



Seasonal Characteristics of Lightning Activity in Connection with Daily Rainfall over a Tropical Location, Kolkata

A. Adhikari⁽¹⁾, D. Mitra⁽¹⁾, M. Kundu, and A. De^{*(2)}

(1) Department of Electronics and Communication Engineering, Techno Main Salt Lake, Kolkata 700091, India.

(2) Electronics & Communication Engineering Department, Netaji Subhash Engineering College, Techno City, Garia, Kolkata-700152, India; *e-mail: arijide0303@gmail.com

Extended Abstract

The lightning activity over a tropical location, Kolkata is investigated utilizing the 2.5 Degree Low Resolution Time Series (LRTS) of version 2.3 (aboard Tropical Rainfall Measuring Mission Satellite [TRMM]) [1, 2] and 0.1 degree resolution daily accumulated precipitation (combined microwave-IR) estimate (GPM_3IMERGDF v06). The 12 years (2002-2013) observations of LIS/OTD show the distinct seasonal variation of lightning activity prevailing over Kolkata. The lightning activity during the pre-monsoon season is found to exhibit the highest magnitudes whereas the post-monsoon variations show the minimum lightning activity during the 12 year span. The daily rainfall variation in connection with the lightning flash rate is also analyzed for each year. Higher flash rates have been observed in monsoon and pre-monsoon compared to post-monsoon season. It has been observed that during monsoon, heavy rainfall is more frequent when the daily flash rate is below 0.08 /km²/day. However, during pre-monsoon and post-monsoon seasons, lower lightning activity results in below 1 mm daily accumulation. In the monsoon period, sufficient water vapor is present in the atmosphere, whereas in pre-monsoon, localized convection due to strong insolation results in medium to high precipitation along with thunderstorm activities. The observations portray distinguishable nature of rainfall in connection with lightning activity during the three seasons prevailing over Kolkata indicating the seasonal variability of the convective fraction of precipitation. Such investigations in connection with associated atmospheric parameters as well as instability parameters can be utilized for future analysis of convective climatology over such urban location in the proximity of the land-ocean boundary.

References

- [1] Christian, H. J., et al., "Global frequency and distribution of lightning as observed from space by the Optical Transient Detector," *J. Geophys. Res.*, **108**(D1), 4005, January 2003, ACL 4-1 – 4-15, doi:10.1029/2002JD002347.
- [2] Daniel J. Cecil, Dennis E. Buechler, Richard J. Blakeslee, "Gridded lightning climatology from TRMM-LIS and OTD: Dataset description," *Atmospheric Research*, **135–136**, 2014, pp. 404-414, doi:10.1016/j.atmosres.2012.06.028.