

Lightning Activity observed with lightning location systems of electric utilities in Japan 1992-2001

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Cloud-to-ground lightning frequency is one of the most important factors to establish the rational insulation design of power transmission systems. Lightning occurrence data have been collected with the lightning location systems operated by electric power companies in Japan and it is possible to make a lightning frequency map using the data obtained by the lightning location systems with higher accuracy than the conventional IKL (Iso-Keraunic Level or thunderstorm day) map. Ten-year lightning occurrence data from 1992 to 2001 have been collected and analyzed corresponding to the faults of transmission lines. As a result, it is found that the annual number of the lightning strokes varies at the level of about 0.5 million on an average, but it is small in 1993 and extremely large in 2000 and 2001. This is considered due to the abnormal meteorological conditions in summer. Seasonal variations and annual variations of lightning occurrence have been clarified from the seasonal and annual lightning stroke frequency maps made by the above data.

Average lightning stroke density all over Japan is 1 - 2/km²/year, but year-to-year variation is rather large. It is shown that the variation is different from that of thunderstorm days and comparison of the data with thunderstorm day data for about a hundred years collected by the Japan Meteorological Agency is made.

As to lightning current distribution, annual, seasonal, regional variations are clarified. Effects of the polarity and relationship between the current and number of strokes are investigated.