

Effects of convective available potential energy, temperature and humidity on the variability of thunderstorm frequency over Bangladesh

ABSTRACT

The present study examines the effects of convective available potential energy (CAPE), temperature and humidity on the spatiotemporal variation of thunderstorm (TS) frequency over Bangladesh using an Empirical Orthogonal Function (EOF) approach. TS and CAPE, temperature, humidity data have been used for 38-year (1980–2017) and collected from the Bangladesh Meteorological Department and ERA-40 reanalysis, respectively. Mann-Kendall nonparametric trend test, Sen's slope, Pearson's correlation and EOF modes are applied to understand the variability of TS and the effects of CAPE, temperature and humidity on it. Results show a decrease in TS frequency in Bangladesh at a rate of $-0.408/\text{year}$ annually and $-0.384/\text{year}$ during pre-monsoon, when it is most prevalent. The TS frequency spatially varies widely over Bangladesh. The present study shows an increase in TS in the areas where it is less prevalent and a decrease in the areas where it occurs more. CAPE shows a decreasing trend during winter and an increasing trend during post-monsoon and at an annual scale. TS frequency is positively correlated with CAPE and humidity and negatively with temperature. Therefore, the rising temperature may be the cause of decreasing TS frequency in Bangladesh. The findings can be useful for hazard management planning in Bangladesh.