Extended Range Forecast Products from IMD for Third Pole Region

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The third session of the Third Pole Climate Forum (TPCF-3)

And

Meeting of the Third Pole Regional Climate Centre Network (TPRCC-Network) Task Team (3-5 June 2025)

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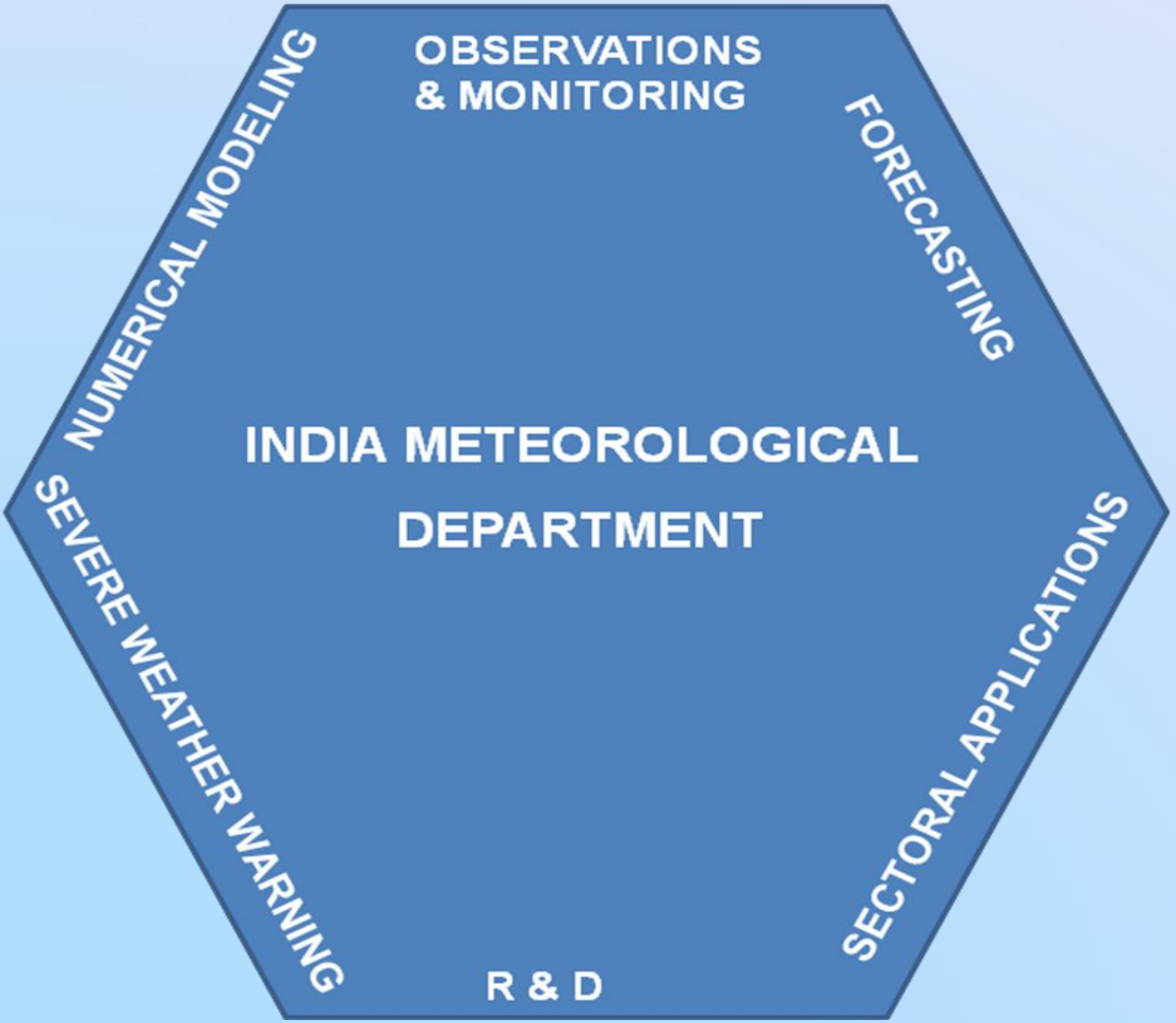
INDIA METEOROLOGICAL DEPARTMENT

Weather and Climate Services for Disaster Resilient India

- **Quantum jump in weather and climate services for disaster Risk Reduction**



- No weather hazard to go undetected and unpredicted
- Accurate warnings against hazards with reasonable lead time, triggering response from disaster managers and public to save life and property.

System for weather and climate services:

Three tier organisation

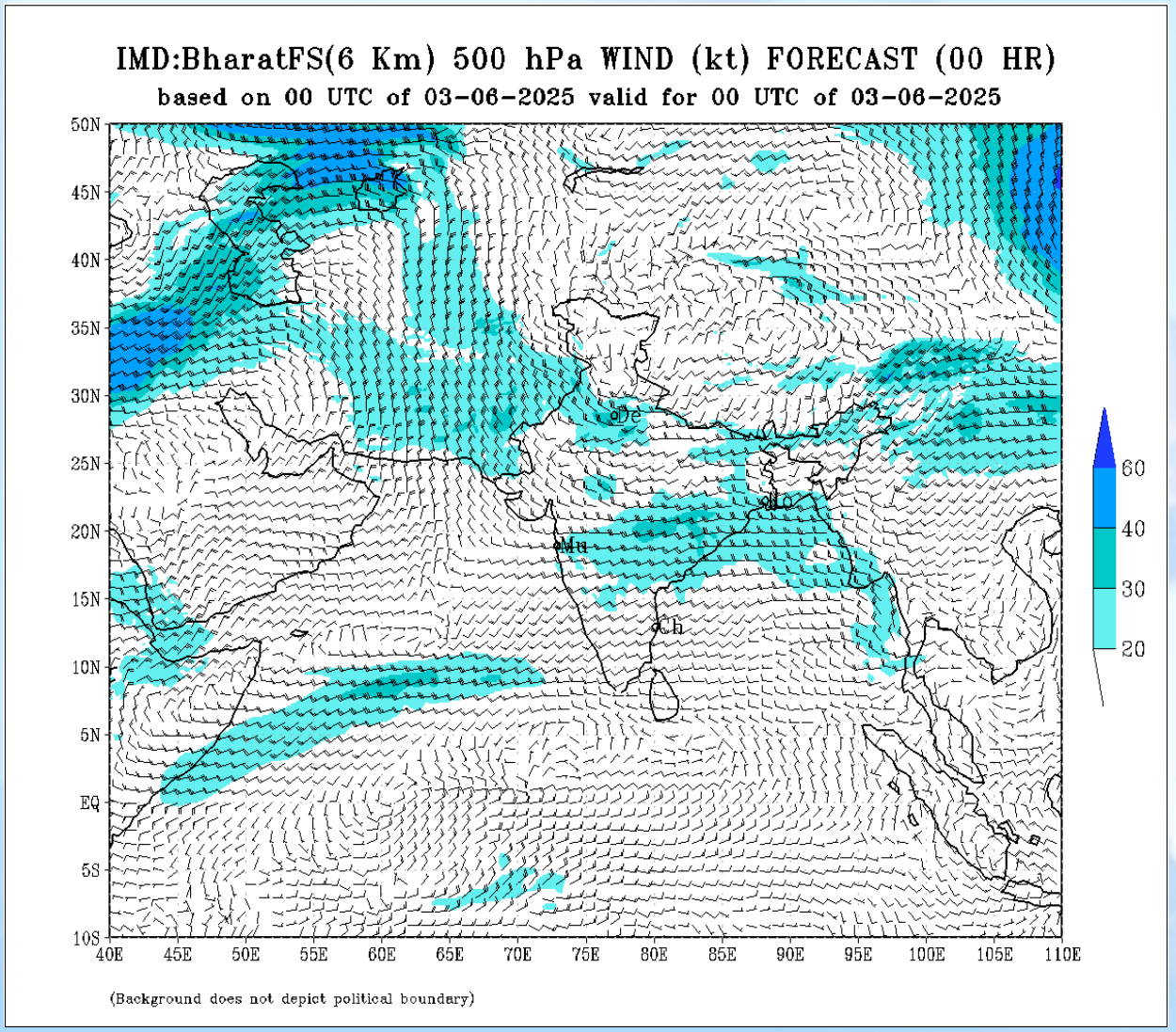
At national level, Regional level and state and district level

A system that doesn't follow norms of previous century. It should be able to fulfill 21st century dreams and be technology driven

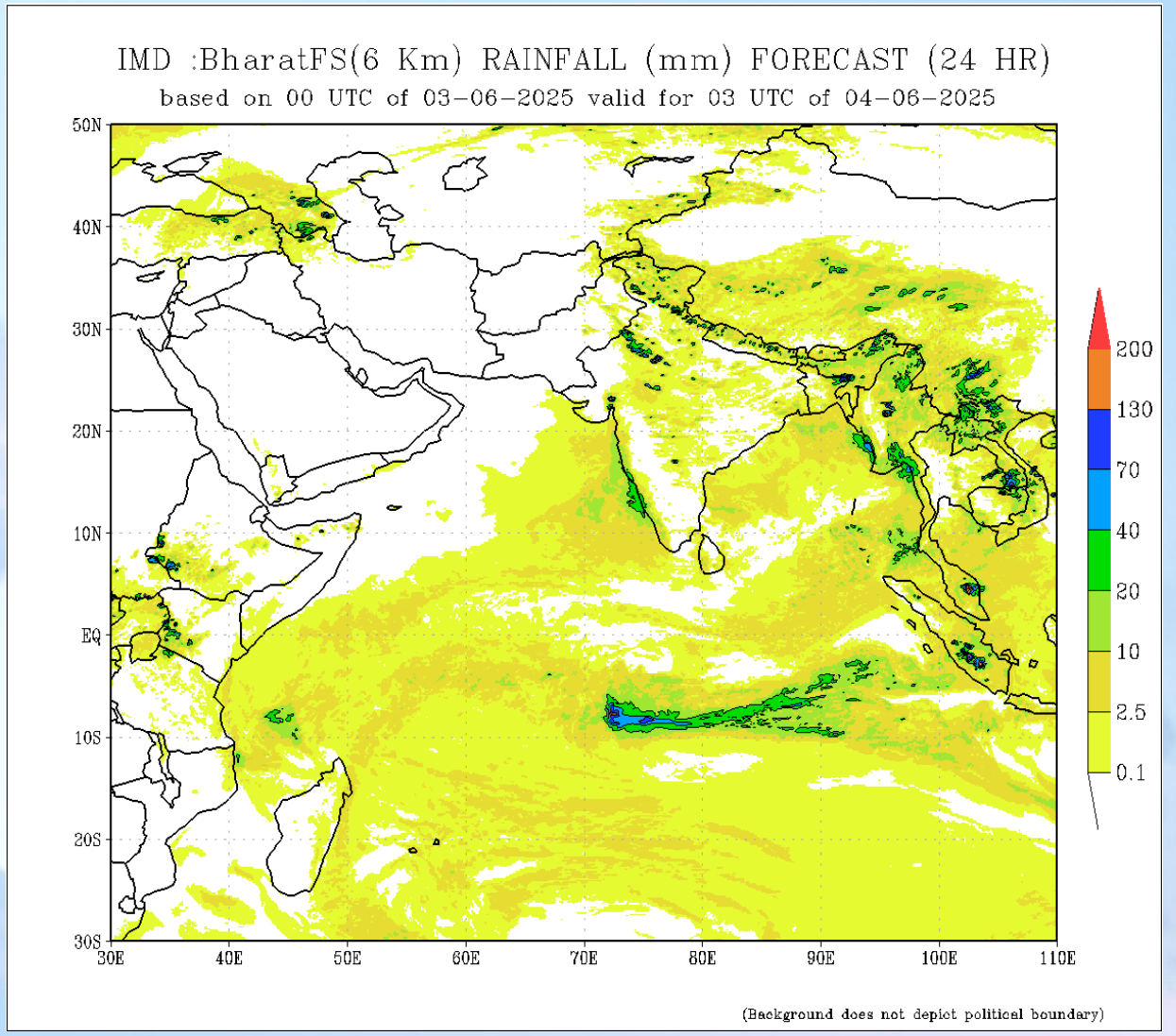
Temporal scales	Numerical NWP/Climate Models	Resolutions and Frequency of Update
Nowcasting to short range forecasting	• Weather Research Forecast (WRF) regional models (Polar WRF for Antarctica is operational) 2010 onwards • HRRR (with radar data assimilation) • E-WRF (with lightning data assimilation) • Coupled Hurricane WRF (HWRF)	• 03 km run for 3 days (Run 4 times a day) 00, 06, 12 & 18 UTC) • Run for 3 domains, 2 km resolution with forecast for 12 hours. (every 2 hrs) • Run 2 times a day (2 km Resl. 24 hr forecast • 18x6x2 km (During cyclone time) for 5 days
Medium range forecast	• Global Forecast System (GFS) Model • Global Ensemble Forecast System (GEFS)	• 12 km (Run four times a day ; 00, 12 UTC) for 10 days and 06 & 18 for 3 days) • 6 km (Bharat Forecast System) for 3 days (Implemented in 2025) • 12 km (00 UTC) for 10 days; 20 Members
Extended range (ERF)	• Climate Forecast System (CFS) coupled models (16 members) with hidcast of 20 Years (2003-2020).	• 38 km (Run once in a week) for 32 days. Run based on every Wednesday and forecast is prepared for 4 weeks.
Multi-Model Ensemble (MME)	• MME forecast based on 6 Global models. (IMD-GFS, IMD-GEFS, NCEP-GFS, NCUM, JMA and ECMWF) • MME based track & intensity with 8 models – IMDGFS, ECMWF, NCEP, NCUM-G, NCUM-R, HWRF,	• Regridded into 12km x12km and customized products are prepared based on all 6 models for 7 days. • Prepared during the cyclone time and used for operational forecast.
Seasonal Forecast	• Climate Forecast System (CFS) coupled models (20 members) with hidcast of 20 Years (2003-2020).	• 38 km (Run once a month) for 7 months for monthly and seasonal forecast

6 Km Global Model Products (Bharat Forecast System) : IC 3rd June, 2025

500 hPa Wind



24 Hour Forecast Rain



Extended Range Forecast Products for South Asia
&
For Third Pole Region

IMD's Operational Extended Range Forecast (ERF) System for 2025

Atmospheric ICs
NCMRWF

Current week **Forecast** run for 32 days
Based on Wednesday ICs of 2024
Total 16 ensemble members
(1 control + 3 perturbed) each
CFSv2_T126 (4 mem)
CFSv2_T382 (4 mem)
GFSv2bc_T126 (4 mem)
GFSv2bc_T382 (4 mem)

Ocean ICs-INCOIS

Forecast Module

Atmospheric ICs
NCMRWF

16 years **Hindcast** run for 32 days
2003-2018 Based on same date ICs
Total 16 ensemble members
(1 control + 3 perturbed) each
CFSv2_T126 (4 mem)
CFSv2_T382 (4 mem)
GFSv2bc_T126 (4 mem)
GFSv2bc_T382 (4 mem)

Ocean ICs-INCOIS

Hindcast Module

Bias Corrected

Forecasts for 4 weeks

(Wind, Rainfall, TMAX and TMIN) and It's anomaly

Friday to Thursday

Week 1 : (30 May - 05 Jun 2025)

Week 2 : (06 Jun - 12 Jun 2025)

Week 3 : (13 Jun - 19 Jun 2025)

Week 4 : (20 Jun - 26 Jun 2025)

Demand-supply chain is our power, we should use it to its full potential.

Climate Applications Products (Five Important Sectors)

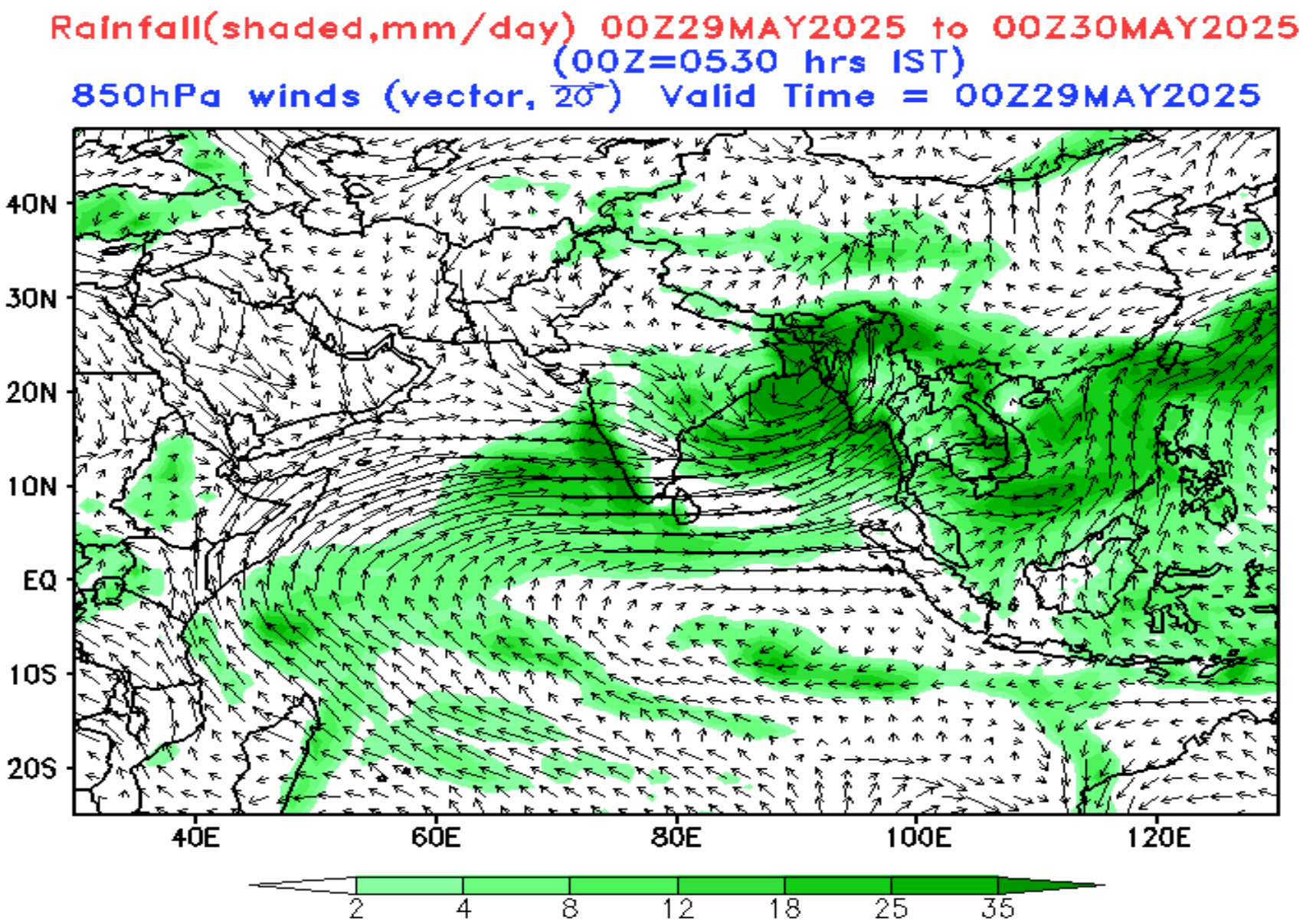
- Agriculture & Food Security *(Active/Break cycle, Temperature; forecast at met-subdivision level for Agro-advisory)*
- Water *(Heavy rainfall forecasting, forecast at river basin scales for reservoir operation etc)*
- Energy *(Tmax/Tmin, Heat wave/Cold wave)*
- Disaster Risk Reduction *(Prediction of Severe Weather like Cyclogenesis)*
- Human Health *(Vector borne diseases) it is being prepared*

Seasonal and Extended range forecast provides useful skill for applications in Agriculture, Hydrology, Energy, Health and Disaster Management.

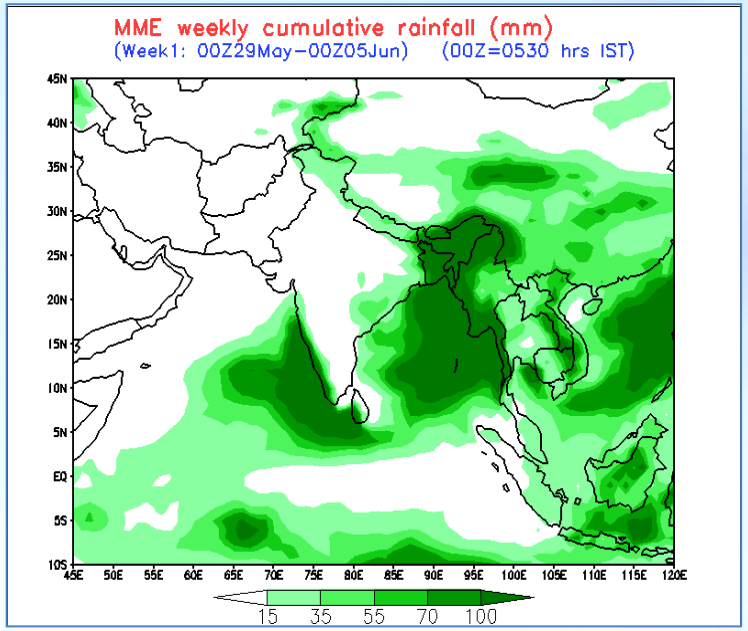
Mean Forecast

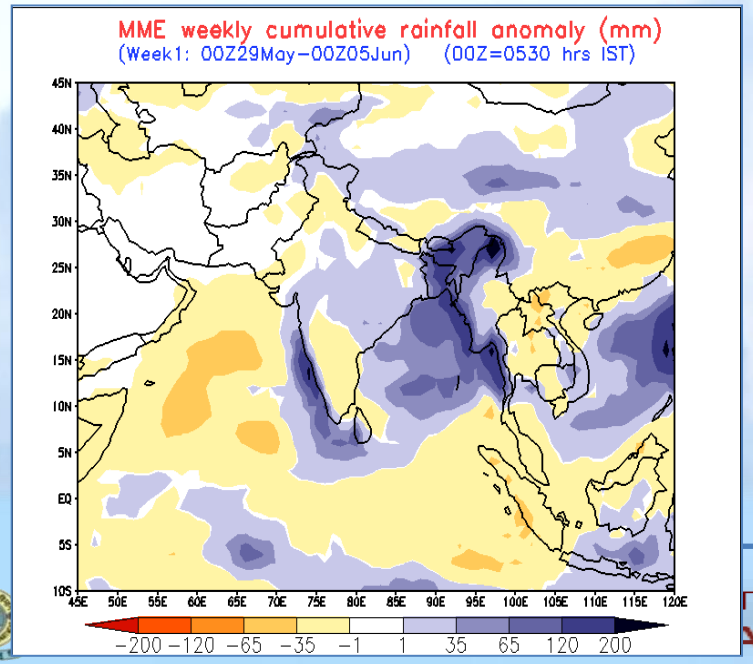
MME Based on 28 May 2025 initial condition

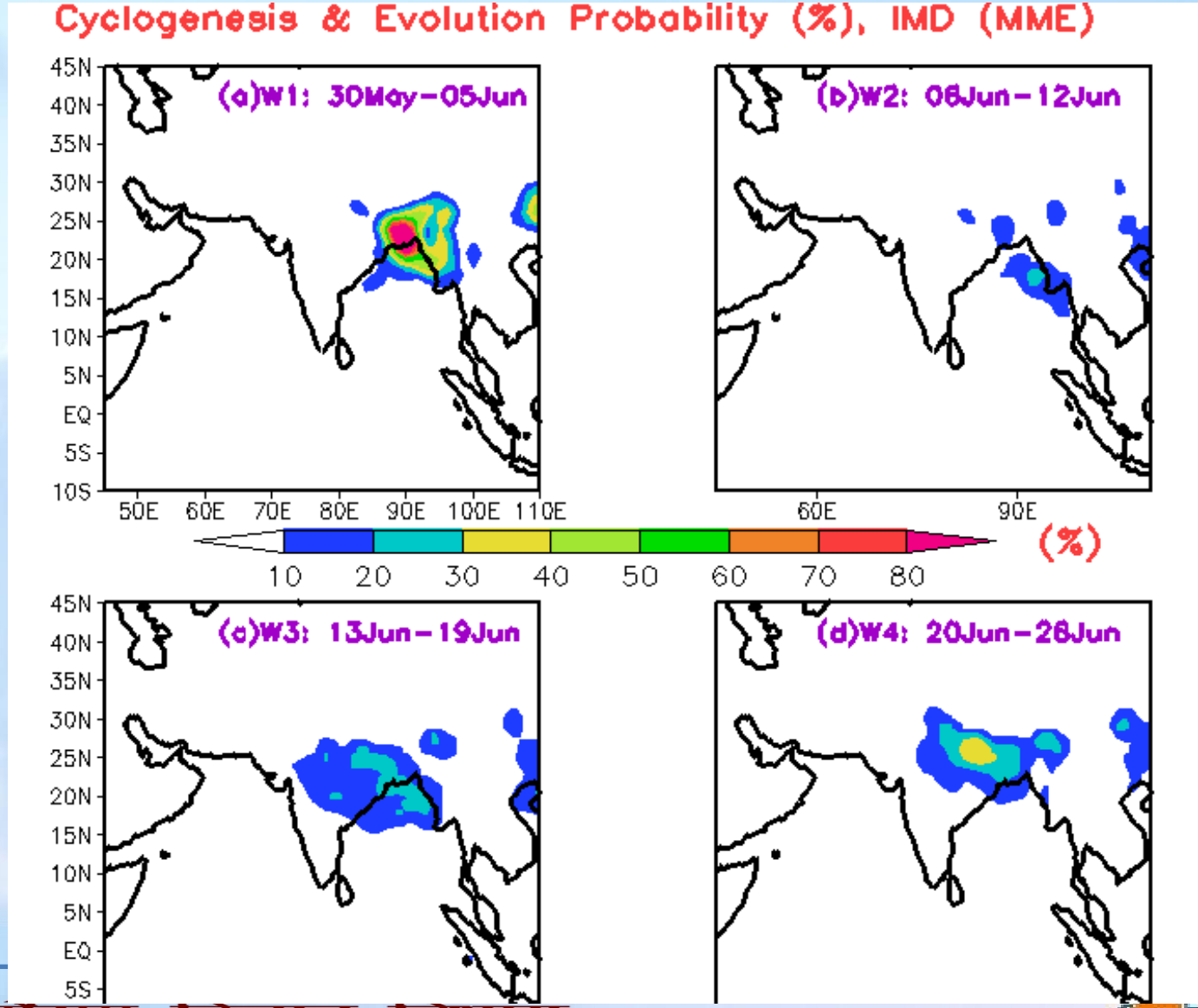
Daily evolution of rainfall and wind at 850hPa



ERF Rainfall and Cyclogenesis Probability for South Asia



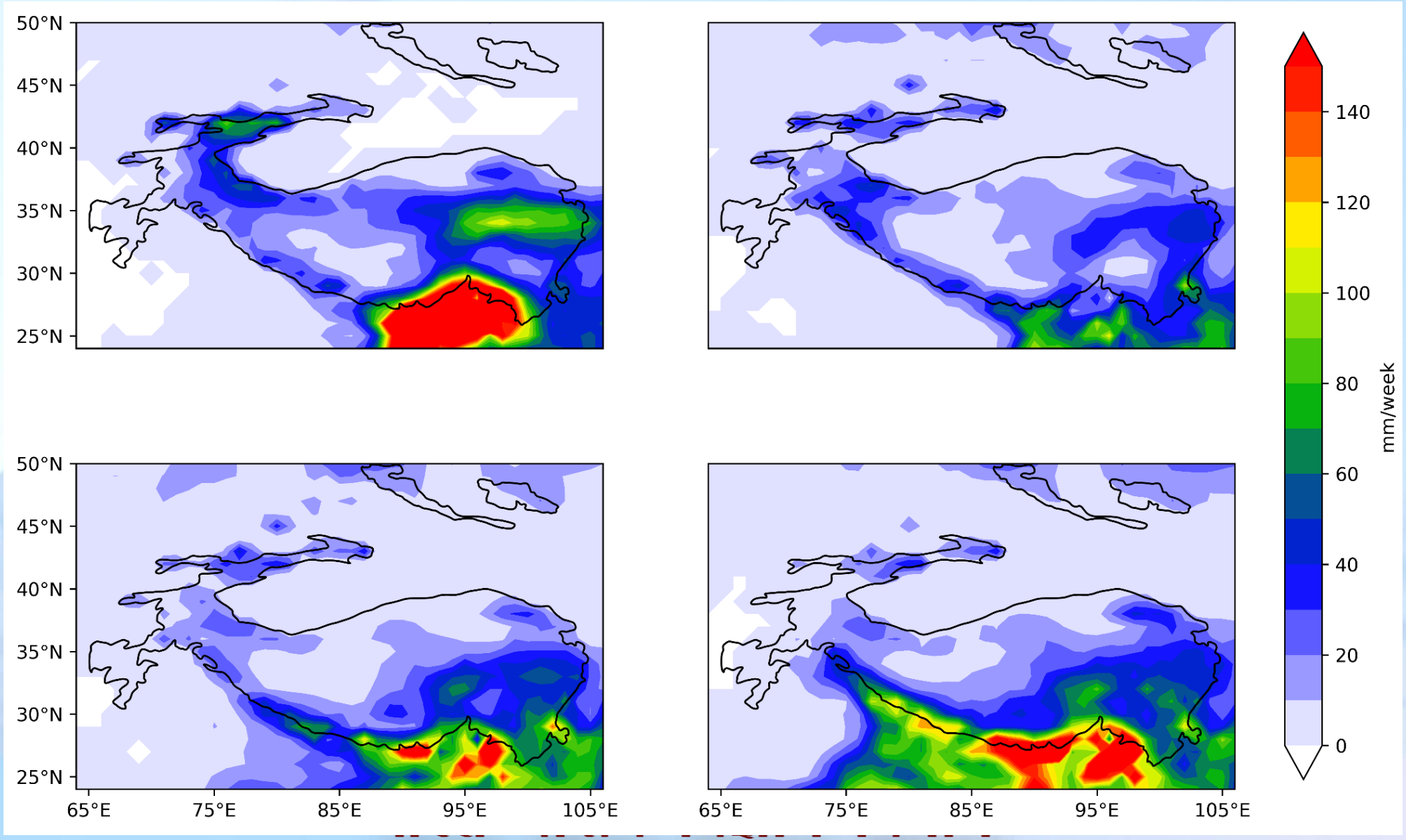




Accumulated Rainfall :Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



Week 3

Week 4

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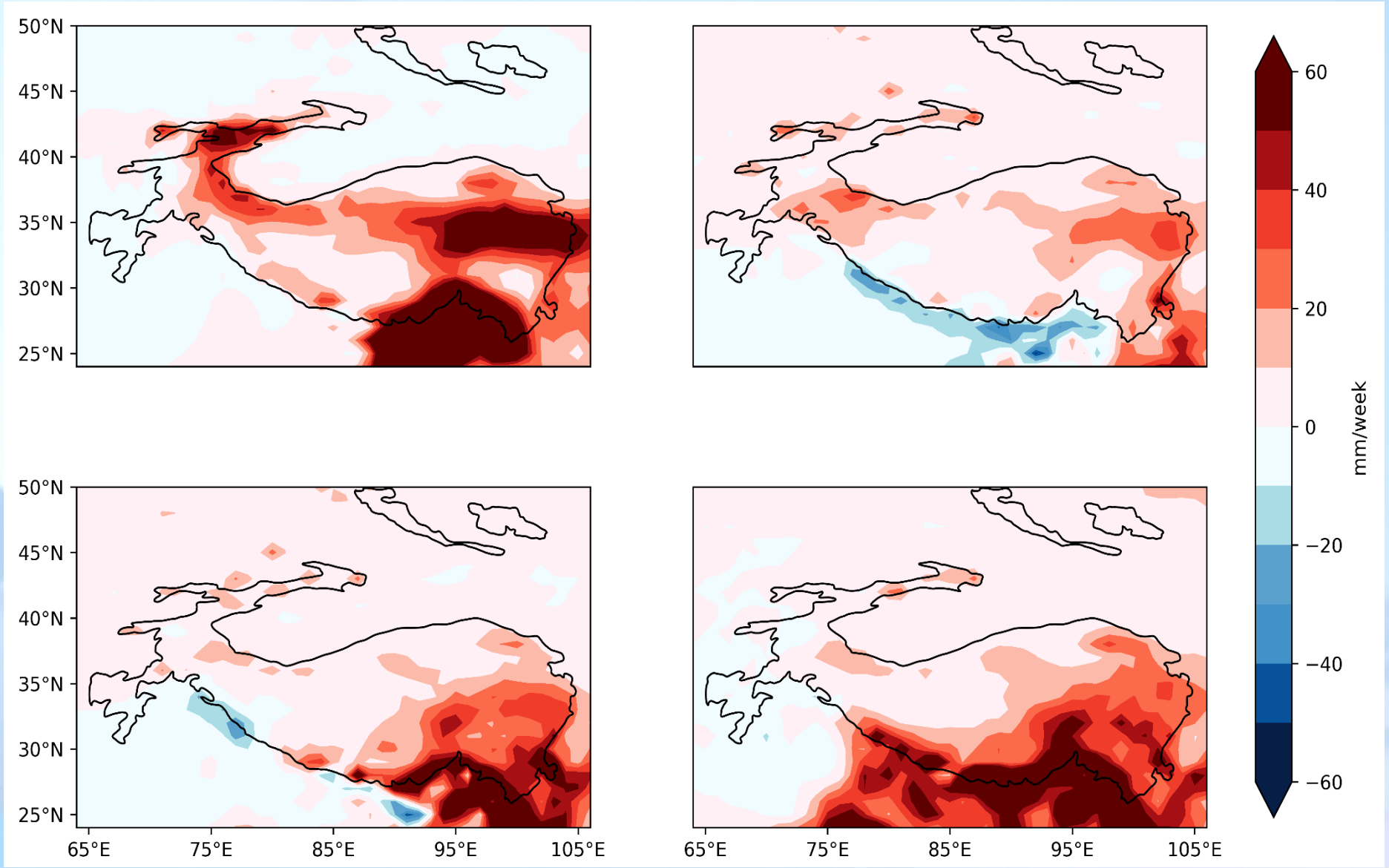
Accumulated Rainfall anomaly : Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



Week 3

Week 4

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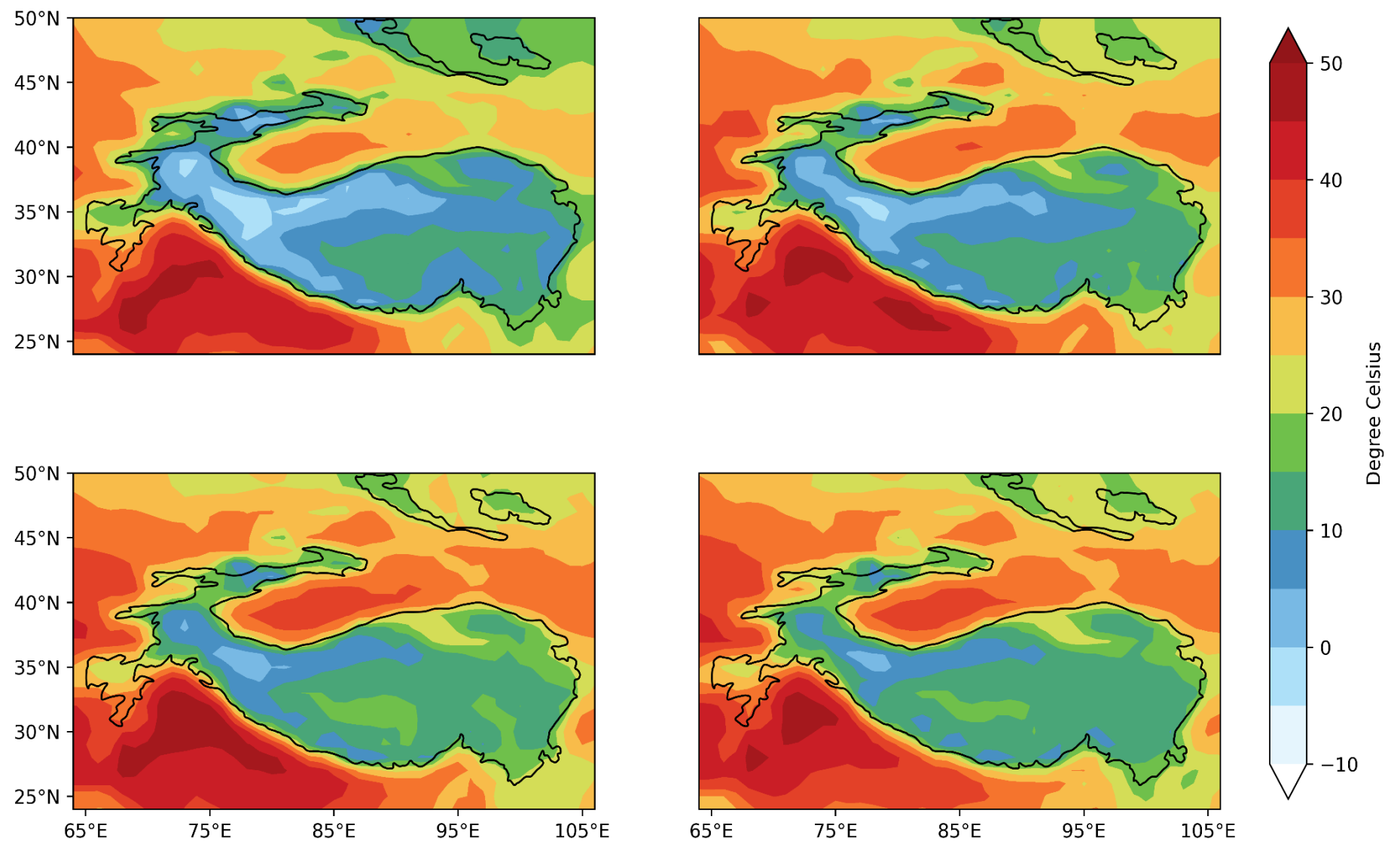
Maximum Temperature : Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



Week 3

Week 4

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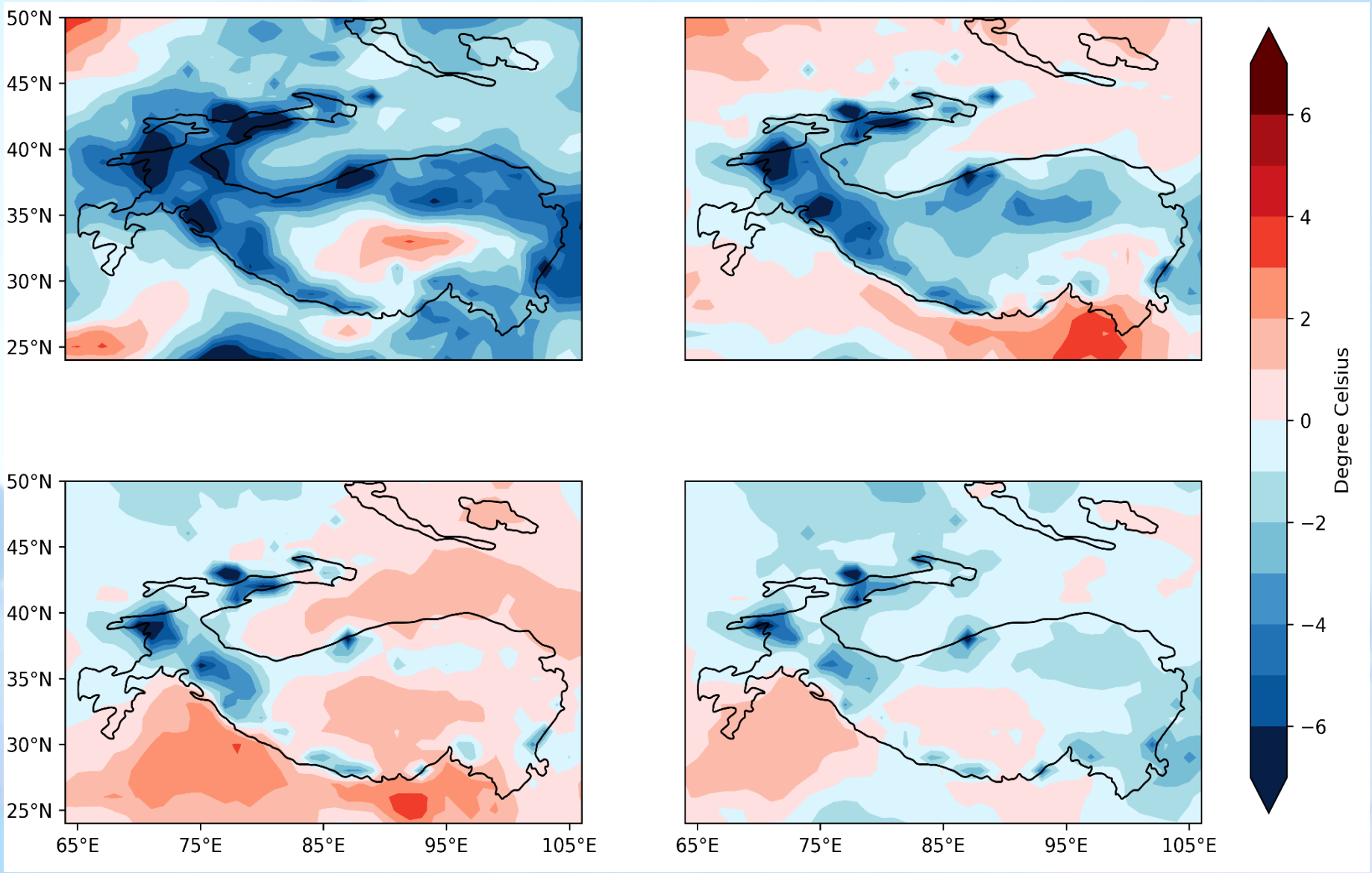
Maximum Temperature Anomaly : Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



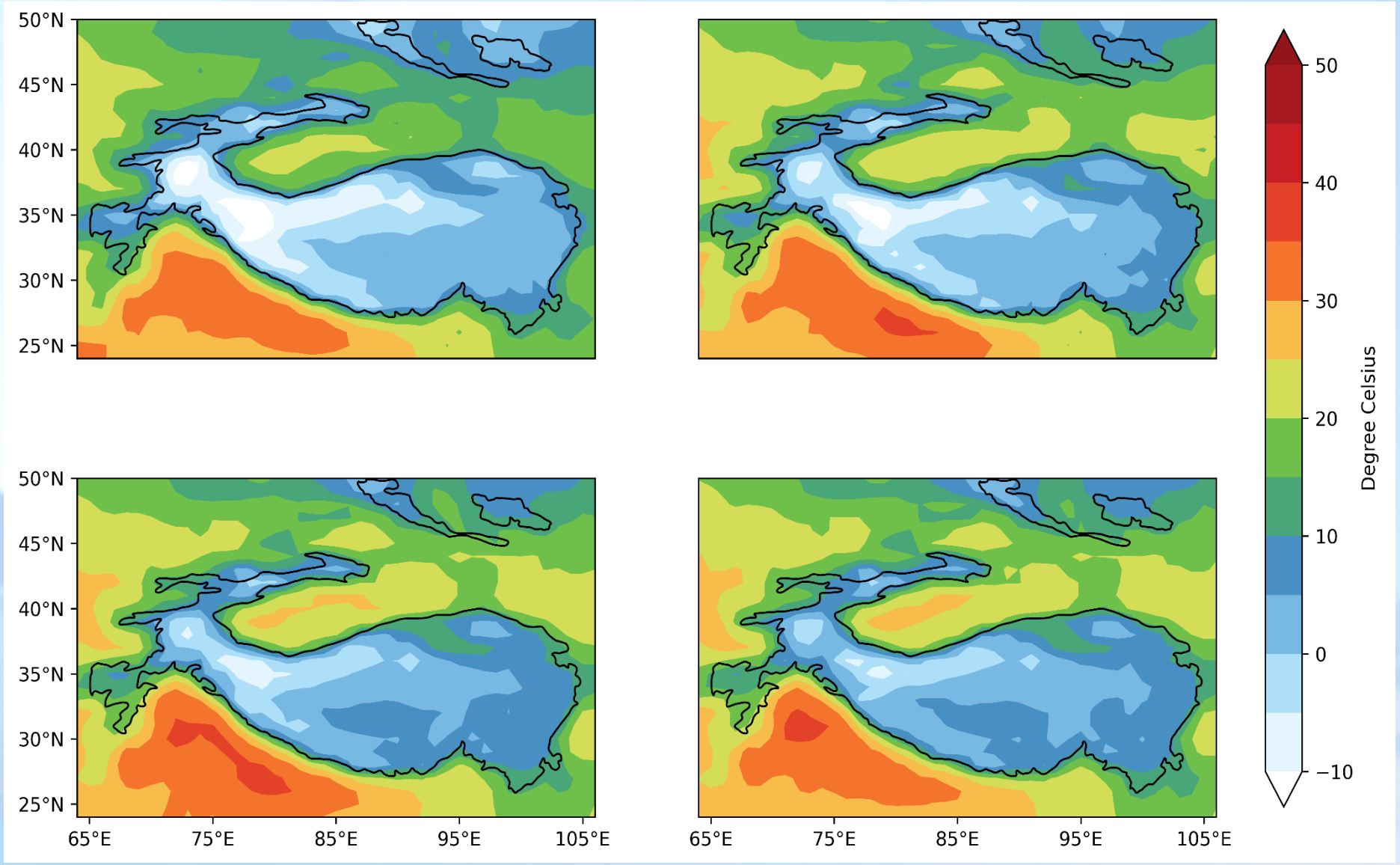
Week 3

Week 4

Minimum Temperature : Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



Week 3

Week 4

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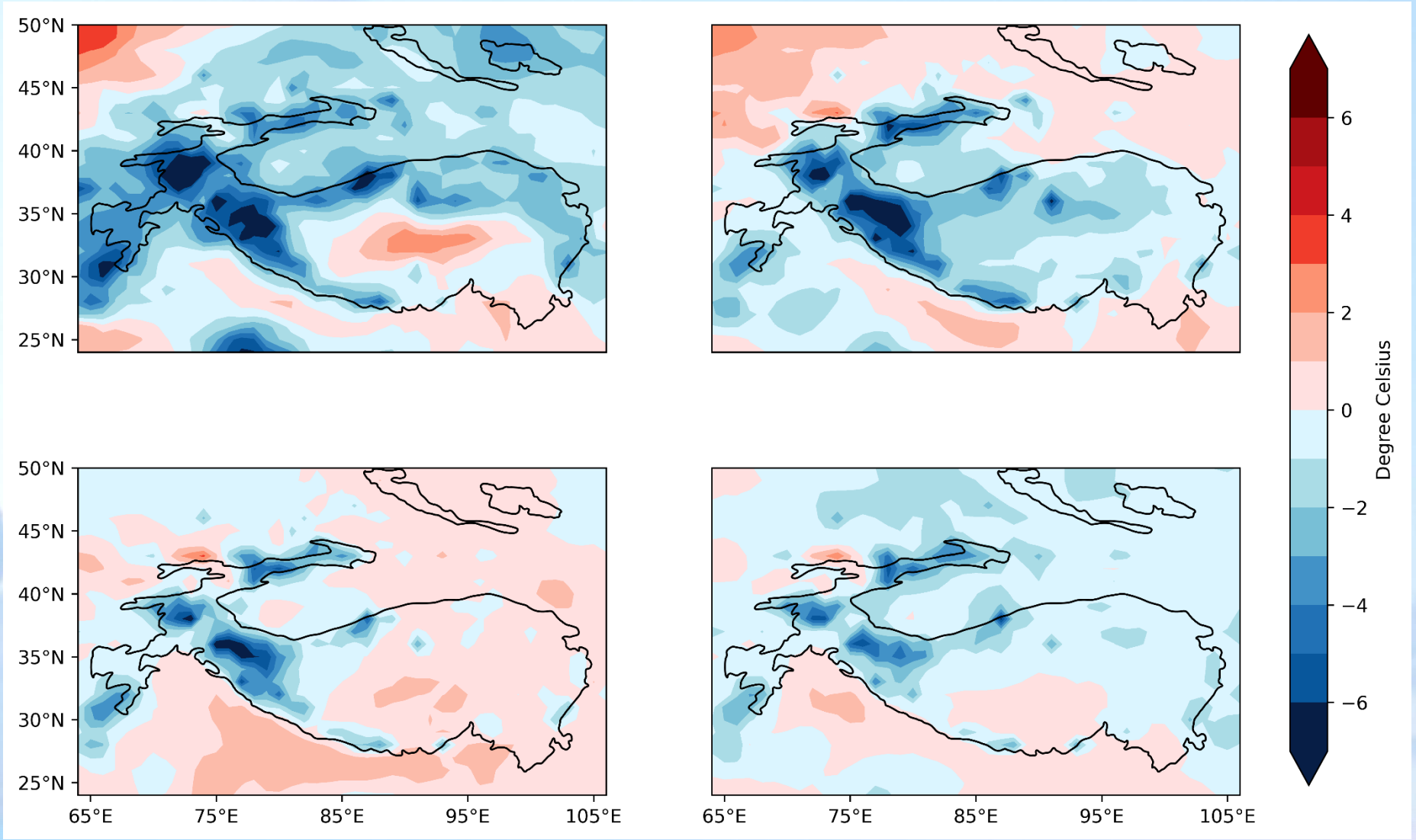
Minimum Temperature Anomaly: Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



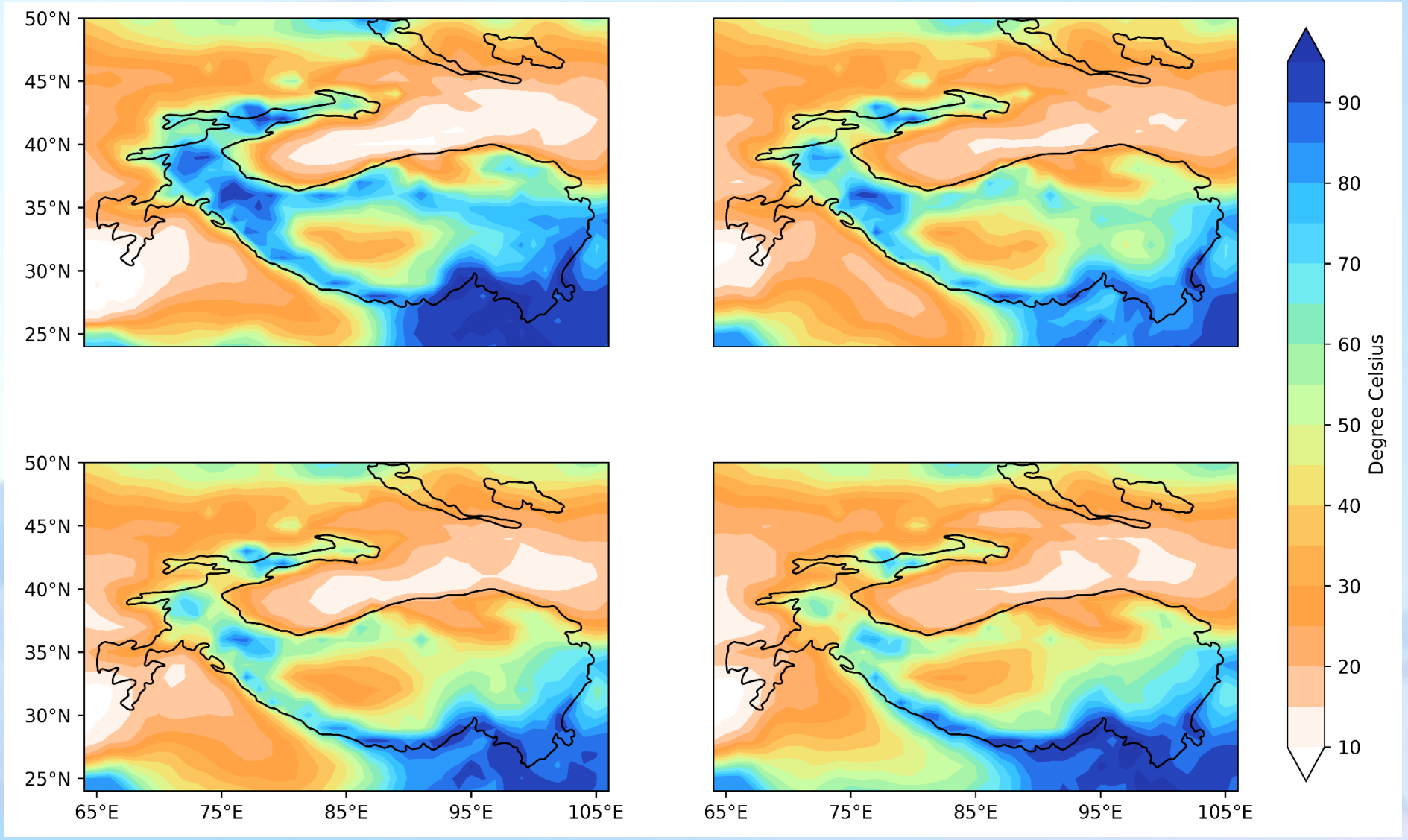
Week 3

Week 4

2m RH: Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



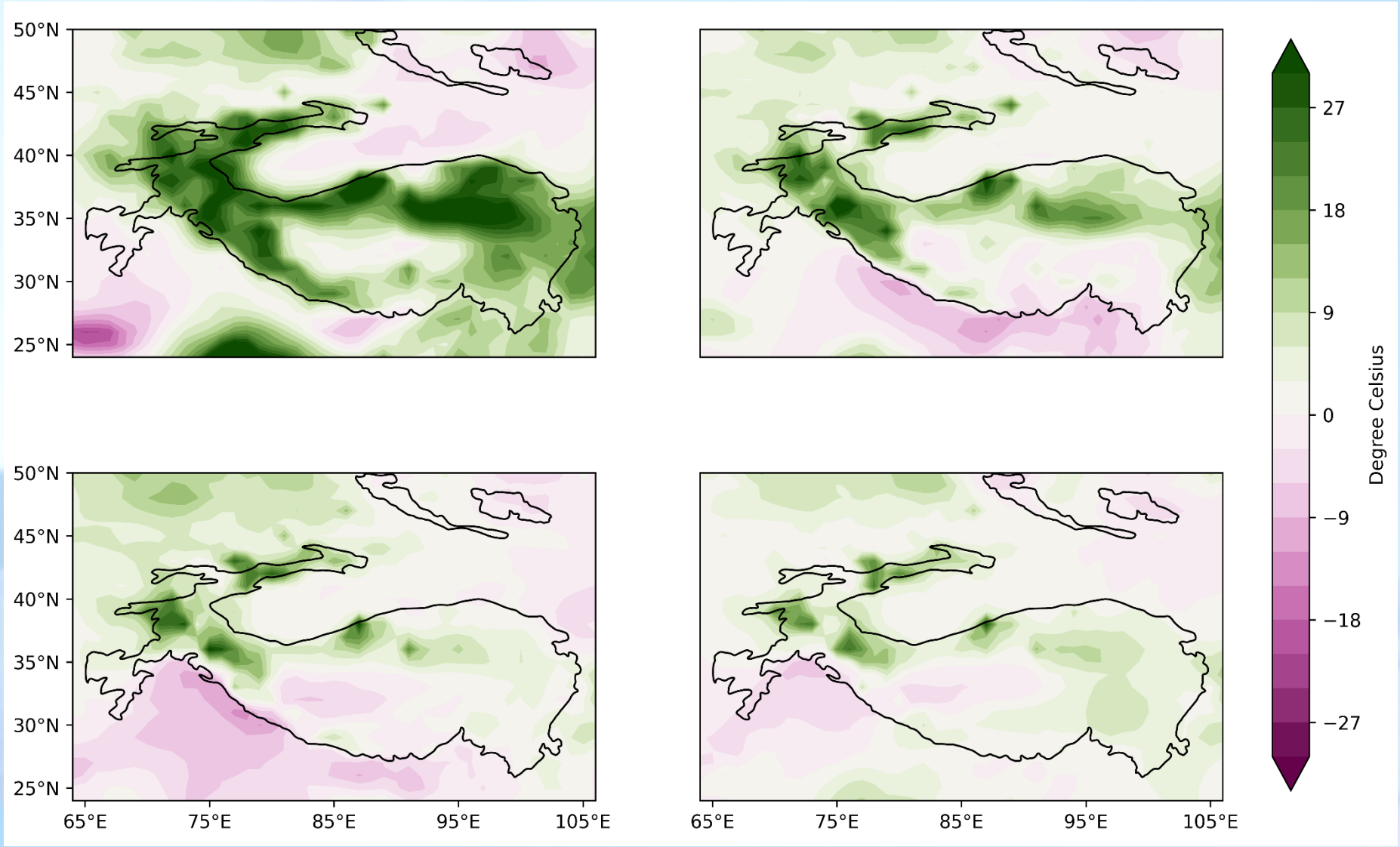
Week 3

Week 4

2m RH anomaly: Week based on 28 May 2025 IC for 4 weeks
(30 May – 05 Jun, 06-11 Jun, 12-18 Jun, 19-25 Jun 2025)

Week 1

Week 2



Week 3

Week 4

Soil Moisture: Week based on 28 May 2025 IC for 4 weeks
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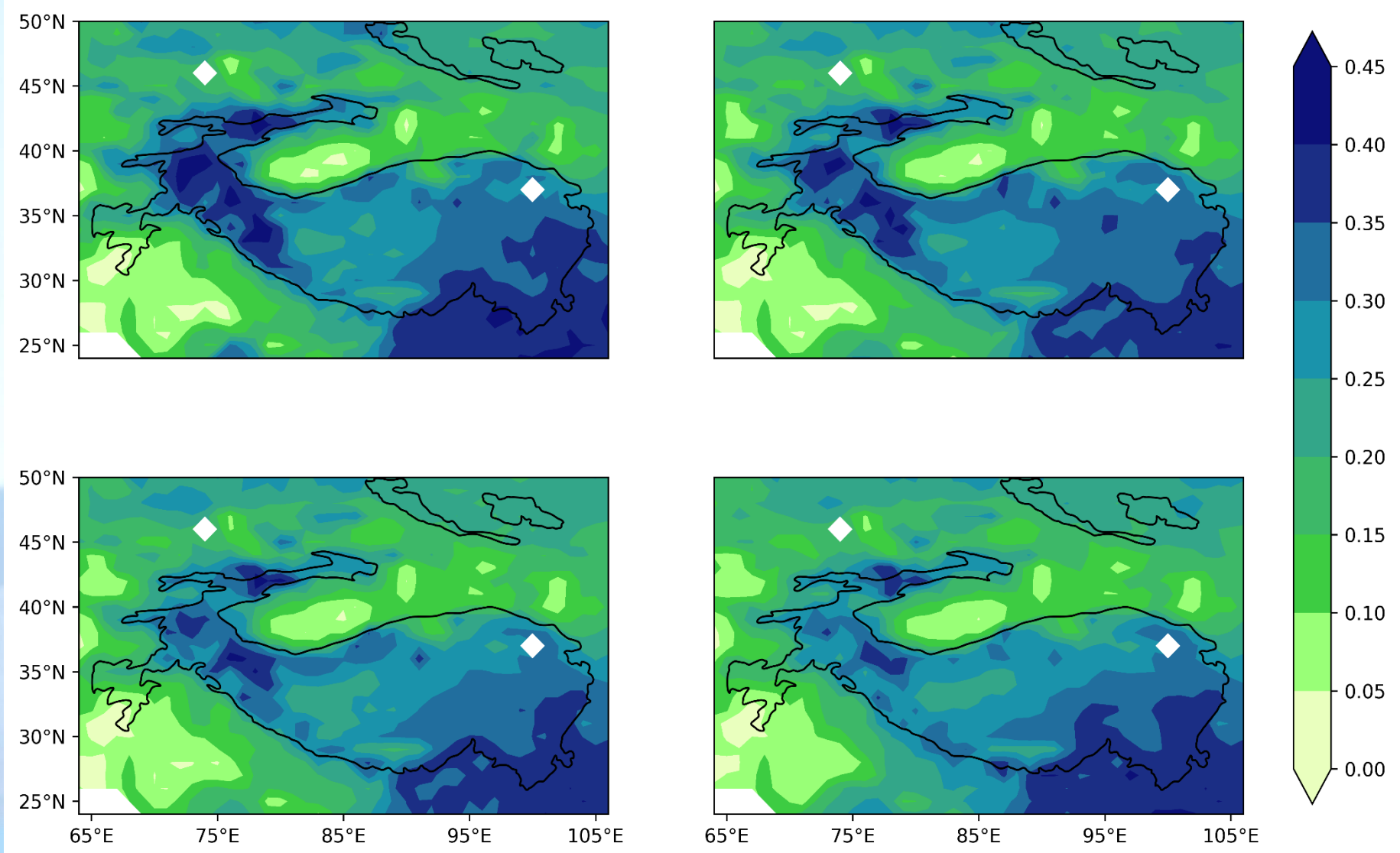
Week 1

Week 2



Week 3

Week 4

Soil Moisture Anomaly: Week based on 28 May 2025 IC for 4 weeks
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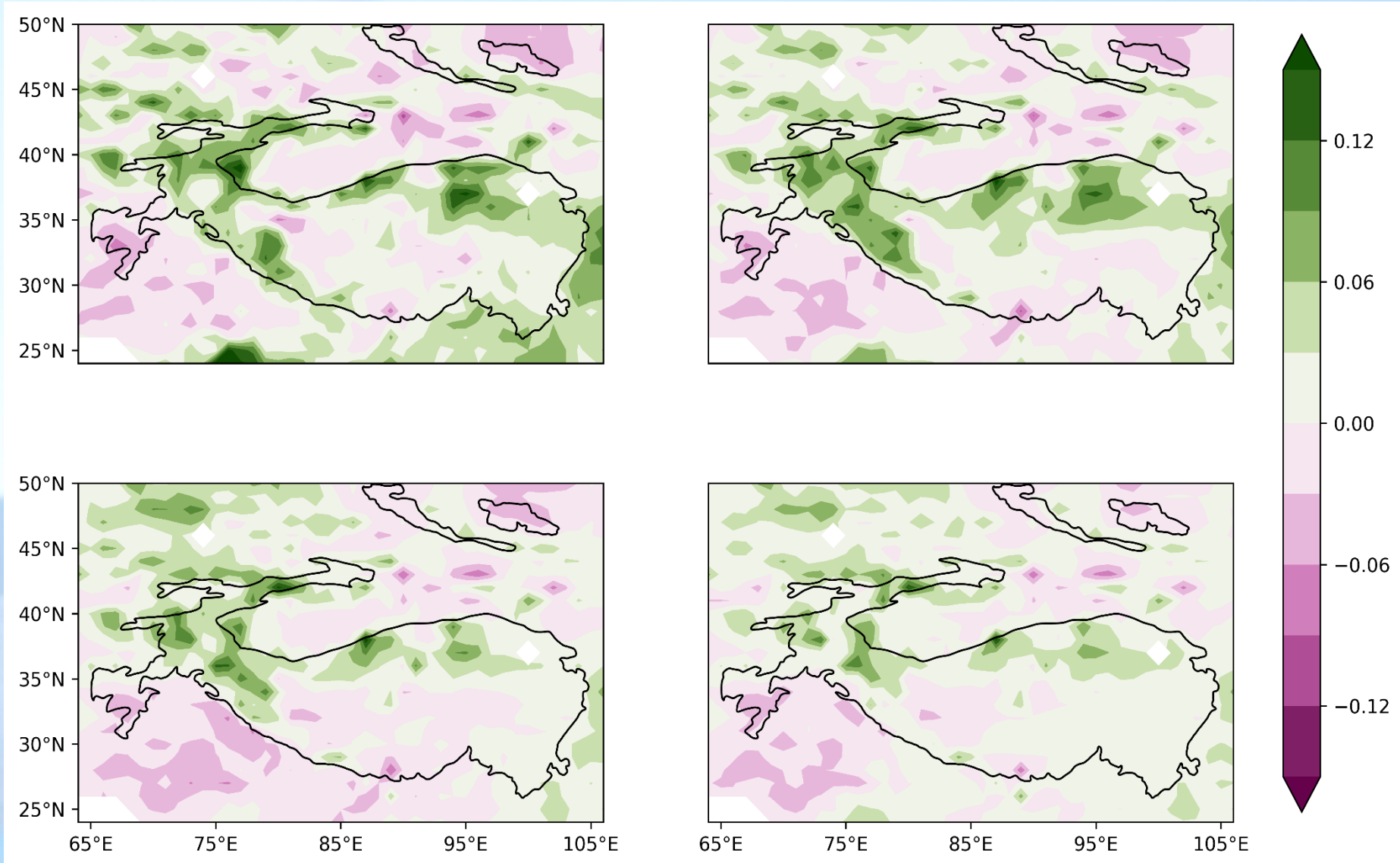
Week 1

Week 2



Week 3

Week 4

Summary

- Climate Service products are being prepared for various sectoral applications like Agriculture, Water, DRR, Energy and Health)
- IMD is working towards establishing the NFCS to facilitate strengthened collaboration between and among various stakeholders for delivering full-value chain climate services in the country.
- IMD generates many ERF products for Third Pole region
- Other ERF products like : Snow Depth, Ice concentration, Ice thickness variables are available and plots can be generated.

Thank You