

IMDAA high resolution regional reanalysis for the Indian monsoon region

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“Indian Monsoon Data Assimilation and Analysis (IMDAA)” is a high resolution satellite-era regional reanalysis produced by National Centre for Medium Range Weather Forecasting (NCMRWF) in collaboration with the Met Office, UK and India Meteorological Department (IMD) under the National Monsoon Mission (NMM) Project of Ministry of Earth Sciences, Government of India. IMDAA was conceived as a 40 years reanalysis from 1979 to 2018, and later the same was extended to 2020. IMDAA is the highest resolution reanalysis, 12 km, currently available over the Indian monsoon region. This reanalysis was produced using the state-of-the-art data assimilation and modeling system (domain is given in Figure-1 and details are given in Table 1).

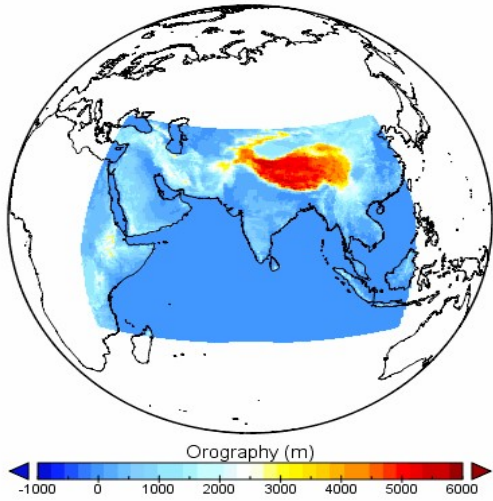


Figure 1: IMDAA domain with overlaid orography in meters

Table 1: IMDAA configurations

Period	1979-2018, extended to 2020 (42 years)
Domain	30°E- 120°E, 15°S to 45°N
Lateral Boundary Conditions (LBC)	ERA-Interim
Data Assimilation method	4D-Var (Atmosphere) Extended Kalman Filter (EKF) method for Soil Moisture
Atmospheric Model	Unified Model
Horizontal Resolution	~12km (~0.11°)
Vertical Levels	63 levels (~ up to 40 km)
Observation Sources	ECMWF, NCMRWF, UK Met Office, IMD
Surface	<u>Soil Moisture Analysis</u> 4 soil levels of soil covering first 3 meters <u>Sea Surface Temperature:</u> HadSST2, OSTIA analysis

IMDAA used ECMWF observational dataset archived for reanalysis. Additional observations from the IMD/NCMRWF archives, which are not available in the ECMWF datasets including Indian satellite observations, were also used in the IMDAA. The lateral boundary condition for IMDAA was taken from ERA-Interim. IMDAA used Variational Bias Correction (VarBC) for the satellite radiance assimilation.

Description of IMDAA regional reanalysis, including historical data restoration, quality control of various observations, data assimilation and modeling systems, comparison of IMDAA products with ECMWF Reanalysis (ERA-5) and the characteristics of Indian south-west and north-east monsoon features are available in *Rani et al., (2021)*. Various validation and verification of IMDAA datasets are available in *Rani et al., (2020)*, *Vishal and Rani (2022)* and *Ashrit et al., (2020)*. An inter comparison of various reanalysis over the Indian region shows that IMDAA better captures the heavy precipitation compared to the global reanalysis (*Singh et al., 2021*). The Outgoing Longwave Radiation (OLR) is a precursor to the Indian southwest monsoon onset and propagation. The IMDAA derived OLR has a good consensus with the satellite derived OLR over the same region. Figure 2 shows the mean daily OLR from Kalpana satellite (0.25°×0.25°) and IMDAA (0.12°×0.12°) during the Indian monsoon season, June to September (JJAS) from 2004 to 2017.

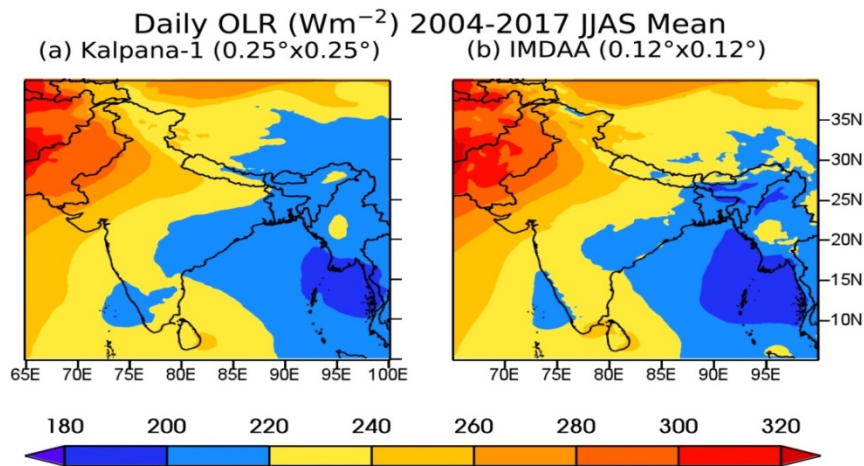


Figure 2: Comparison of mean daily OLR (a) Kalpana-1 satellite and (b) IMDAA reanalysis during June-July-August-September (JJAS) for the period 2004 to 2017.

The IMDAA regional reanalysis products are disseminated to the international researchers through the NCMRWF reanalysis portal, <https://rds.ncmrwf.gov.in/>. Many of the IMDAA products at 12 km spatial resolution are available at hourly intervals and the others at 3 hourly intervals. Details of the products are available at the reanalysis portal. There are approximately 2250 registered users for the IMDAA dataset till now. As per the request from the users, as continuity, NCMRWF started disseminating IMDAA-Like products from NCMRWF Unified Model (NCUM) analysis over the IMDAA domain through the reanalysis portal beyond December 2020.

References

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