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Evaluation of ECMWF lightning forecast over Indian subcontinent during 2020 premonsoon months

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Convective cumulus clouds with vigorous updrafts and downdrafts form thunderstorms. Severe thunderstorms consist of multiple thunderclouds at different stages, and the storm itself has a longer lifetime than individual cells. As the convective clouds grow larger, the negative charge accumulates in their lower region, and the positive charge in the upper level forms a dipole. When the charge difference between the positive and negative ends becomes high enough, lightning occurs.

Indian subcontinent premonsoon months are March, April and May (MAM), sandwiched between Winter seasons and monsoon, classified as the 'Hot weather period' by the Indian Meteorology Department. During the premonsoon season, eastern and northeastern parts of India, Himalayan foothills, and southern parts of India experience extensive lightning activity. Mean moisture, surface, and upper-level winds, the sheared atmosphere in the lower level and high positive values of vertically integrated moisture flux convergence (VIMFC) create favorable conditions for deep convective systems to occur, generating lightning.

With the Indian Institue of Tropical Meteorology (IITM) Lightning Location Network (LLN) operational over more than 80 locations across India, we evaluated the ECMWF lightning forecast with a lead time of 3 days over India and analyzed the fidelity of ECMWF lightning forecast with a longer lead. Despite having some shortcomings, a newly implemented IFS lightning forecast can capture overall lightning events during MAM 2020, specifically lightning associated with large synoptic-scale events.

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