

“Monsoon Par Charcha” मानसून पर चर्चा Monsoon Discussion Forum of 2024

*short and medium-range products
(inputs from IITM and NCMRWF)*



Mohan T. S, Sc- E

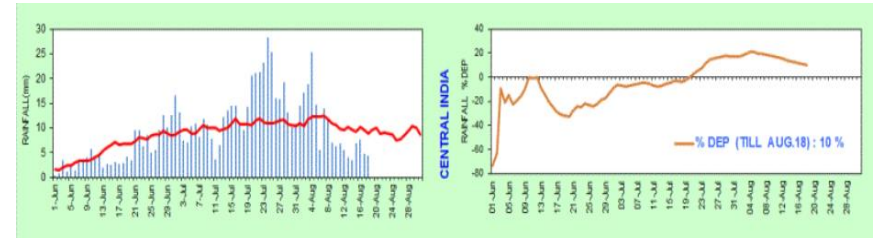
National Centre for Medium-Range Weather Forecasting, Ministry of
Earth Sciences

Email: mohans.thota@gov.in

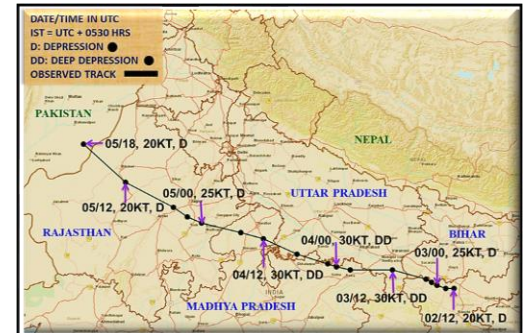


Outline

- Monsoon 2024
 - *Active phase (19-27 July 2024)*
 - *Deep Depression over Land (02-05 August 2024)*
- Forecast
- Special products
- Km scale modelling



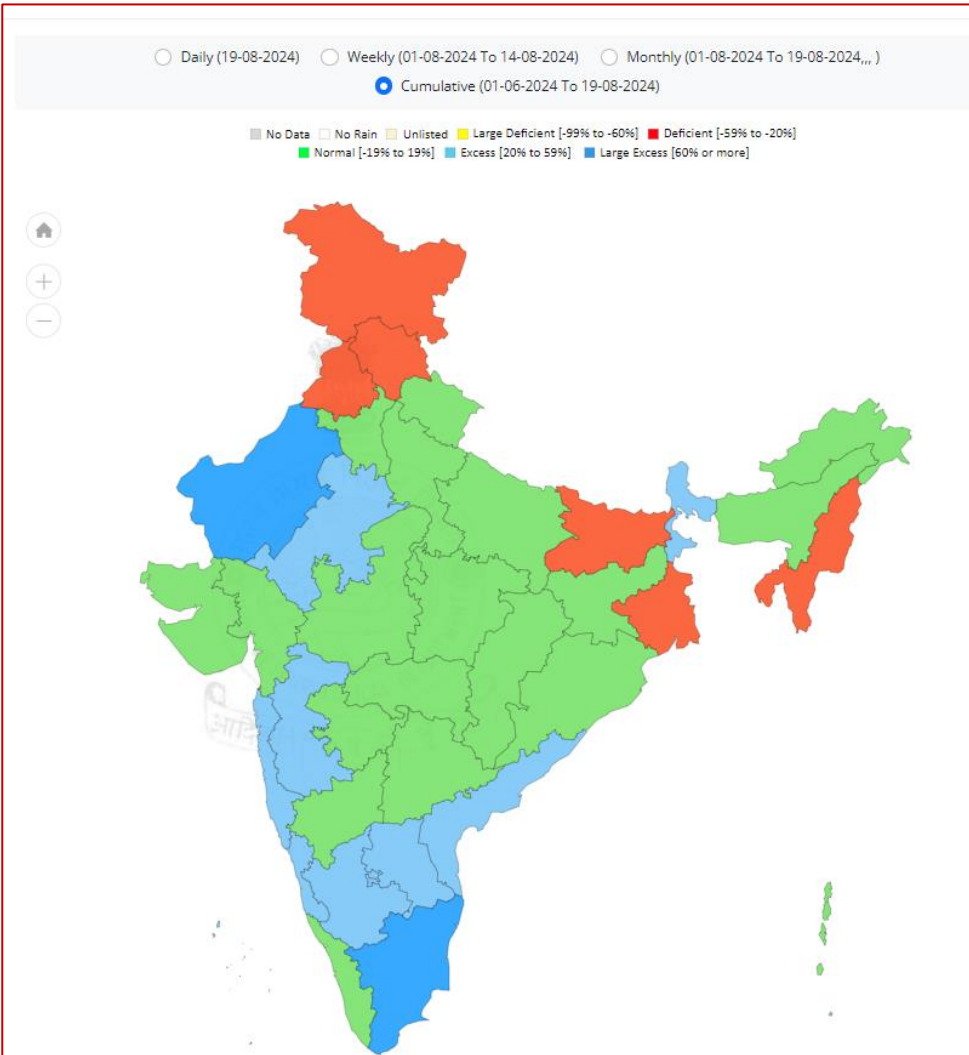
Source : IMD



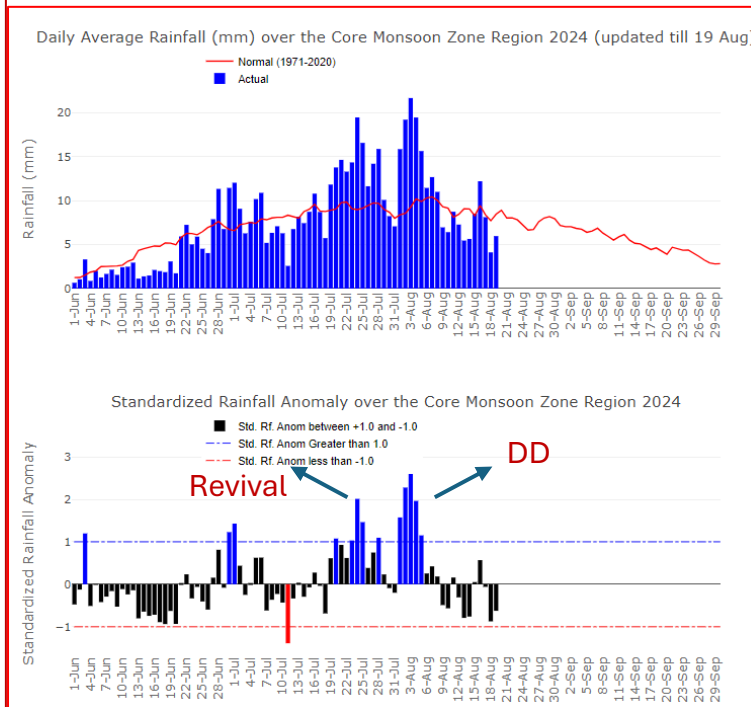
Source: IMD

Monsoon 2024

- Meteorological subdivisions in central and East India - normal rainfall
- Southeast Peninsular India – excess rainfall
- Northwest India – Excess rainfall
(climatologically dry region, synoptic system during first week of August)



Source: IMD

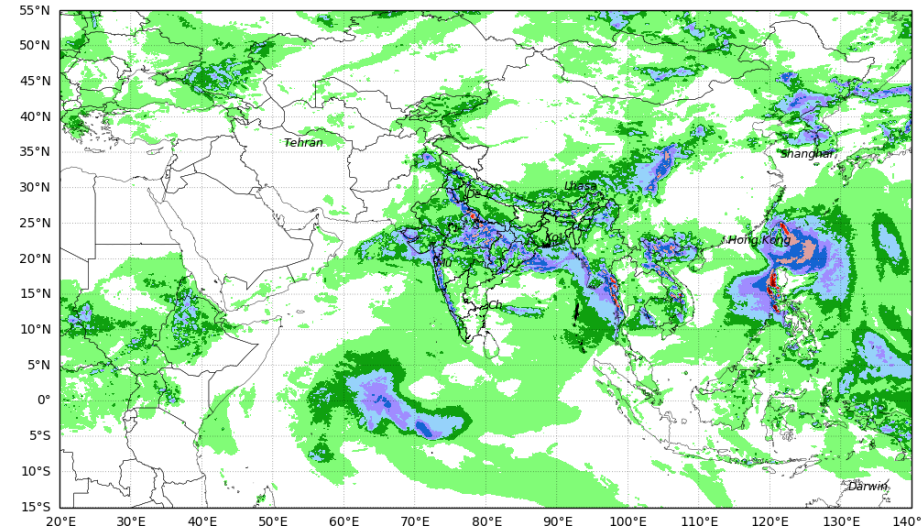


- Monsoon onset in 2024 was “early”
(due to established cyclonic storm “REMAL” - IMD)
- By **2nd July 2024** it covered the entire country.
- Monsoon **Revival** from break – 3rd week of July

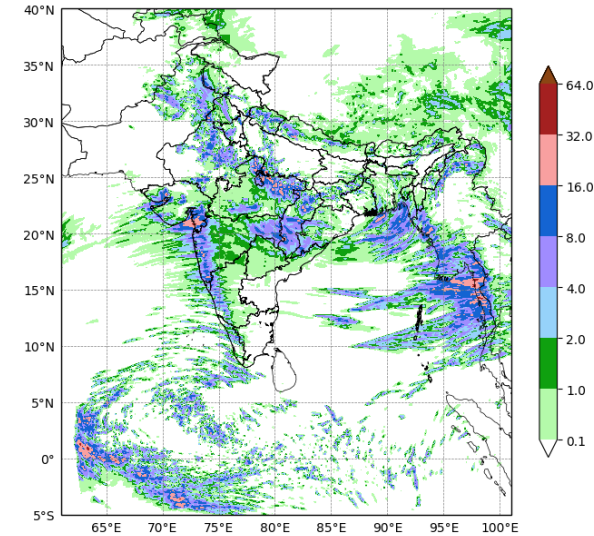
Peak active day (24th July 2024) (Day – 1 forecast)

- Rainfall maxima – tilting rain band
- Convection over the Bay of Bengal.
(different in GFS)
- GEFS ensemble mean performance is better
- Overestimation of rainfall amounts
NCUM (Global and regional)

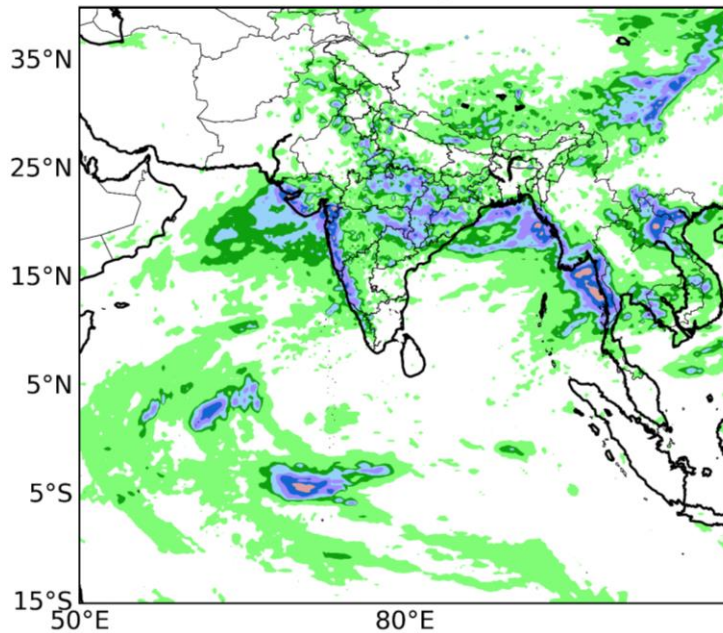
NCUM 24HR FORECAST VALID ON 03Z24Jul2024
RAINFALL(cm) CI=0.1,1,2,4,8,..



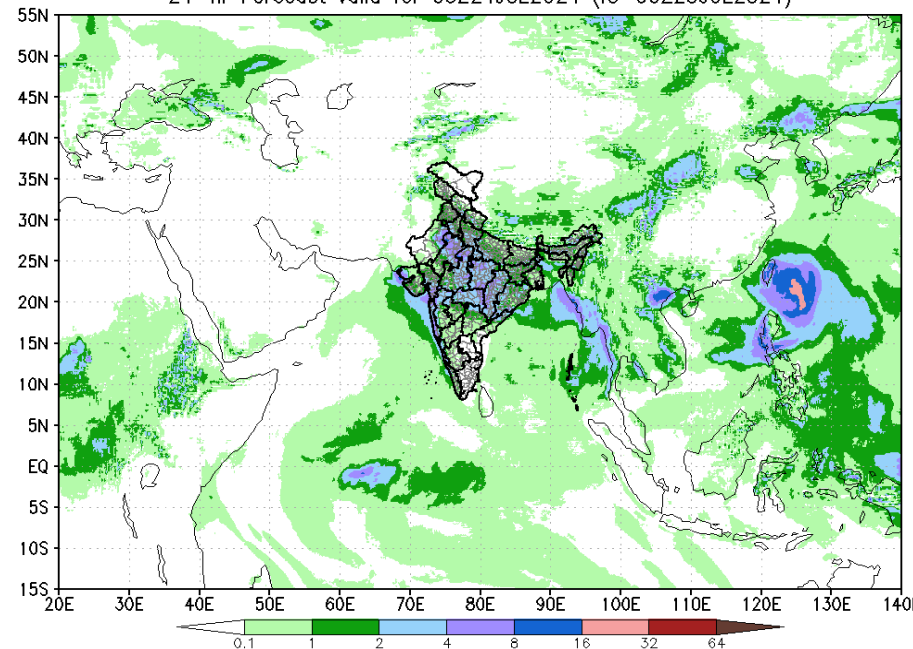
NCMRWF regional 4-km model Day-1 Forecast Valid on 03Z24Jul2024
Total RAINFALL (cm)



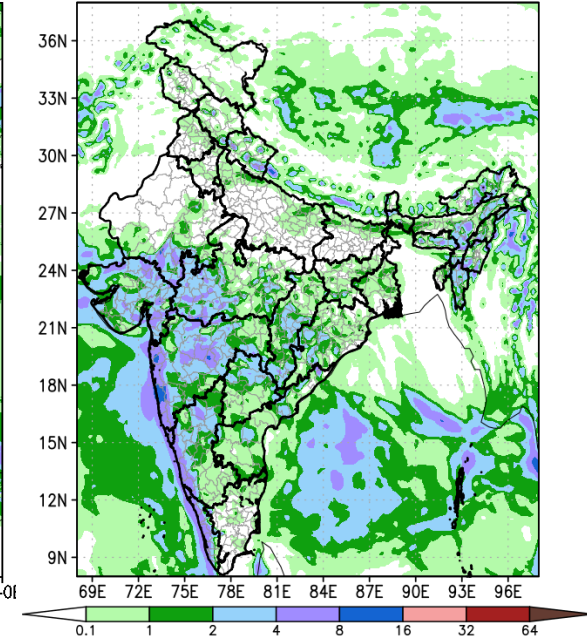
Observed rainfall (in cm) 20240724



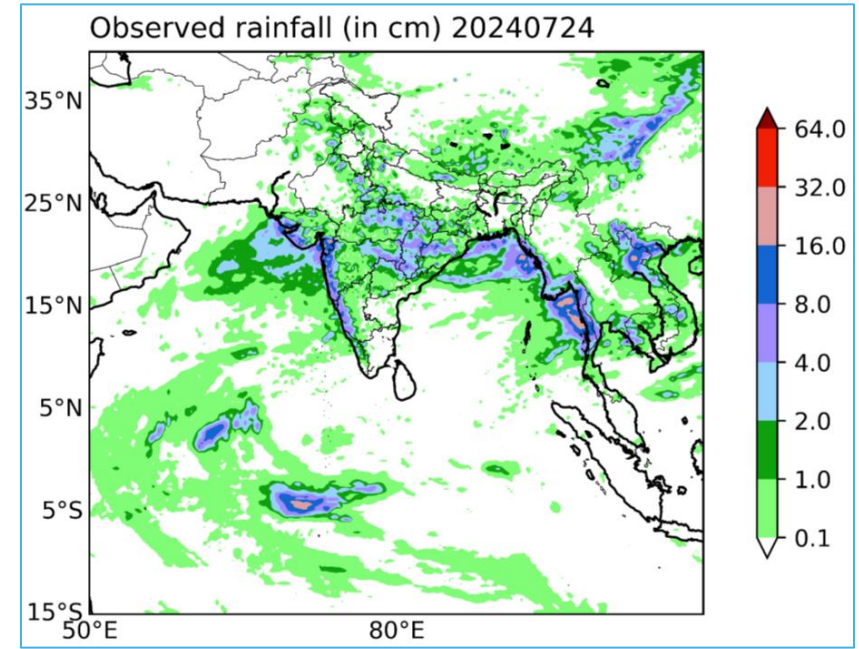
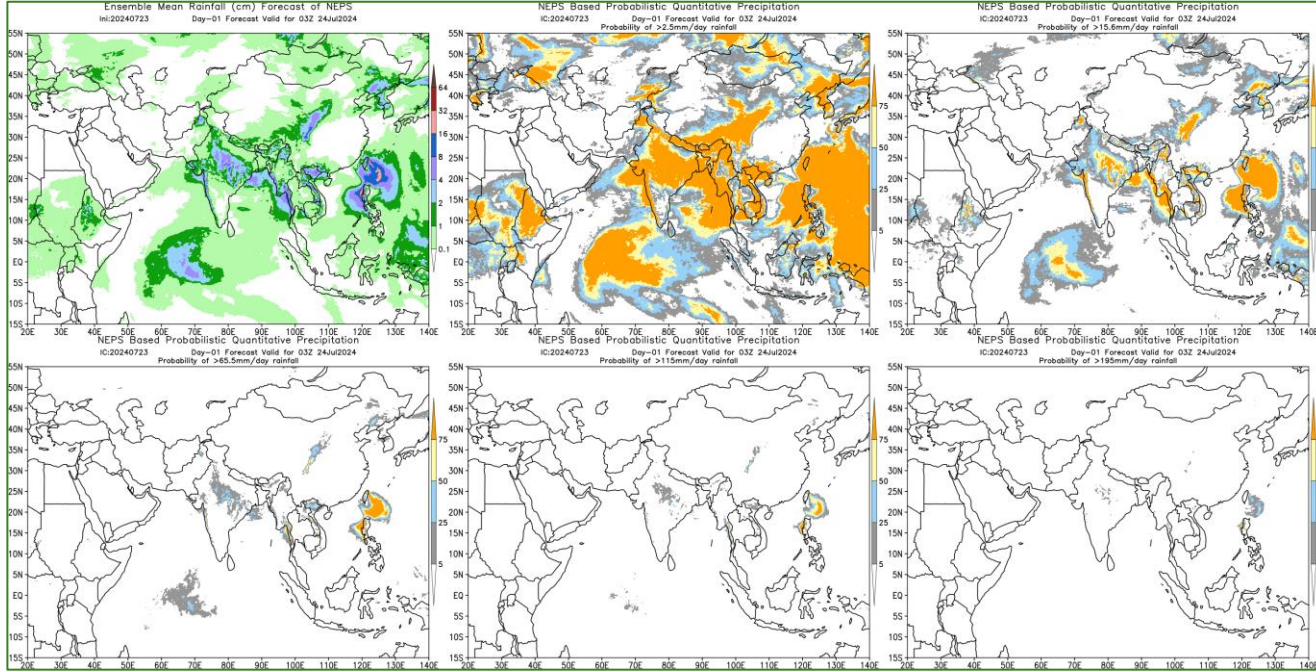
GEFS T1534 : Rainfall (cm/day), Ens Mean (20 Ens)
24-hr Forecast valid for 03Z24JUL2024 (IC=00Z23JUL2024)



IITM GFS T1534 : Rainfall (cm/day)
Forecast valid for 03Z24JUL2023 (IC=00Z23JUL2023)

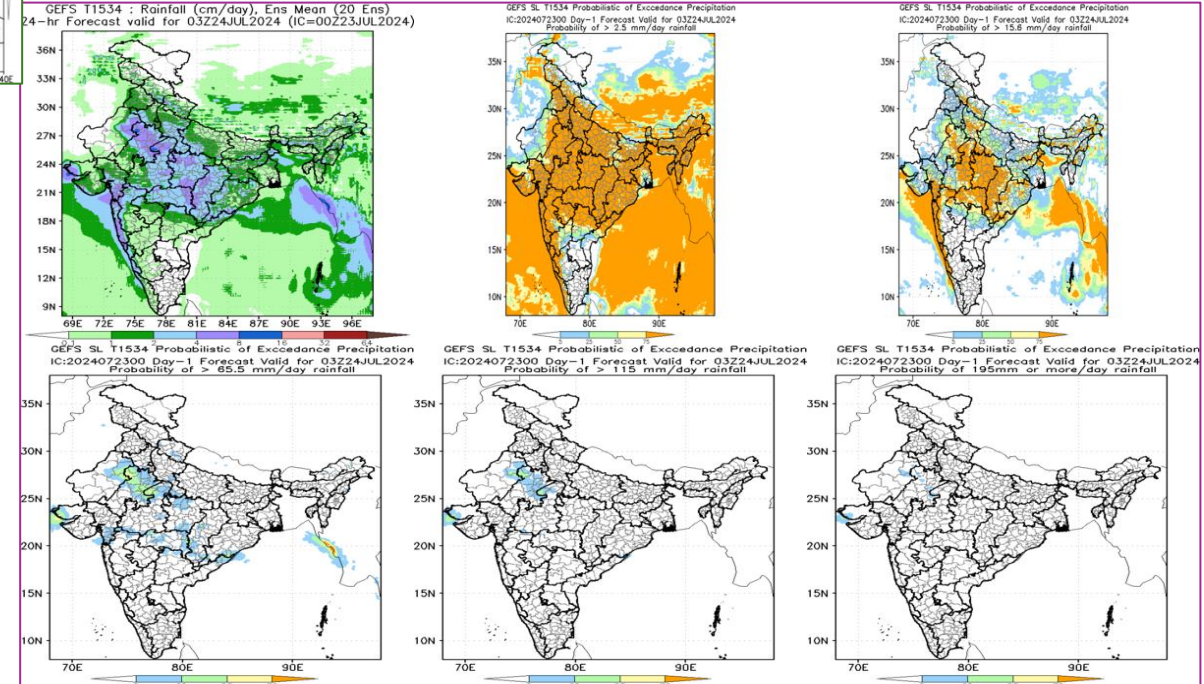


Probabilistic forecasts (Day-1 forecast 20240724)



Both NEPS and GEFS exhibit – spatial rainfall patterns with observations.

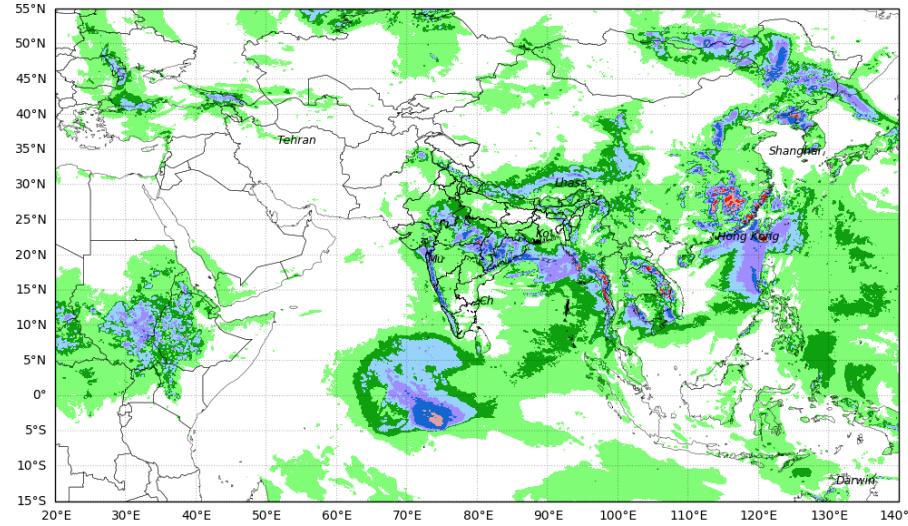
Rainfall >115mm/day is both EPS systems



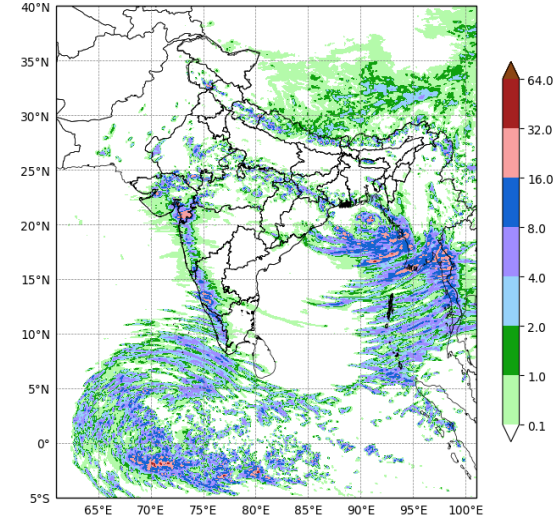
27th July 2024 (Day - 3 forecast)

- Overestimation of Western Eq. Indian Ocean convection in NCUM Global model
- Convection over the Bay of Bengal.
(different in GFS)
- GEFS ensemble mean performance is better

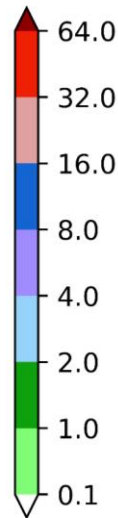
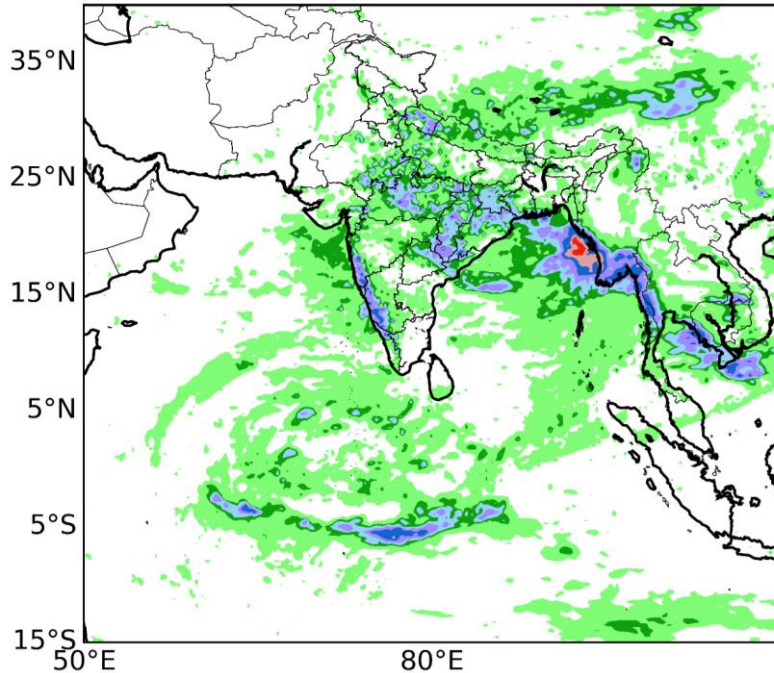
NCUM 72HR FORECAST VALID ON 03Z27Jul2024
RAINFALL(cm) CI=0.1,1,2,4,8,...



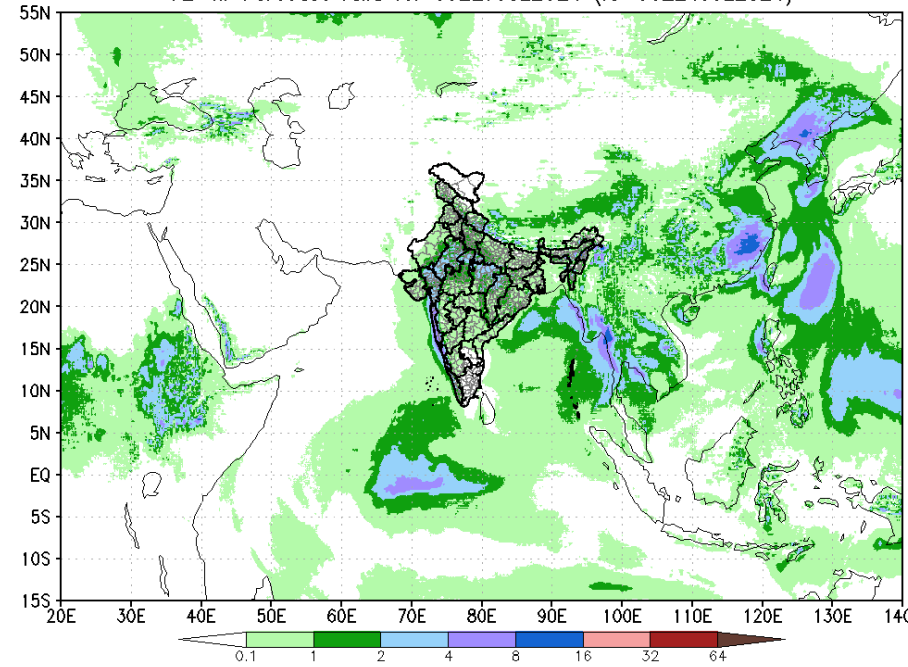
NCMRWF regional 4-km model Day-3 Forecast Valid on 03Z27Jul2024
Total RAINFALL (cm)



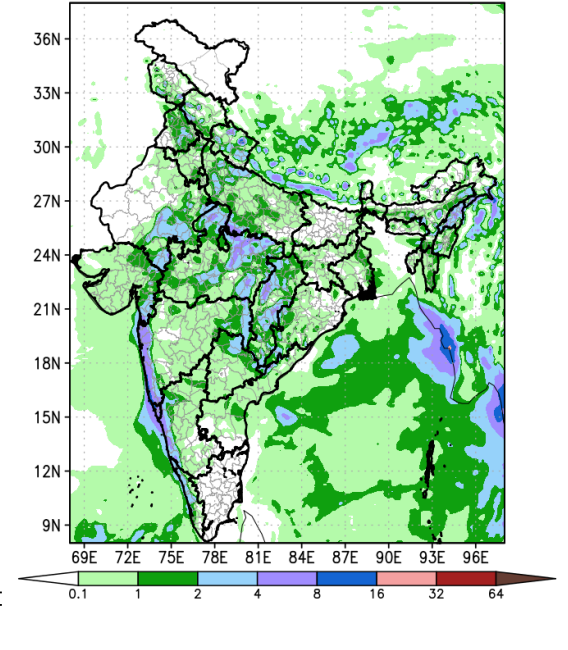
Observed rainfall (in cm) 20240727



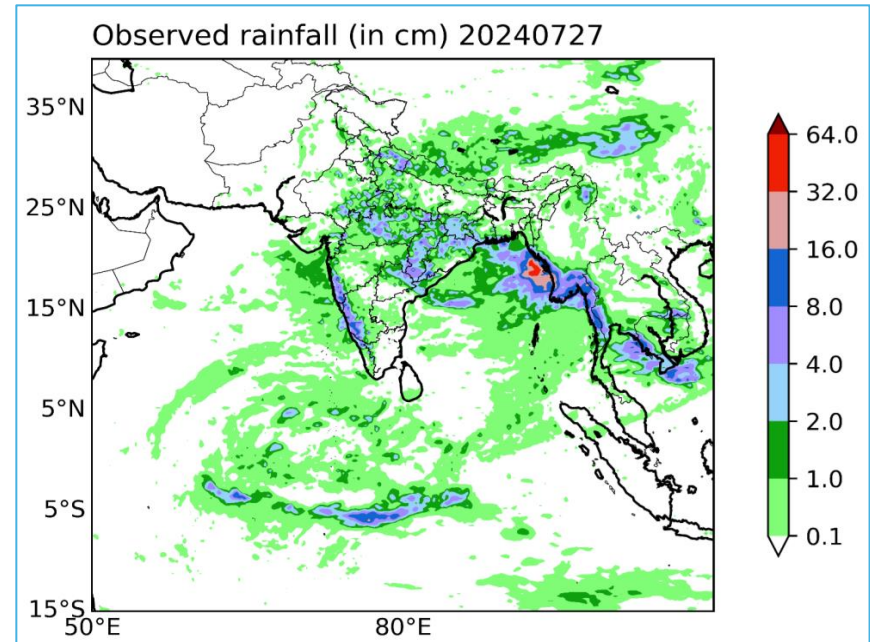
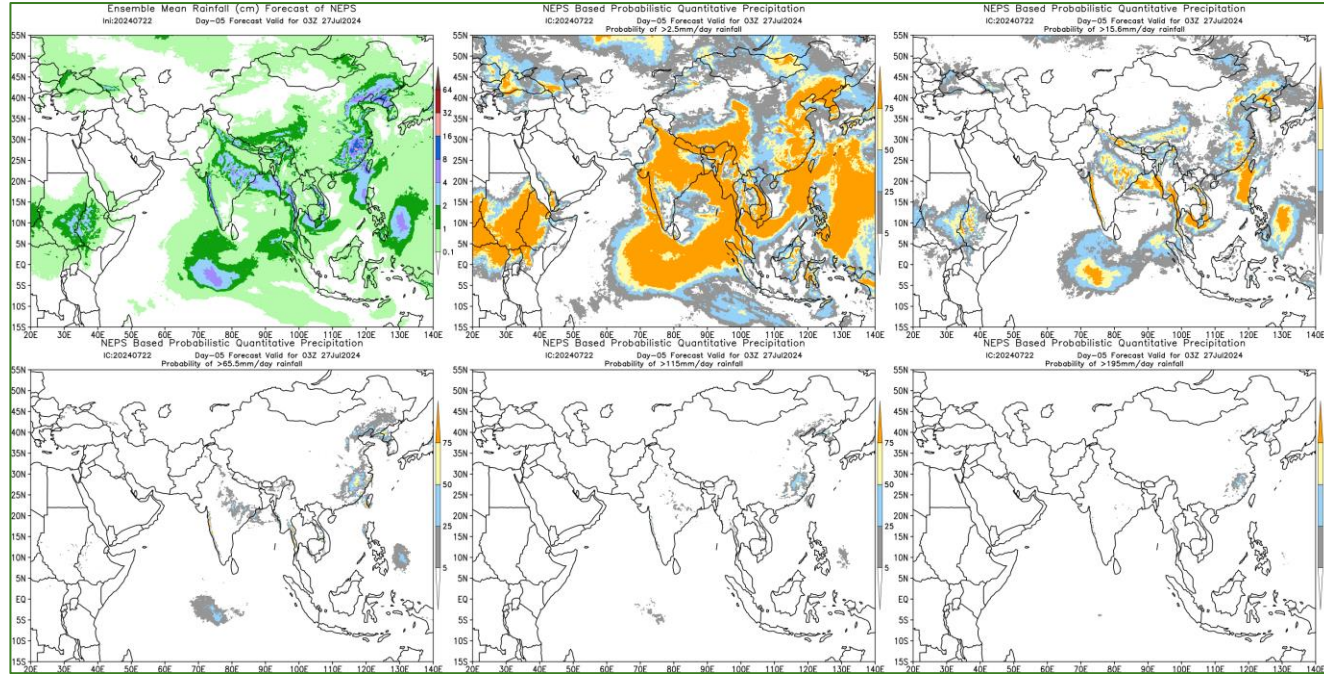
GEFS T1534 : Rainfall (cm/day), Ens Mean (20 Ens)
72-hr Forecast valid for 03Z27JUL2024 (IC=00Z24JUL2024)



IITM GFS T1534 : Rainfall (cm/day)
Forecast valid for 03Z27JUL2024 (IC=00Z24JUL2024)

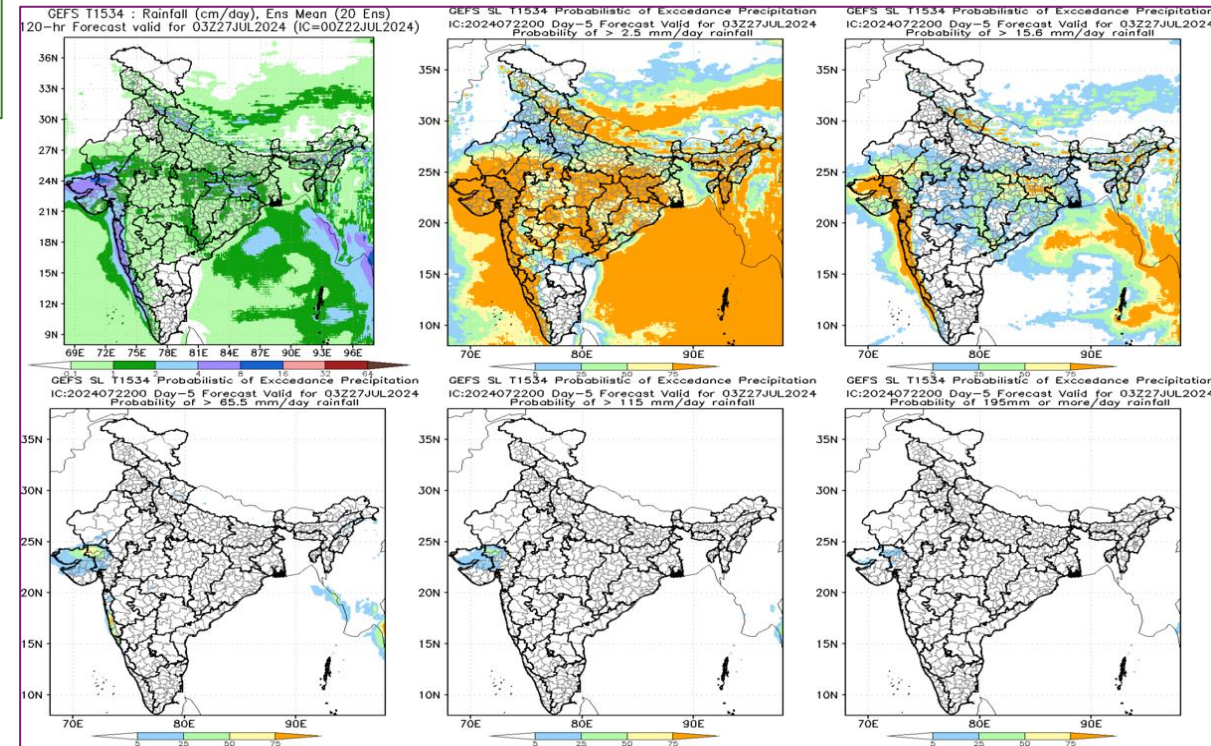


Probabilistic forecasts (Day-5 forecast 20240727)



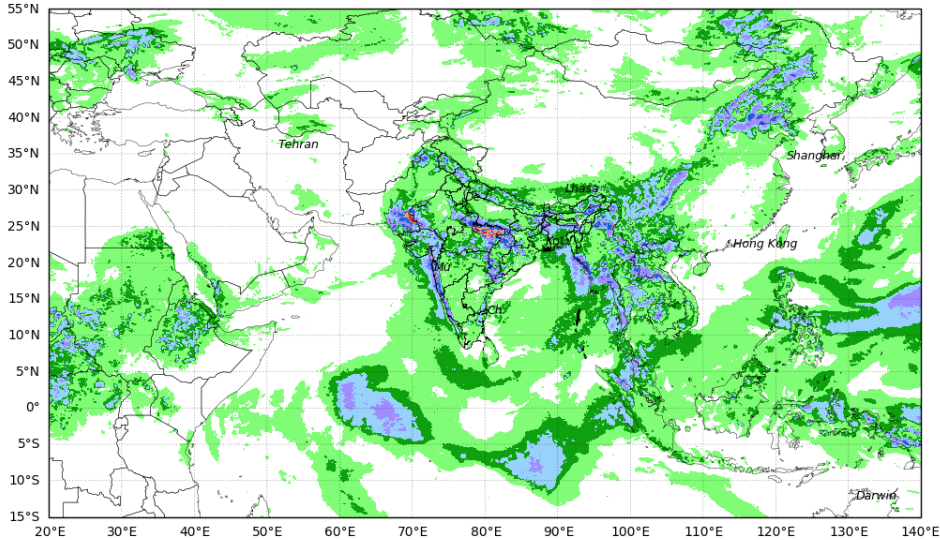
Overestimation - land convection (Gujarat)

Rainfall >115mm/day is both EPS systems

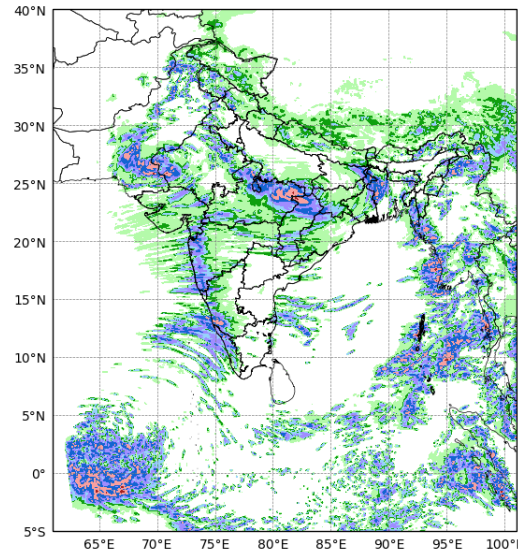


Deep depression 02-05 August 2024

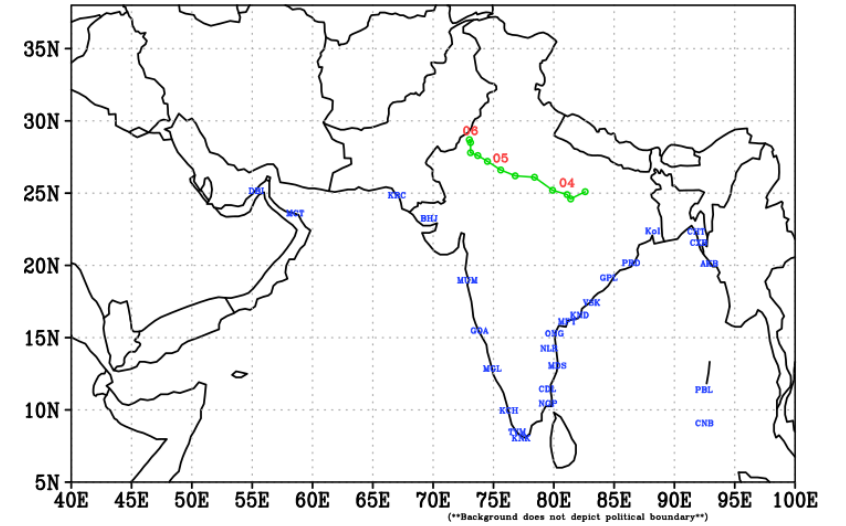
NCUM 24HR FORECAST VALID ON 03Z04Aug2024
RAINFALL(cm) CI=0.1,1,2,4,8,..



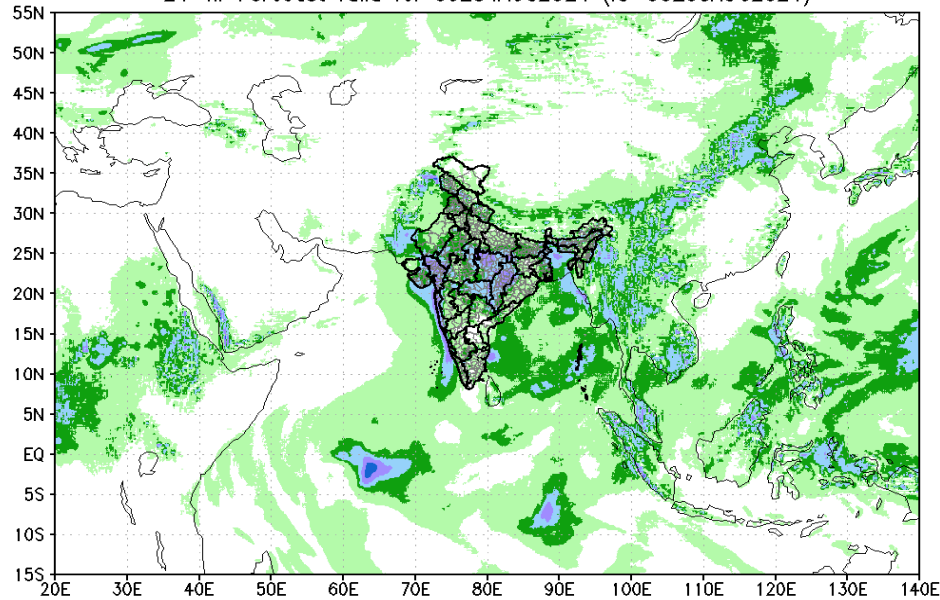
NCMRWF regional 4-km model Day-1 Forecast Valid on 03Z04Aug2024
Total RAINFALL (cm)



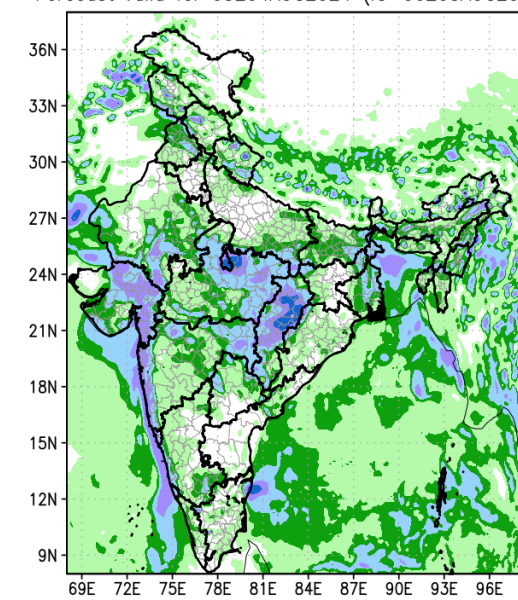
NCUM Predicted TC Track over NIO IC: 12Z20240803



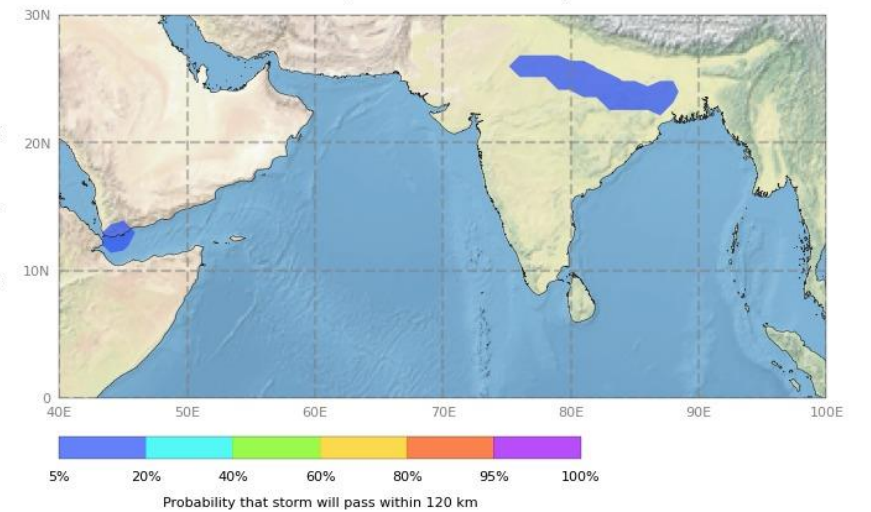
GEFS T1534 : Rainfall (cm/day), Ens Mean (20 Ens)
24-hr Forecast valid for 03Z04AUG2024 (IC=00Z03AUG2024)



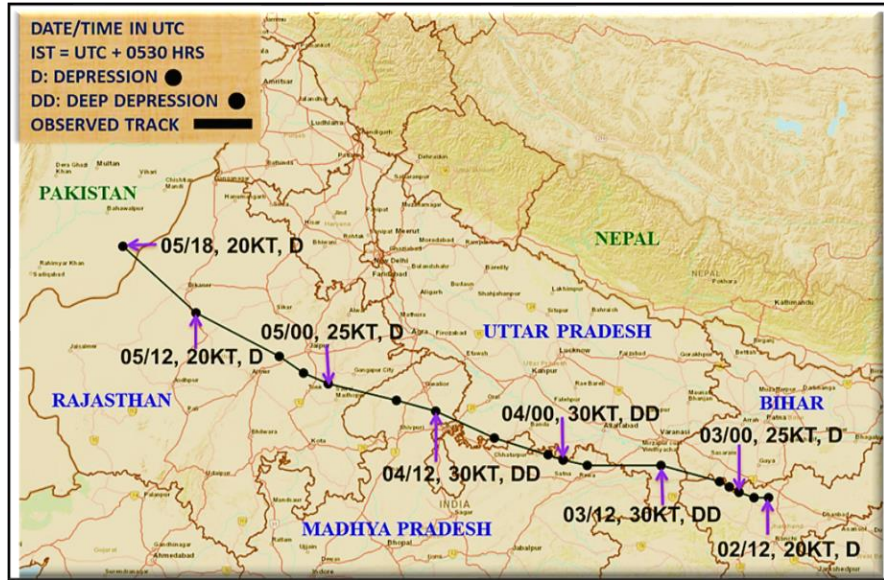
IITM GFS T1534 : Rainfall (cm/day)
Forecast valid for 03Z04AUG2024 (IC=00Z03AUG2024)



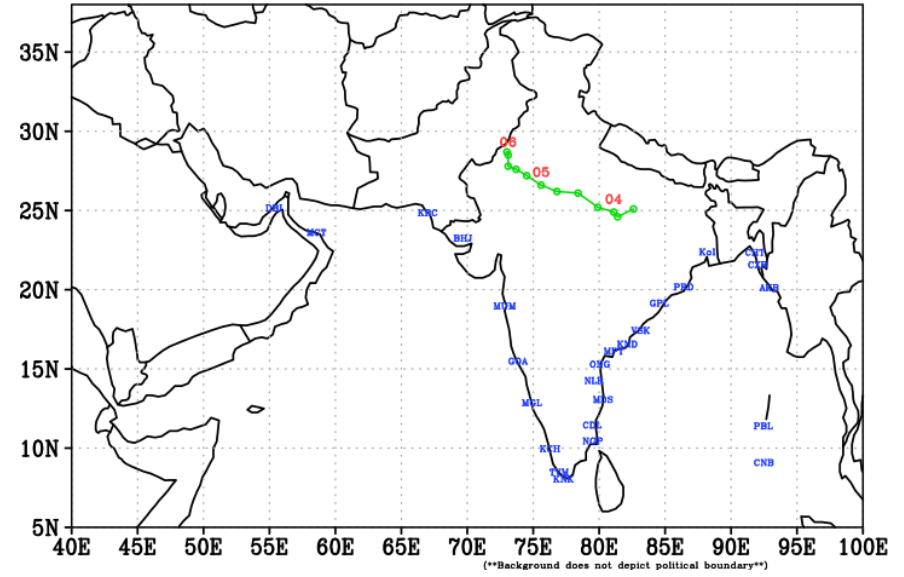
NEPS-G_12km_22mem: Forecast TC activity (named and forming storms)
in the North Indian basin from 00 UTC Thu 01 Aug 2024
Composite over the next 5 days



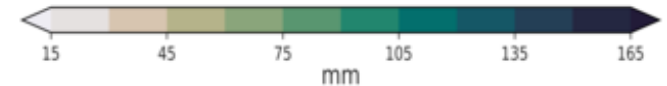
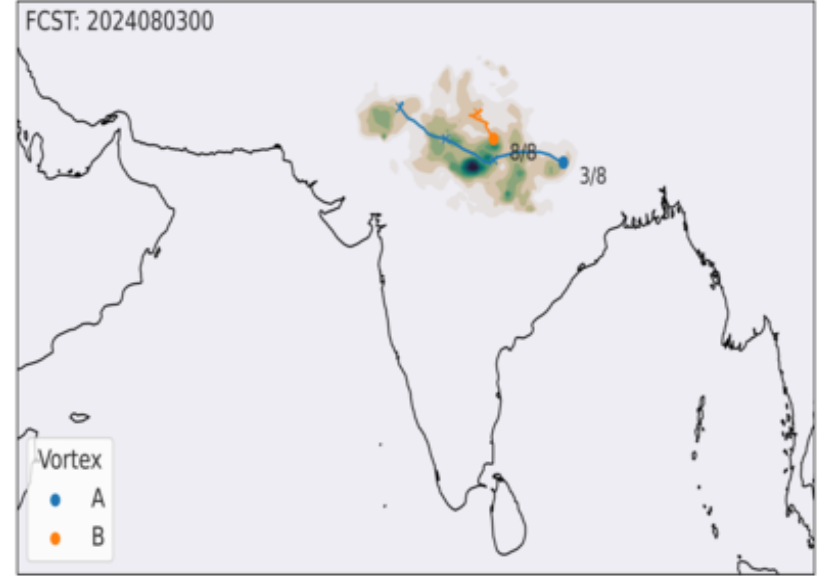
Deep depression 02-05 August 2024



NCUM Predicted TC Track over NIO IC: 12Z20240803

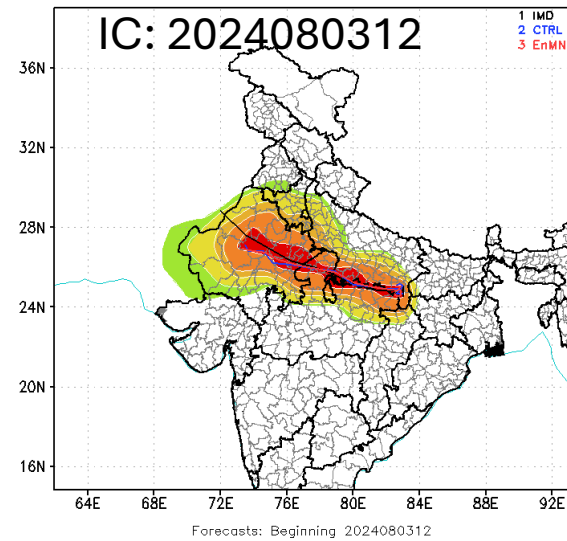


Tracks and Accumulated Rain Along Tracks

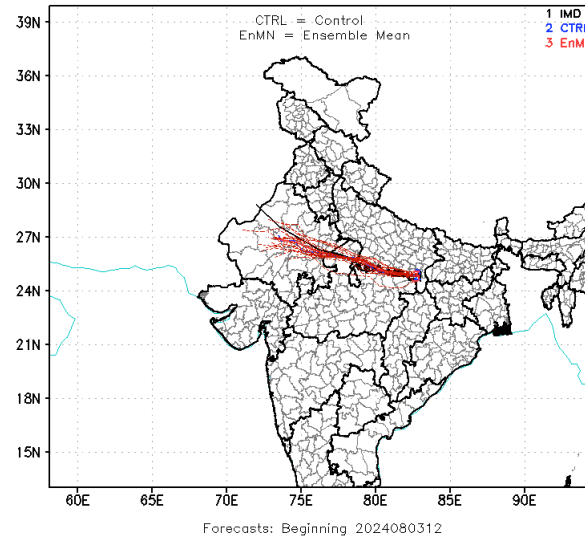


GEFS T1534 Verification – Deep Depression 03 August 2024

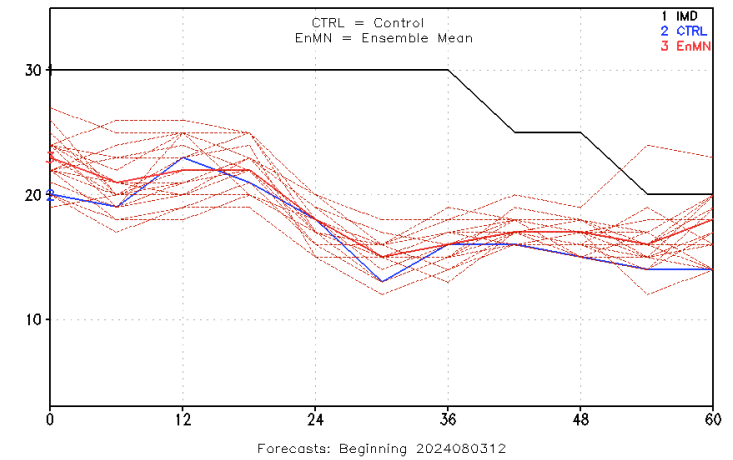
Probability (%) of storm passing within 65nm during next 60h



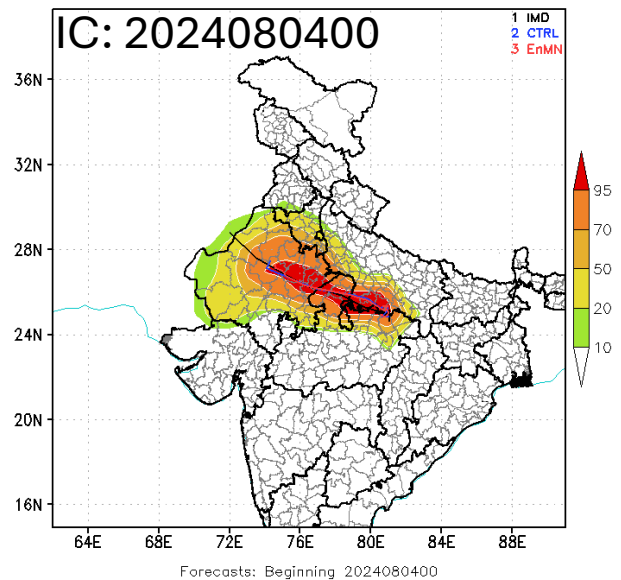
2024 Deep Depression Tracks Aug 2024



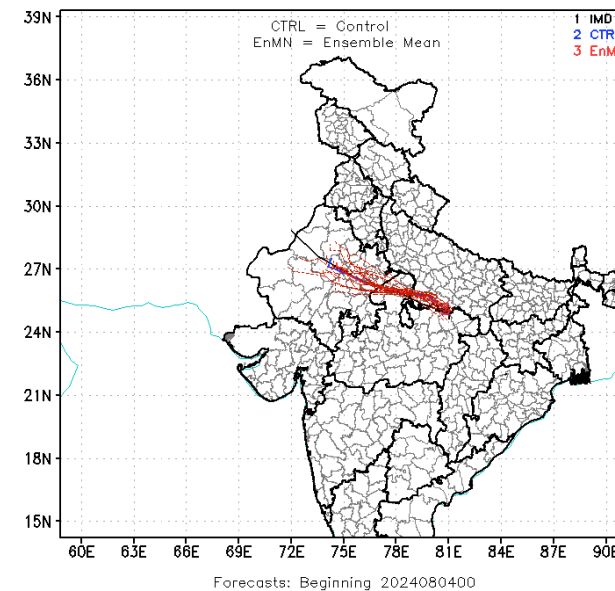
2024 Deep Depression Intensity Aug 2024



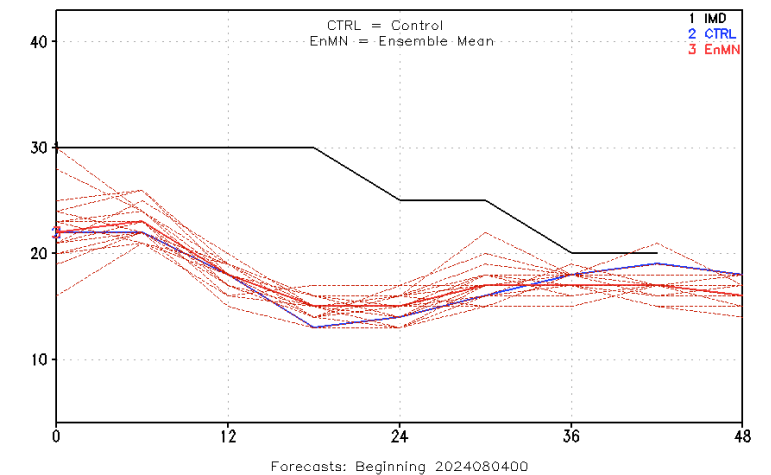
Probability (%) of storm passing within 65nm during next 48h



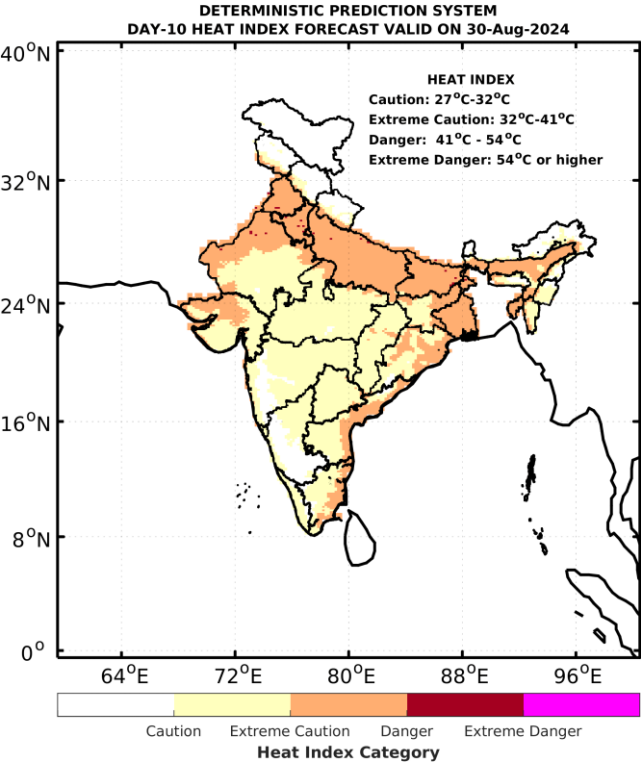
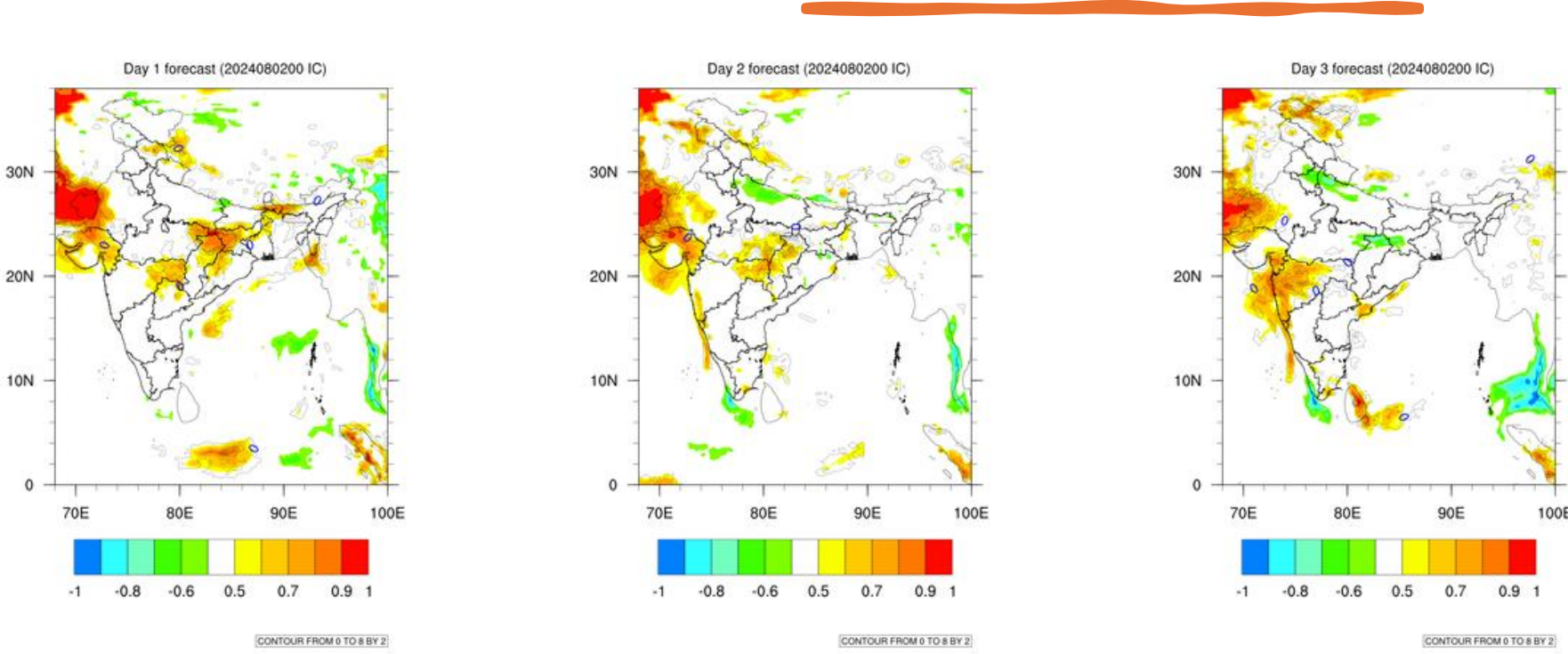
2024 Deep Depression Tracks Aug 2024



2024 Deep Depression Intensity Aug 2024



Extreme Forecast Index - DD over NW India

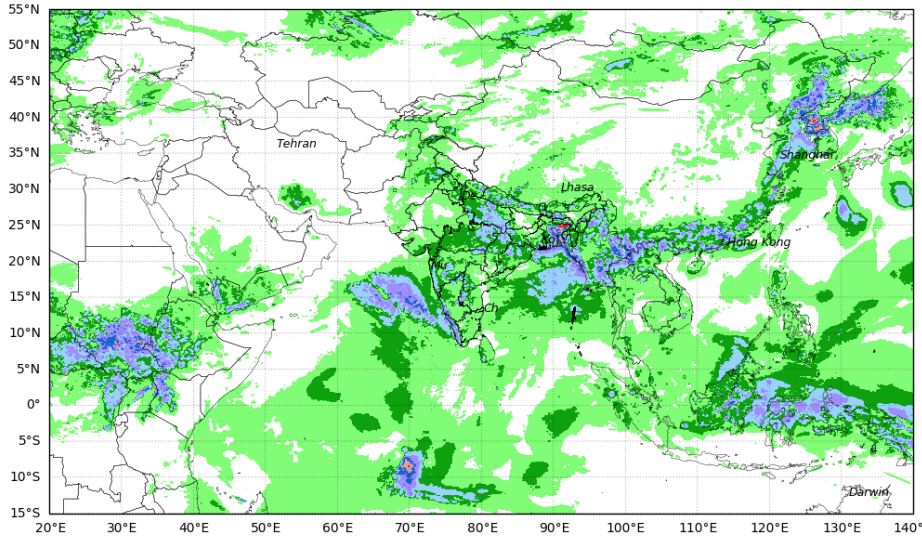


Likelihood of extreme weather.

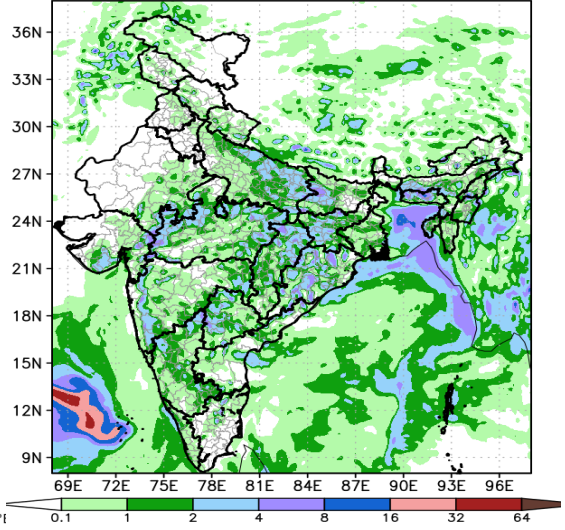
NCMRWF is also generating EFI (2m temperature)
EFI for Rainfall is ongoing

Forecasts Day -1

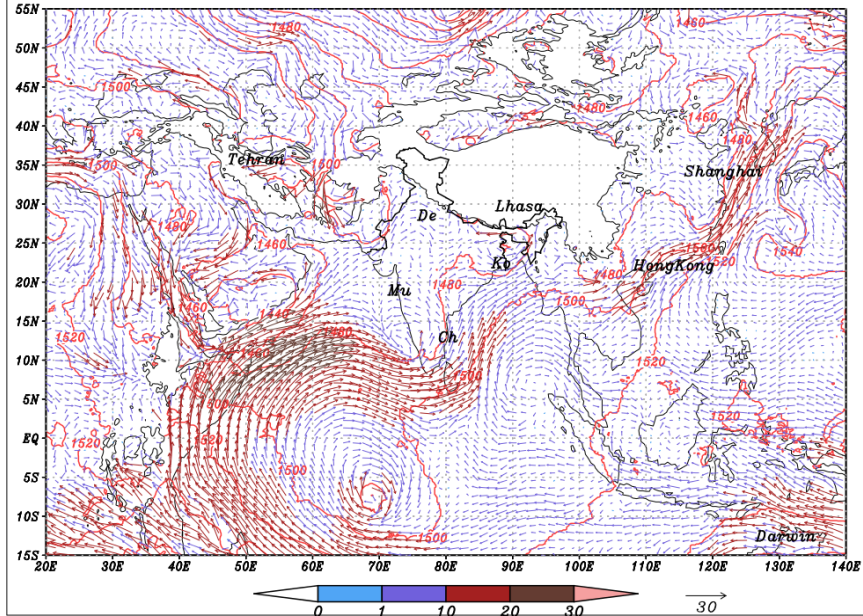
NCUM 24HR FORECAST VALID ON 03Z22Aug2024
RAINFALL(cm) CI=0.1,1,2,4,8,...



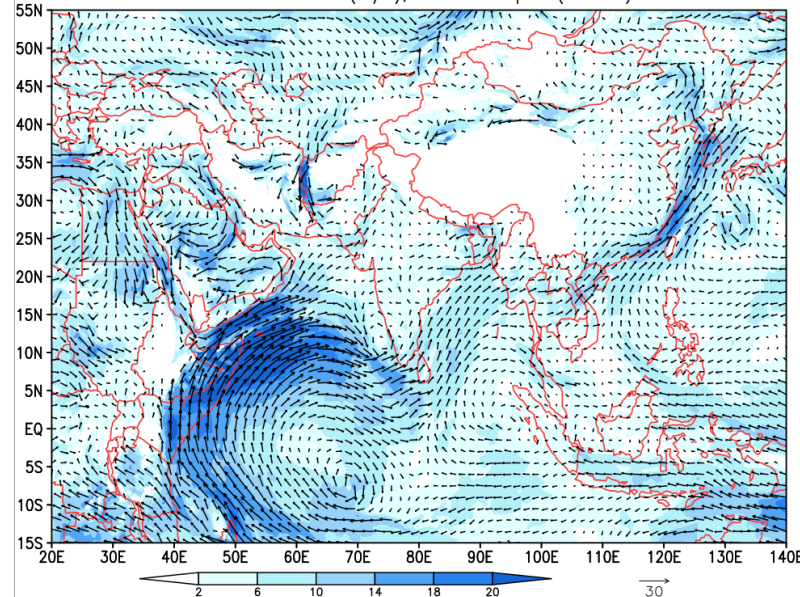
IITM GFS T1534 : Rainfall (cm/day)
Forecast valid for 03Z22AUG2024 (IC=00Z21AUG2024)



NCUM ANALYSIS VALID ON 00Z21AUG2024
850 hPa GEOP(m) & WINDS(m/s)

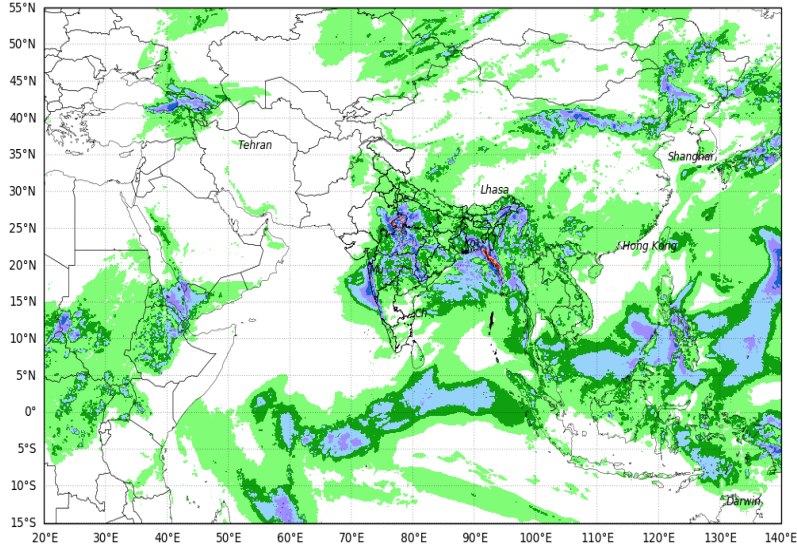


IITM GFS T1534 Analysis valid for 00Z21AUG2024
850 hPa Winds (m/s), and wind speed(shaded)

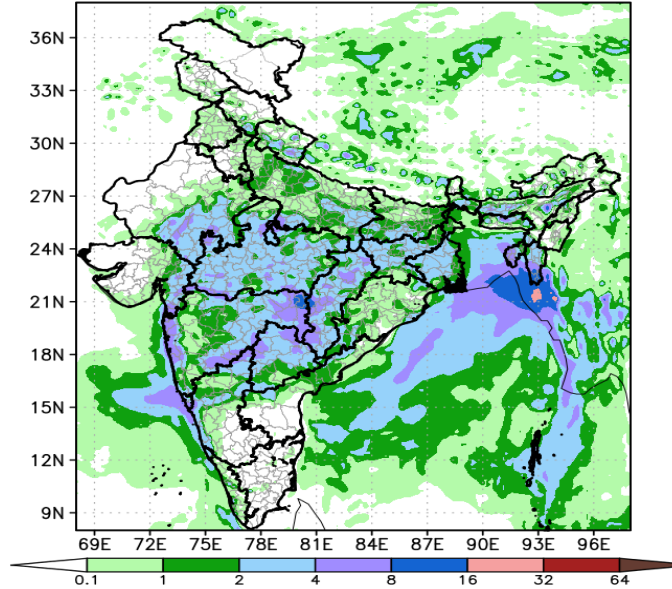


Forecasts Day -5

NCUM 120HR FORECAST VALID ON 03Z25Aug2024
RAINFALL(cm) CI=0.1,1,2,4,8,...

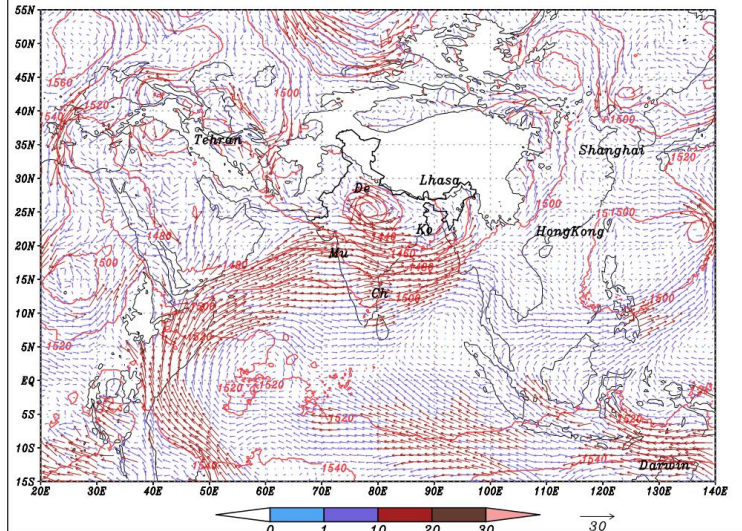


IITM GFS T1534 : Rainfall (cm/day)
Forecast valid for 03Z25AUG2024 (IC=00Z20AUG2024)

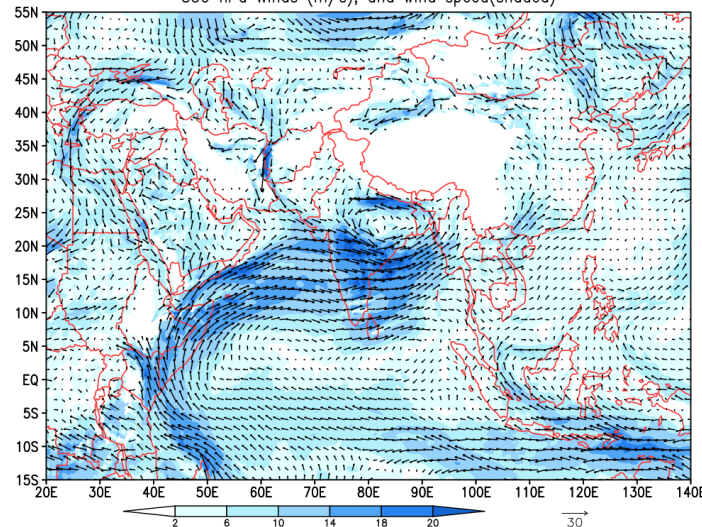


- Position of the cyclonic circulation.
- The intensity of the rainfall and its spatial distribution.

NCUM 120 HR FORECAST VALID ON 00Z25AUG2024
850 hPa GEOP(m) & WINDS(m/s)

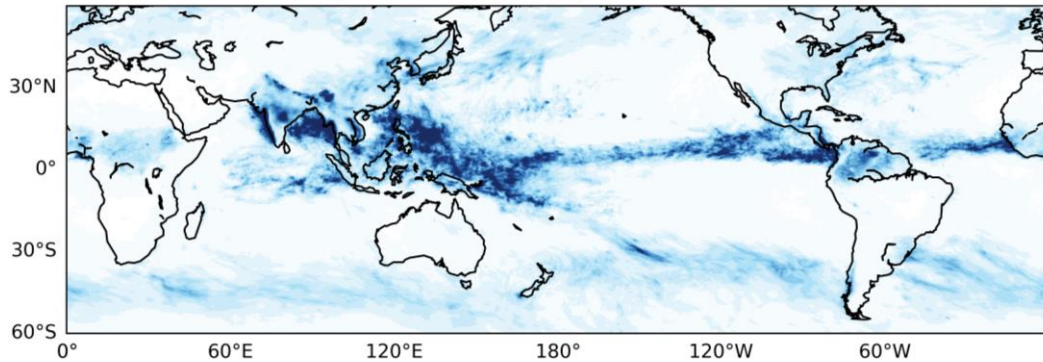


IITM GFS T1534 120-hr Forecast valid for 00Z25AUG2024 (IC=00Z20AUG2024)
850 hPa Winds (m/s), and wind speed(shaded)

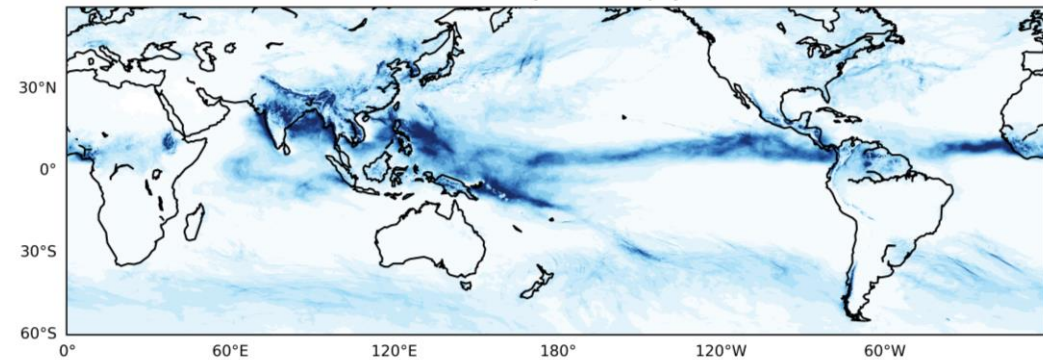


Towards km scale modelling - a new paradigm

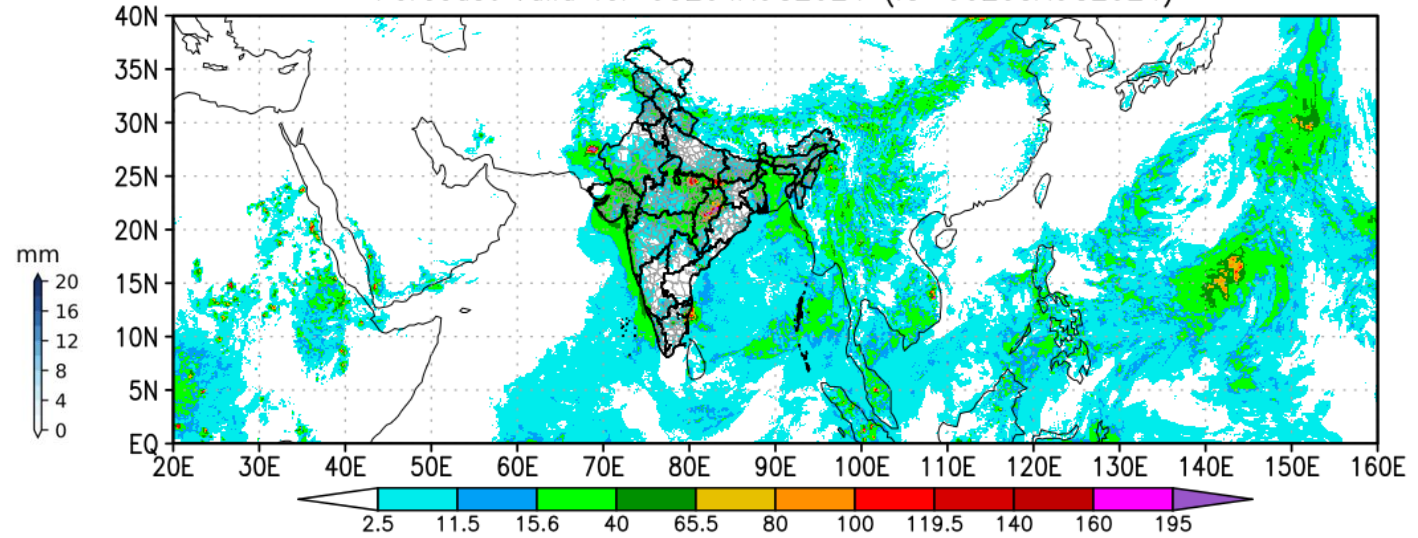
(a) GPM July-2023



(b) NCUM-6G Day1 Forecast July 2023



MOES-IITM HGFM TC01534 : Rainfall (mm/day)
Forecast valid for 03Z04AUG2024 (IC=00Z03AUG2024)



- Km-scale - substantial progress in understanding climate extremes, and circulation changes.
- Do not solve every problem.
- Resolving the mesoscale organization critical for precipitation extremes

*It still needs to be operational! NCMRWF
(Acknowledgements to Dr. M.N. Sreevathsa, Sc-F)*

Summary

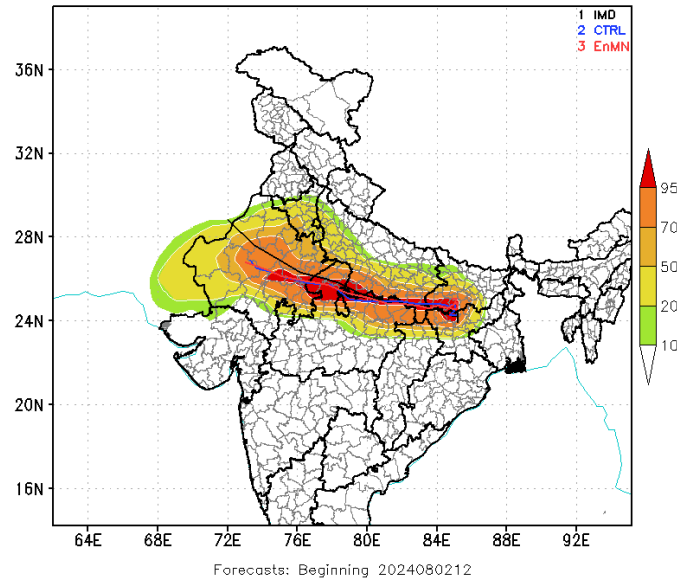
- Rainfall forecast verification at the medium range during monsoon 2024 in IITM and NCMRWF modelling systems are performing well.
- Overestimation (underestimation) in NCUM (GFS) over the Indian subcontinent.
- Ensemble tracks/strike probability need to be checked for various thresholds.

Thanks

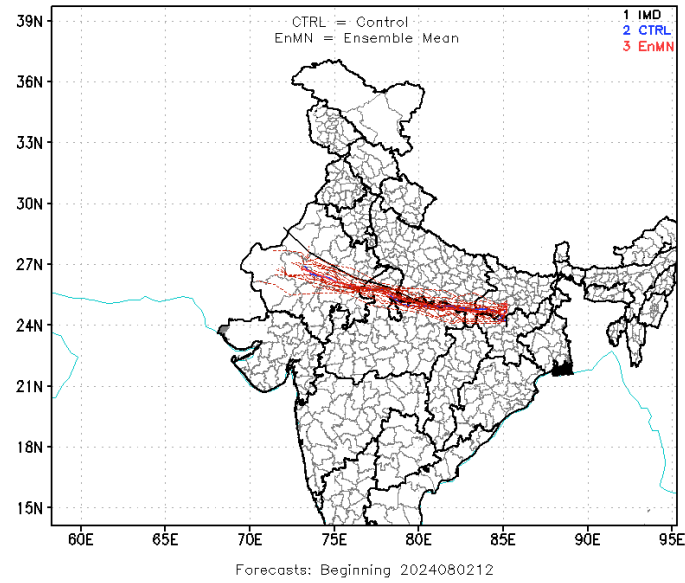
GEFS T1534 Verification

IC: 2024080212

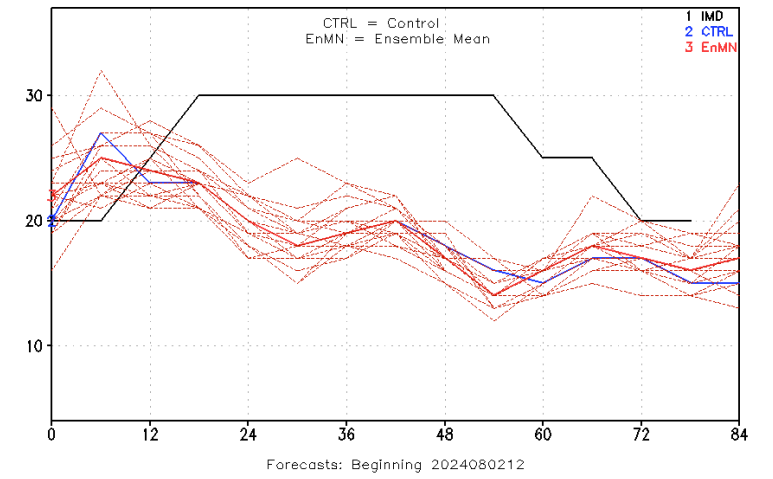
Probability (%) of storm passing within 65nm during next 84h



2024 Deep Depression Tracks Aug 2024

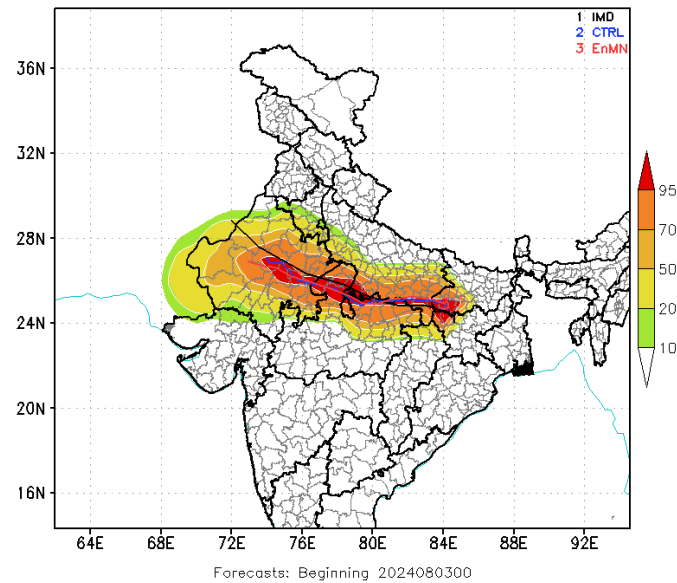


2024 Deep Depression Intensity Aug 2024

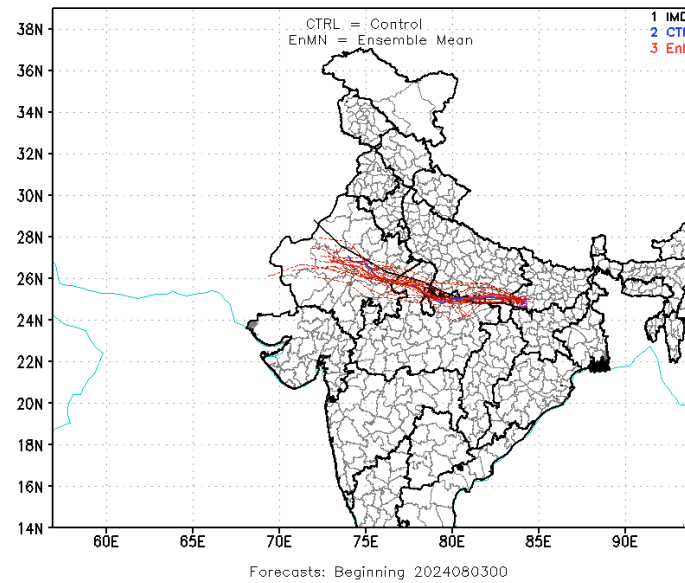


IC: 2024080300

Probability (%) of storm passing within 65nm during next 72h



2024 Deep Depression Tracks Aug 2024



2024 Deep Depression Intensity Aug 2024

