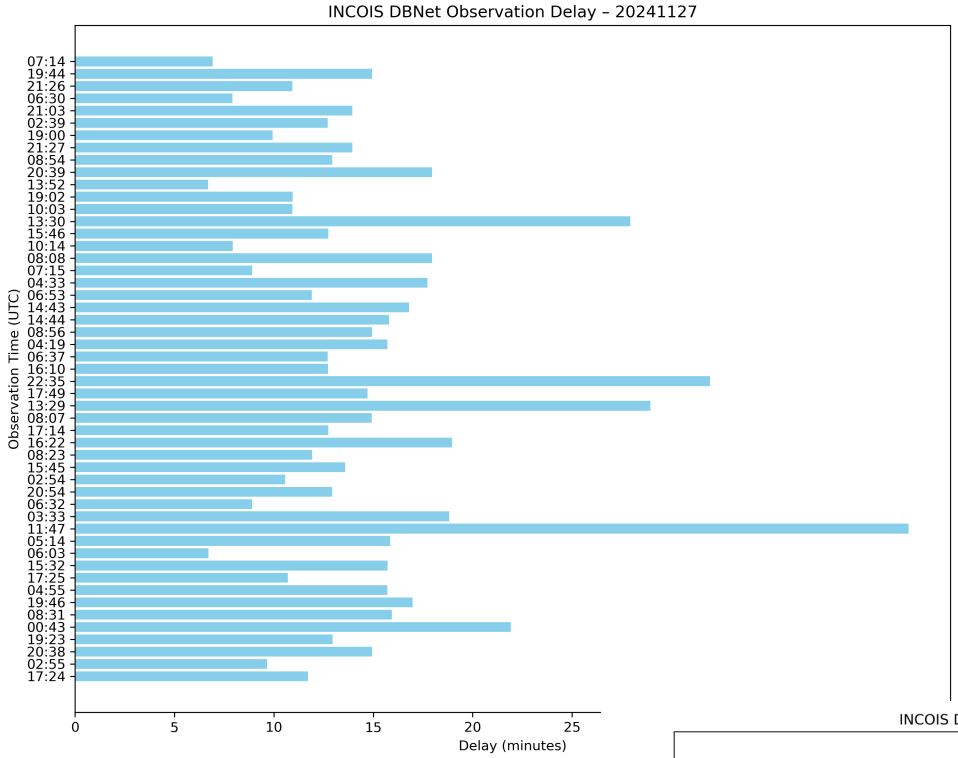
Life cycle of Cyclonic Storm “Fengal”

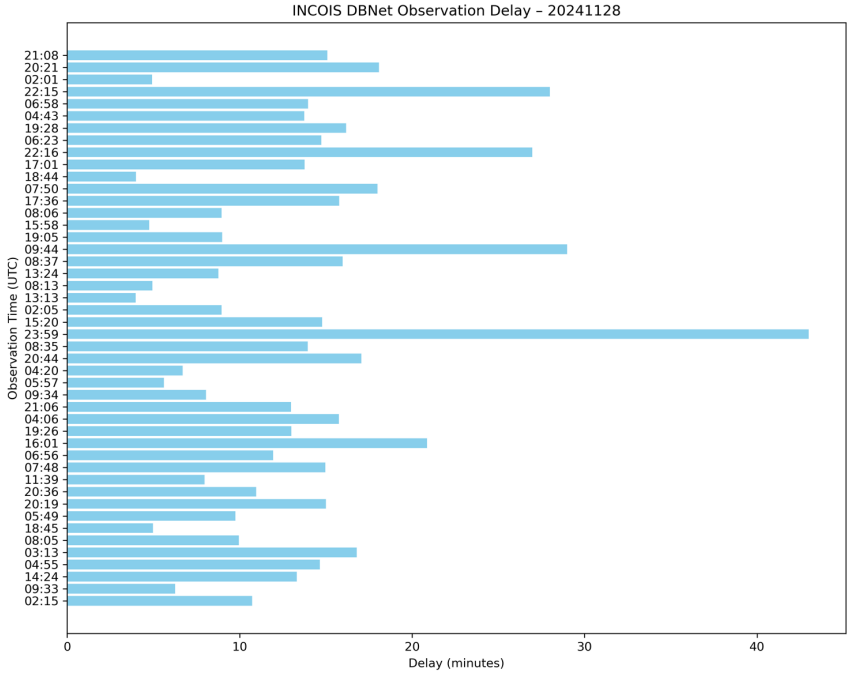
- ✓ A **low pressure** area formed over east Equatorial Indian Ocean and adjoining southeast Bay of Bengal on the morning of **23rd November**.
- ✓ It moved west-northwestwards and became a well-marked low on 24th November.
- ✓ Further **intensified into a depression on 25th November** over central south Bay of Bengal and adjoining EIO.
- ✓ Strengthened into a **deep depression** over southwest Bay of Bengal on **26th November**.
- ✓ **Intensified into Cyclonic Storm “FENGAL” on 29th November over the southwest Bay of Bengal**.
- ✓ Moved northwestwards and lay over the same region on the morning of 30th November.
- ✓ **Crossed North Tamil Nadu & Puducherry coasts near Puducherry between 2230 and 2330 IST on 30th November with wind speeds of 70–80 kmph, gusting to 90 kmph.**
- ✓ Weakened into a deep depression by forenoon of 1st December and further into a depression by the evening.

Observed track of severe cyclonic storm “FENGAL” over Southwest Bay of Bengal during 24th November- 02th December, 2024 (IMD Report, 2024)

Ref: Cyclonic Storm “FENGAL” over the Bay of Bengal (23th November– 02nd December, 2024): A Report



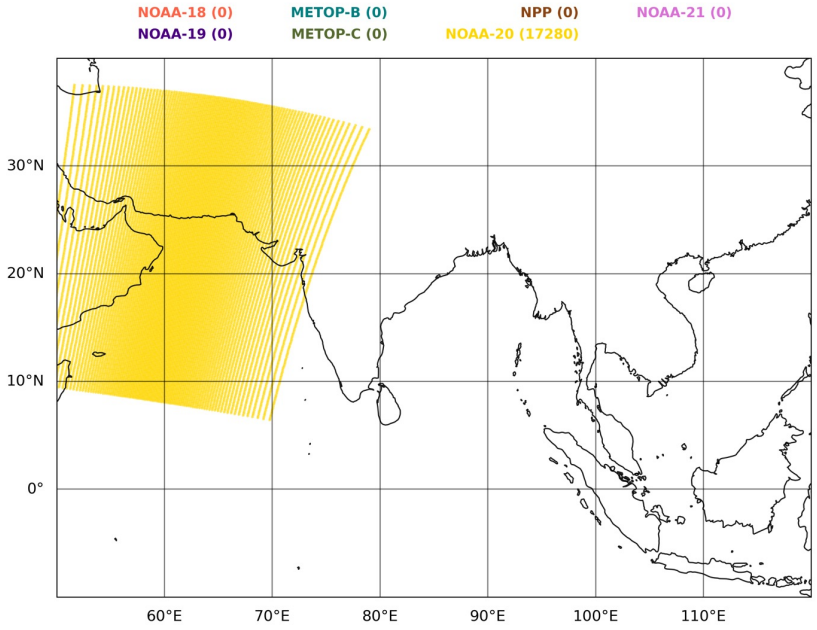




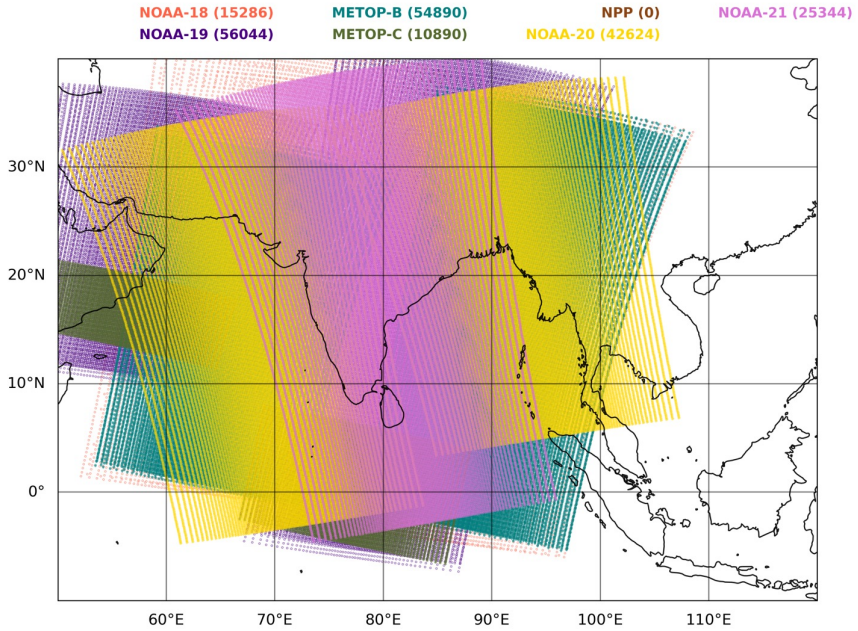
Data Reception via GTS from INCOIS
26 - 28 Nov 2024

Data Coverage (28 Nov 2024)

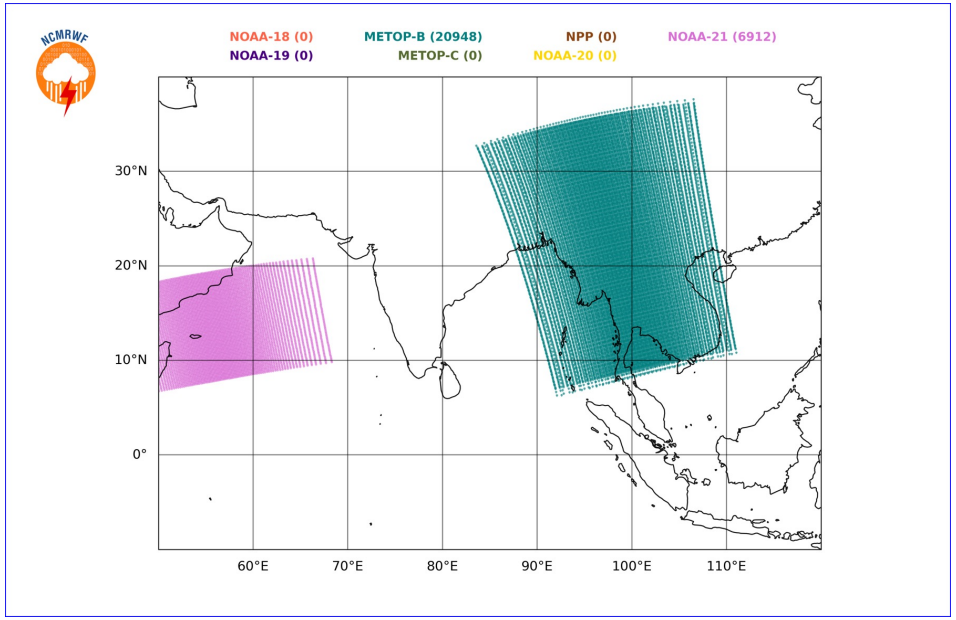
00 UTC



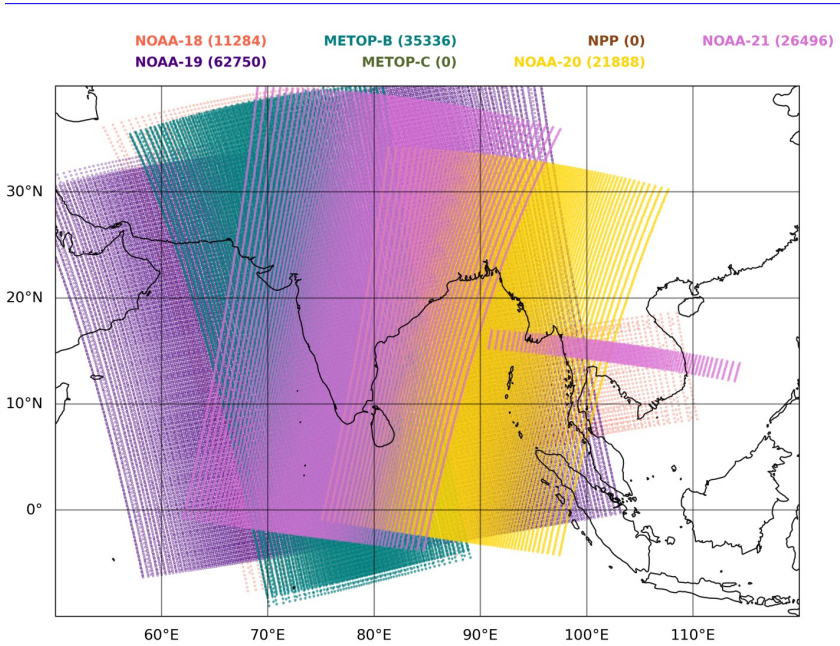
06 UTC

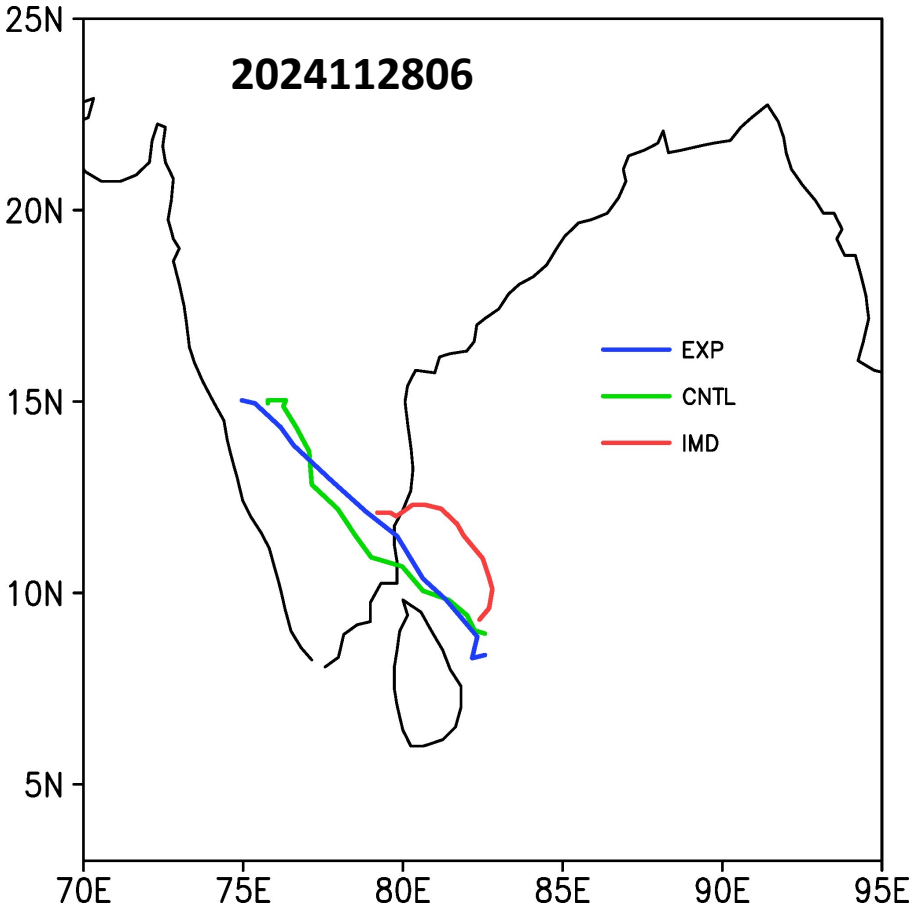


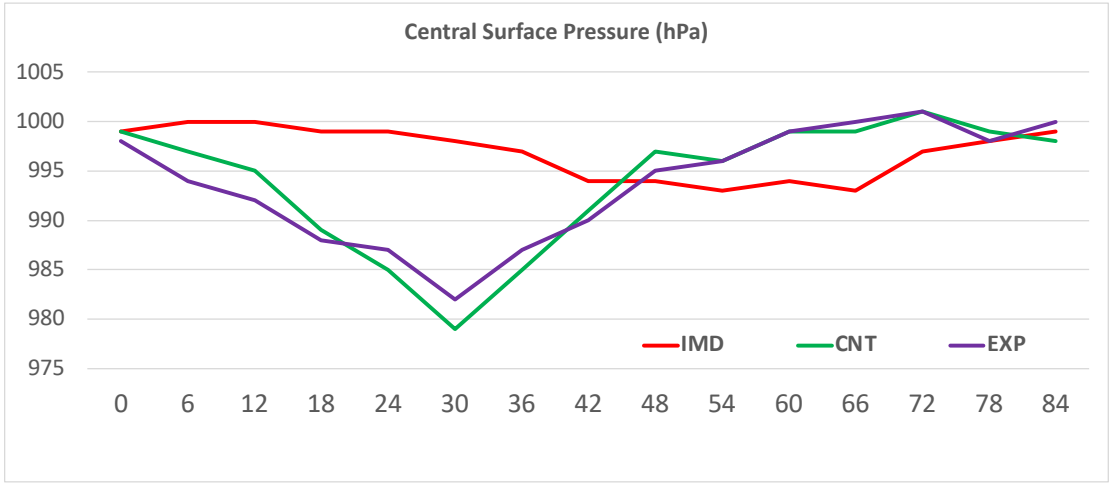
12 UTC

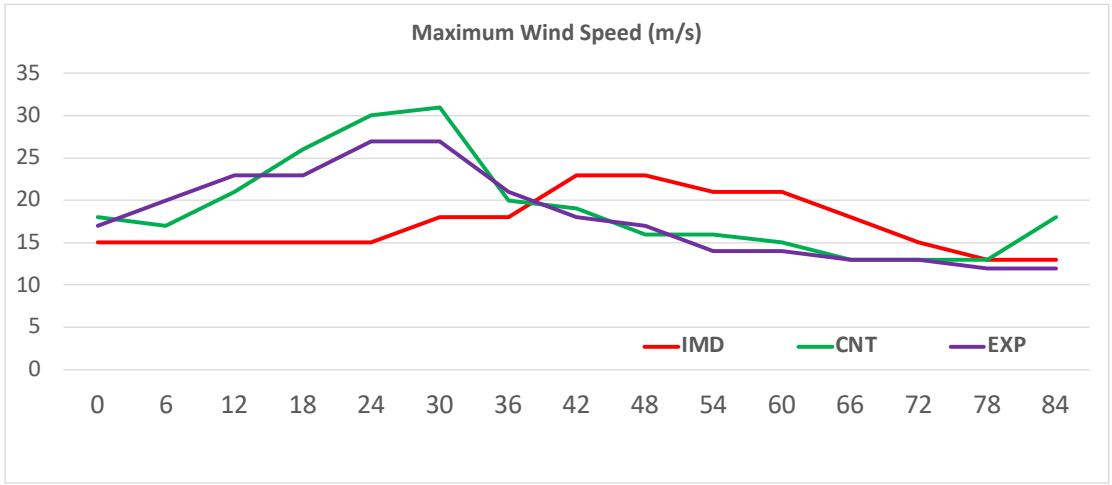


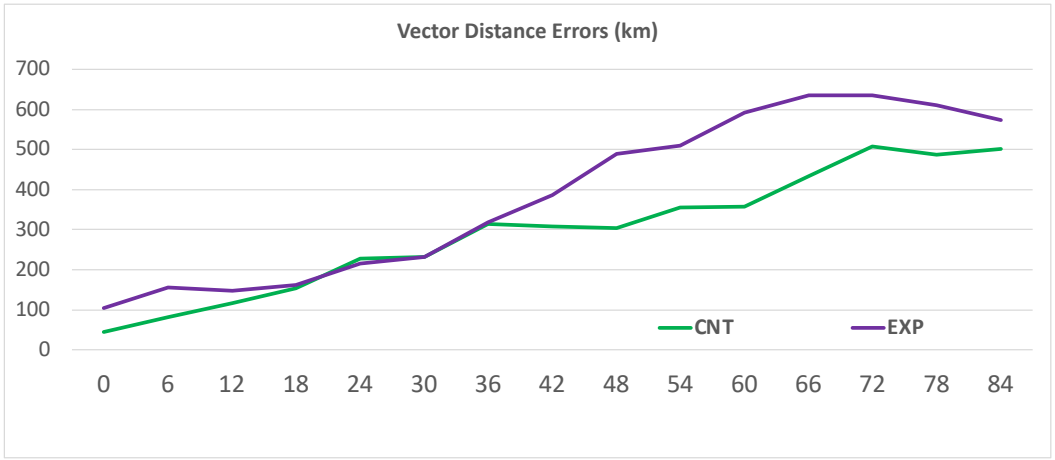
18 UTC







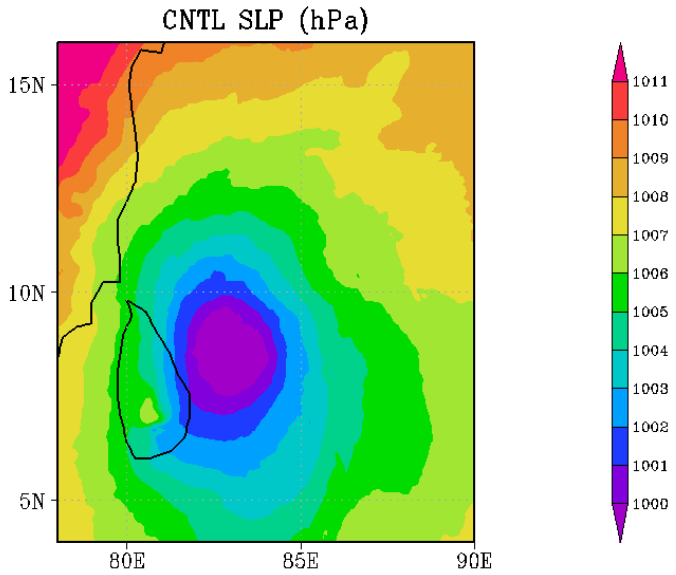


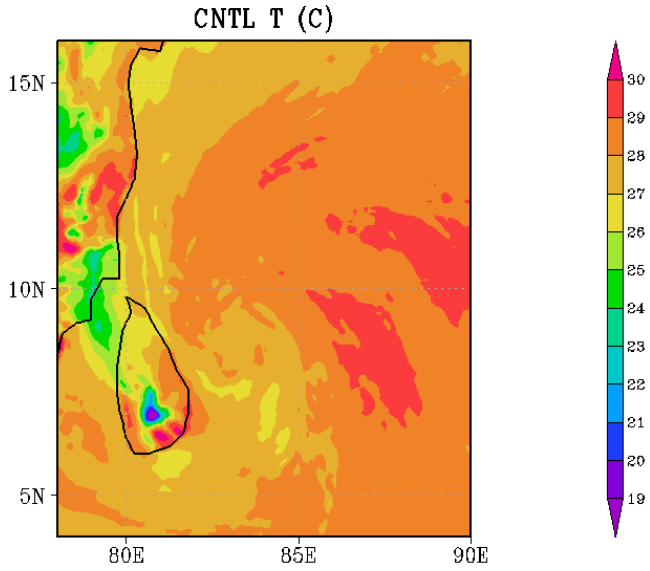


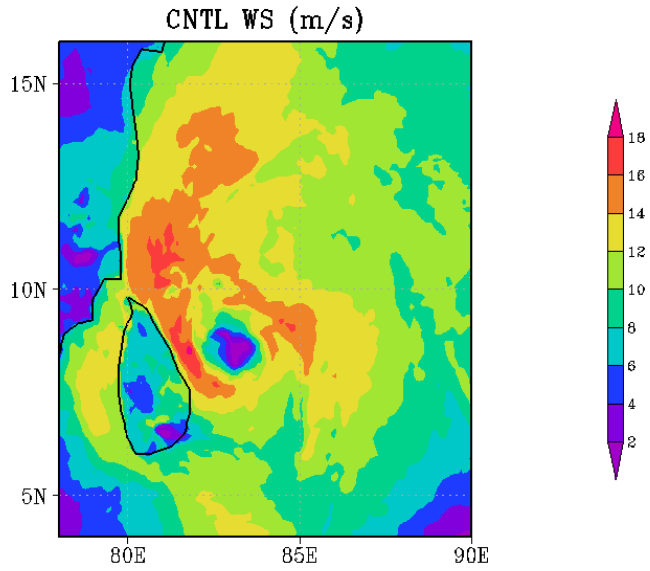
❖ Blue color (EXP) better than CNTL until 36.42 hours

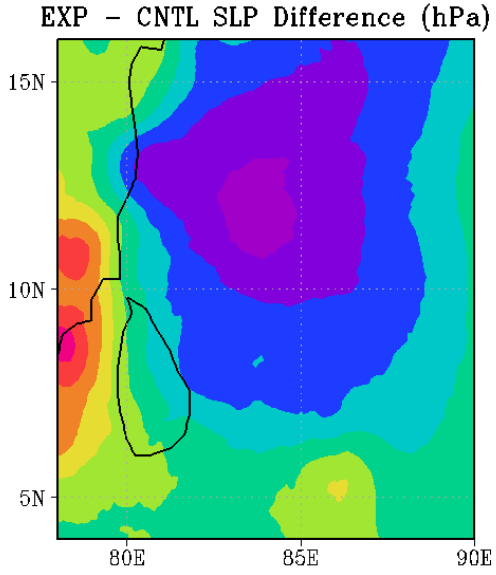
2024112806

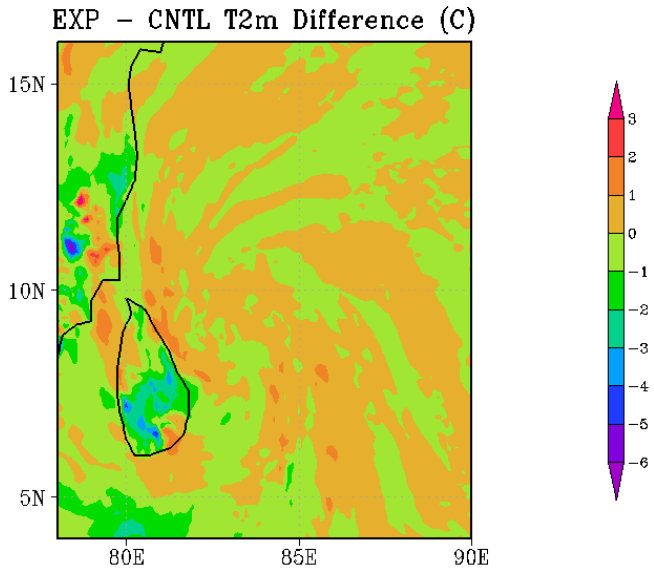
Initial Conditions

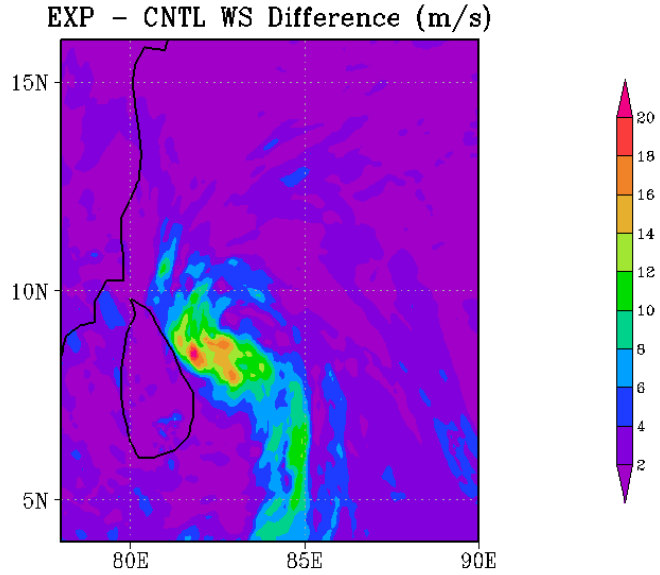








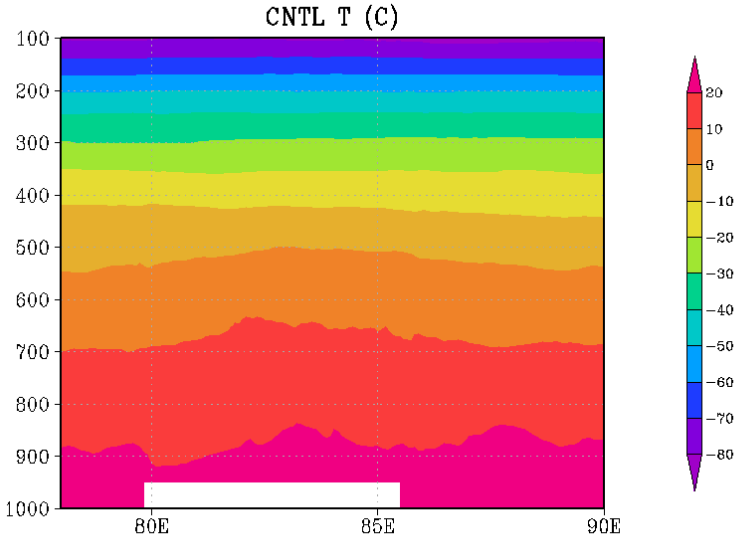


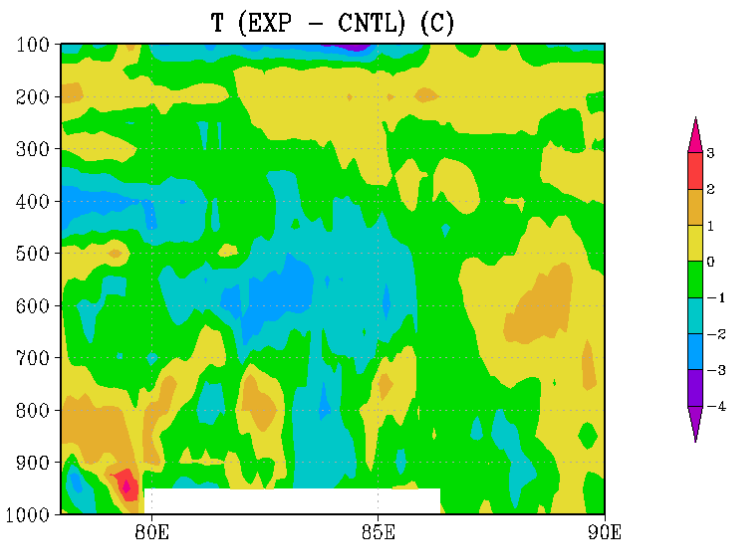


Initial Conditions (Centered 8 Deg N)

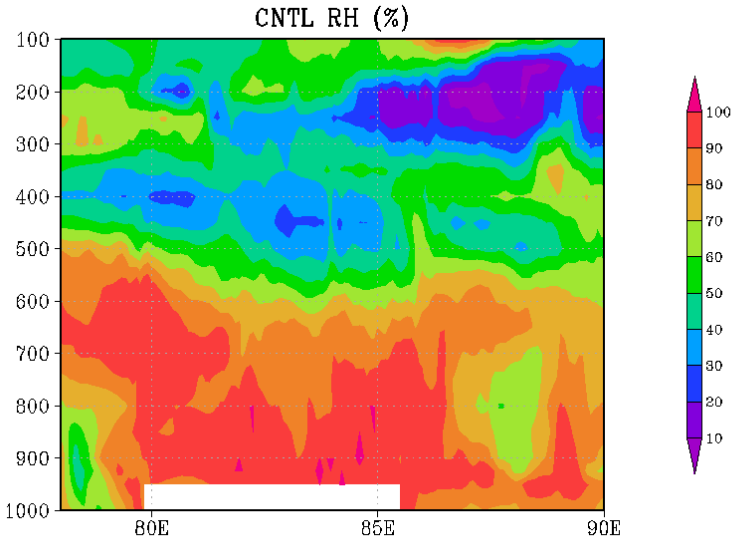
2024112806

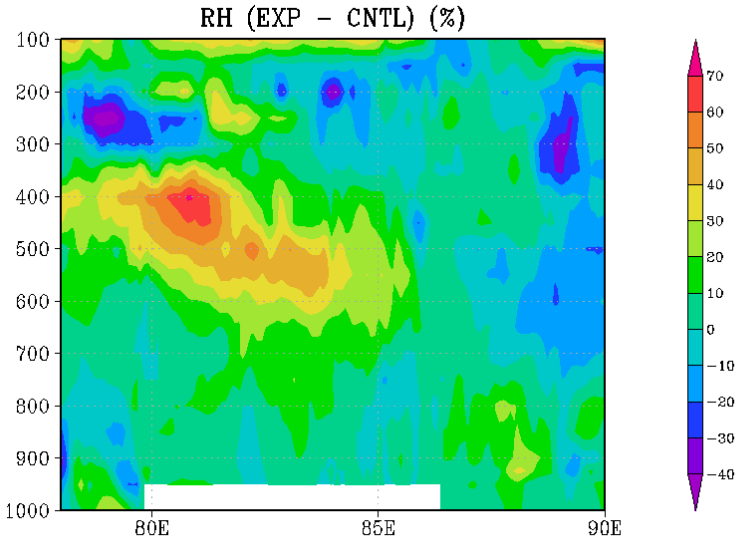
Height Vs T



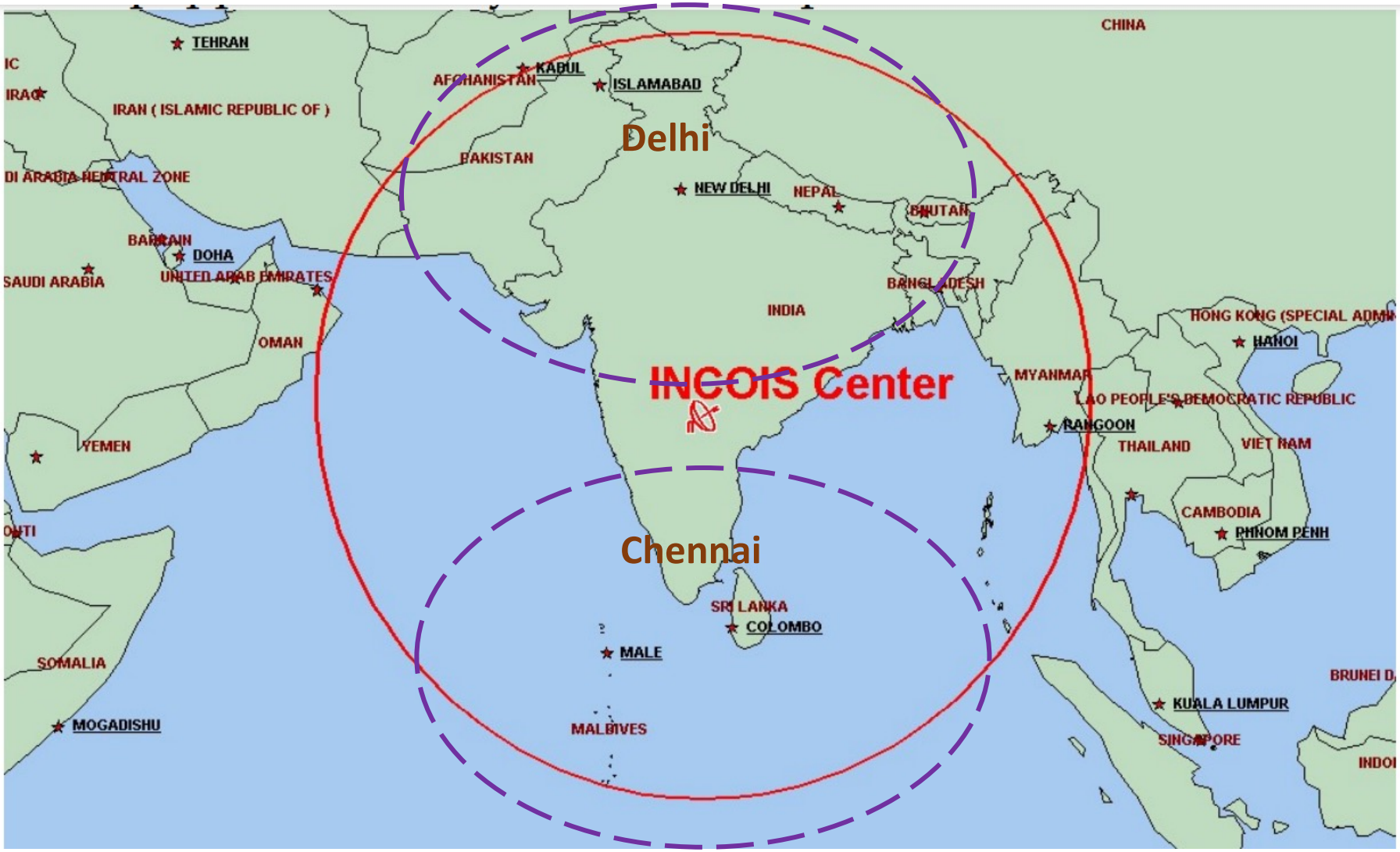


Height Vs RH





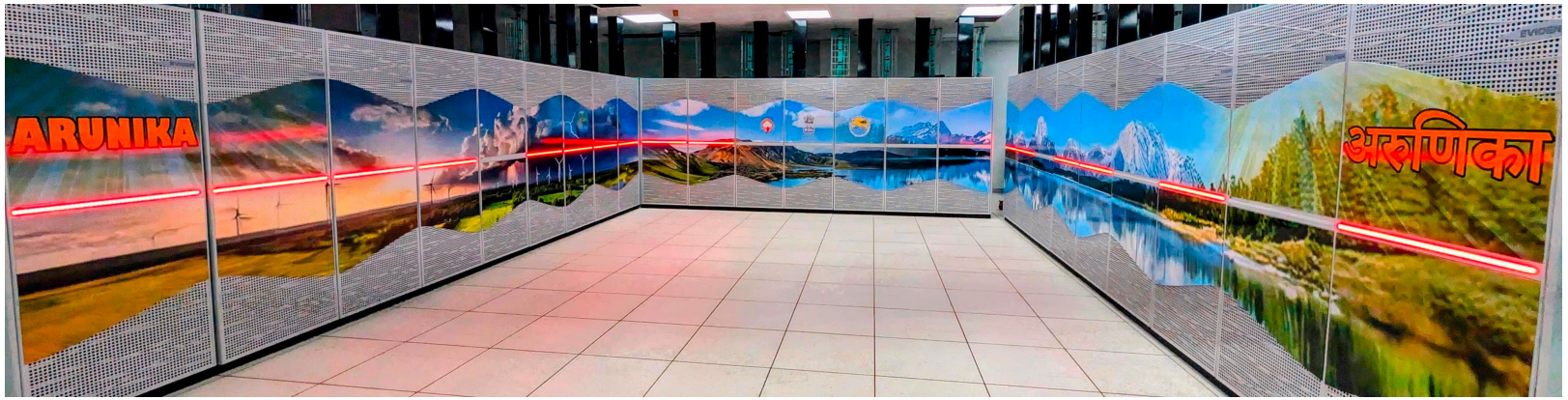
NCMRWF (MoES) Future DBNet Plans



Conclusions

- ✓ Indian DBNet level 0 data from NRSC has been processed at NCMRWF with in house developed scripts by using opensource software AAPP, OPS-LRS, Metopizer, RT-STPS, CSPP.
- ✓ INCOIS directly transmitting the data through GTS via RTH Delhi
- ✓ The level 1c bufr data (ATOVS, ATMS, CrIS, IASI) data is generated shared with global community in near real time through GTS.
- ✓ The study presents the impact of ATOVS and ATOVS data in the NCUM DA system.
- ✓ The ATOVS and ATMS have positive impact which help the environment for further movement of system inland as comparative to Control experiment. The track errors less with ATMS followed by ATOVS+ATMS. Similarly intensity (maximum wind) premature stage was forecasted well with ATMS and deepening and decay stages were predicted well by ATMS+ATOVS.
- ✓ ATOVS colls the upper atmosphere and slightly warms mid troposphere; where as ATMS follows similar trend of CNTL.
- ✓ The MW sounder DBNet data has the impact upto 36 hours in the Regional system adding moisture in the mid-troposphere.
- ✓ More case studies studies will be done to address the impact of DBNet in the Global and Regional systems.

Thank you



Write to us

indira@ncmrwf.gov.in
srinivas@ncmrwf.gov.in