

Meteorological conditions for lightning jump associated with downburst and heavy precipitation in Japan inferred from X-band radar and Himawari-8 satellite data

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In this paper we have studied characteristics of thunderstorms producing extreme weather events in detail both from ground-based and satellite measurements. We focused on thunderstorms producing downbursts and heavy rains in summer time in Japan. The data from Total lightning continuously monitored by JTLN (Japanese Total Lightning Network) deployed by UEC over Japan were used to identify Lightning Jump (LJ: sudden increase in lightning discharges) before extreme weather occurrence. LJ is suggested to be useful for severe event prediction. The thunderstorm cells were identified and tracked by using the volume scan data from X-band high speed Doppler weather radar, which provides the information on how the thunderstorms evolve both in space and time coordinates. Moreover, Japanese geostationary meteorological satellite (Himawari 8) data from different optical bands were used to identify the meteorological conditions around the target thunderstorm cells such as cloud top height and amount of water vapor in different altitude. Above-mentioned physical parameters from radar and satellite measurements are utilized to understand the in-cloud meteorological conditions generating total LJ such as updraft intensification in the storm cell and extreme weather event onset.

Keywords: total lightning, extreme weather, downburst, heavy precipitation, radar, meteorological satellite