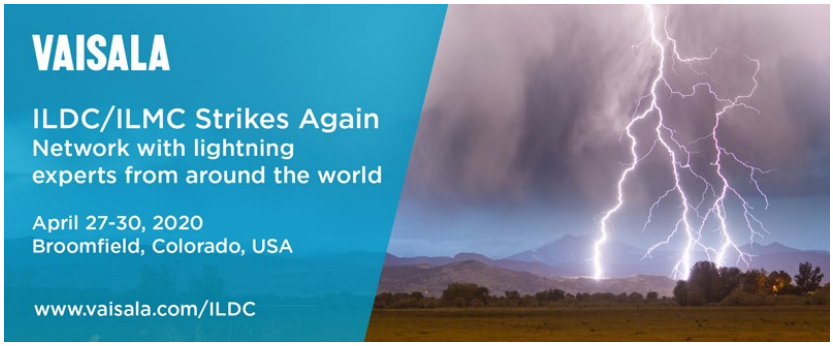

Global Lightning Climatology Estimates using Peak Current Distribution Observations

Authors

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Abstract

Cloud-to-ground (CG) Lightning flash density climatologies are of interest to many commercial and meteorological applications. Precision VLF/LF lightning locating systems (LLS) provide well-calibrated CG flash density estimates in many parts of the world. Additionally, total lightning (TL) observations from optical instruments in low-earth and geostationary orbit have provided global-scale TL climatologies. However, to date no global CG lightning climatology is available.

While it is more challenging to distinguish between cloud and CG events with a global scale ground-based LLS, these networks can provide accurate peak current magnitude estimates. This paper explores what information can be gleaned from long-term observations of peak current distributions around the globe. In particular, tower records indicate a log-normal distribution of CG peak current magnitude values, with different distribution parameters for first, subsequent, and positive CG return strokes. Total lightning observations will superimpose on these CG stroke distributions effective peak current estimates of cloud pulses.

Using the assumption that the higher effective peak current magnitudes correspond to an increasing fraction of CG strokes (Biagi et al 2007), this paper uses peak current observations to estimate the upper end of the log-normal distribution of CG strokes. Using an empirical fit to this distribution, which depends on location (eg land versus ocean) and season, we estimate the total CG climatology. This paper demonstrates this technique and shows a global distribution of peak current distribution parameters and extrapolated CG flash density estimates.

Biagi CJ, Cummins KL, Kehoe KE, Krider EP (2007) National Lightning Detection Network (NLDN) performance in southern Arizona, Texas, and Oklahoma in 2003–2004. J. Geophys. Res. 112(D5) 10.1029/2006jd007341.

Topic Areas

Lightning Climatology

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