



Global distributions of Lightning Electrical Energy Estimated by Optical Observations from International Space Station

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Recent study by [1] demonstrates the remarkable similarity between the time series of lightning optical irradiance observed by high speed photometric observations in GLIMS (Global Lightning and sprite Measurements on JEM-EF) mission installed in the International Space Station (ISS) and current moment change estimated by ground-based ELF magnetic field measurement based on 169 lightning strokes around Japan, which also indicates the high correlation between integrated irradiance and charge moment change (Qds).

In this paper, we extend further the work [1] to derive the global distributions of lightning discharge with Qds indicating the energy of lightning only from high speed photometric observations from GLIMS based on the previously obtained statistical relationship between the integrated irradiance and Qds . We analyzed totally about 800 lightning events detected by photometers from June to August in 2013.

As a result, global spatial distributions of lightning discharges with estimated Qds were successfully derived only by the optical measurement in the first time. Spatial distributions of all lightning events clearly indicate the three thunderstorm active regions (Asia, Africa and America). Spatial distributions of lightning with top 25% of Qds (i.e. energetic lightning) value for two photometers are similar to those from all detected lightning events. Since obtained global spatial distributions of energetic lightning in this study basically agrees well with those obtained from previous ground-based ELF observations, the proposed method seems to work well.

1. Y. Hobara, S. Kono, K. Suzuki, et al. , "Lightning charge momentchanges estimated by high speed photometric observations from ISS", *American Geophysical Union, Fall Meeting 2017*, abstract #AE41A-08, 2017.