

# Spatial and Temporal Variation of Thermodynamic Indices in Relation to Pre-Monsoon Thunderstorms over Tripura, India

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Thunderstorms are frequent in Eastern and Northeastern Indian region and are the primary source of precipitation and extreme events during Pre-monsoon season. The intensity and frequency of these storms are higher, which leads to impact the climate over these regions. Thermodynamic indices variations are globally accepted to see the variation of a thunderstorm (TD) and non-thunderstorm days (NTD) spatially and temporally, and are helpful in nowcasting of thunderstorm event. In this study, we have analysed both spatial and temporal variation of thermodynamic indices for a northeastern state Tripura, India, to study the prevalence of thunderstorm. Radiosonde observation data are used for the thirty years (1987-2016) to understand the temporal variation of thermodynamic indices over Agartala. The thermodynamic indices analysis has been divided in equal interval of five years to see the trend variation of the thermodynamic indices. For spatial variation of thermodynamic indices, we utilities ERA-5 reanalysis dataset with  $0.25^{\circ} \times 0.25^{\circ}$  (31 km) resolution over Tripura throughout TD and NTD days. The information of thunderstorm occurrence is obtained from the India Meteorological Department (IMD) for Agartala and over several other locations over Tripura. The results shows a shift in threshold values of some index which mark the impact of climate change by temporal variation of these indices. At the same time, some other indices are unable to show any change in the pattern over this area. For the spatial pattern, some indices (convective and potential) shows better results for categorising the thunderstorm days over Tripura and in contrast conditional instability indices unable to distinguish thunderstorm days spatially. We correlated the changes in the threshold value of the thermodynamic indices by using Man-Kendall trend test to analyse the spatial variation of thermodynamic indices.

Keywords: Radiosonde, Thunderstorm, Climate change, Thermodynamic indices