Geophysical Research Abstracts
Vol. 18, EGU2016-14941, 2016
EGU General Assembly 2016

Electrical properties of lightning over northern part of Japan by using ELF and LLP observations

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Cloud-to-ground strokes with a large charge transfer are known to often generate the fascinating Transient Luminous Events (TLEs) in the mesosphere, while those intensive strokes damage the overhead ground wire in various locations in Japan. Despite requirement to identify promptly the possible damages after lightning strokes, remote estimation of the charge amount lowers to the ground is technically difficult in general. In this study electrical properties of Cloud to Ground Flashes (CGFs) such as Charge Moment Change (CMC) as well as peak current (Ip) and polarity information over northern part of mainland Japan are studied. Lightning geolocations are obtained from the conventional lightning detection system LLP operated by TEPCO, while corresponding lightning CMCs are calculated by using ELF transients observed in Moshiri, Japan. Based on the statistical results for two years, spatial distributions of CGFs with their CMCs and peak currents with different polarities were obtained in detail first time. Significant differences in the spatial distributions of CGFs are seen between CMC and Ip. Negative CGs with a large CMC are superior to those for +CGs and are predominantly distributed over inland. Negative CGFs with a large Ip are distributed more over the coastal waters. Seasonal dependence of CMCs clearly indicates the characteristics of a famous winter thunderstorm activity in Hokuriku region with many large CMC events with a positive polarity around the northern costal region of Japan.