

# Lightning, convective rain and solar activity study over-different parts of India

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## Abstract

The effect of solar variability parameters (solar flux ( $F_{10.7}$  cm), cosmic ray flux, sunspot numbers) and meteorological parameters on convective rainfall and lightning flashes in four different Indian regions of equal area is studied. Regions are selected having different topological, vegetation, proximity with ocean and habitat features. Solar variability shows statistically insignificant effect on lightning flash and convective rainfall. The seasonal variation of lightning flashes and convective rainfall in each region could be explained considering the variation of CAPE and surface temperature in that region. The dependence of lightning flashes and convective rainfall on meteorological parameters varies from region to region, as is evident from correlation studies. Lightning flashes is well correlated ( $R = 0.81$ ) with CAPE in region  $R_1$  and barely correlated ( $R = 0.23, 0.24$ ) in region  $R_3$  and  $R_4$  whereas rainfall is well correlated ( $R > 0.68$ ) in all the regions. Lightning flashes are better correlated ( $R > 0.57$ ) with temperature in  $R_1, R_2$  and  $R_4$  and moderately correlated in  $R_3$  ( $R = 0.44$ ). Rainfall in  $R_3$  is very well correlated ( $R = 0.91$ ) with surface temperature and there is insignificant correlation in  $R_1$  ( $R = 0.09$ ). There is very good positive correlation ( $R > 0.59$ ) between cloud cover and convective rainfall in the entire region and well negative correlation ( $-0.83 < R < -0.61$ ) between OLR and convective rainfall. OLR and cloud cover show little impact on lightning flashes. Lightning flashes and convective rainfall show average positive correlation ( $0.48 < R < 0.53$ ). Aerosol concentration is the largest in the region  $R_4$  and showed an increasing trend between 2007 and 2011. Lightning flashes and convective rainfall are positively correlated ( $0.10 < R < 0.58$ ) with aerosol concentration.