

Geolocation of lightning discharge in the Maritime Continent based on radio observation in 0.1-40 kHz band

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Recent researches based on observation and data assimilation of lightning discharge indicate a possibility of now-cast and forecast of severe weather such as torrential rain. In these works, lightning data is focused on as a proxy for the presence or absence of deep convection which generates thunderstorm.

In previous works, occurrence of cloud-to-ground (CG) lightning discharges has been mainly used due to the ease of data availability. However, lighting observation based on electromagnetic measurement shows that there is extremely huge scale lightning whose scale is more than hundreds times bigger than that of averaged event. Lightning data including " occurrence " and " scale " enable us to evaluate not only existence but also intensity of atmospheric convection. Quantitative evaluation of atmospheric convection would make it possible to make a now-cast and forecast for intensity distribution of precipitation.

The Maritime Continent (MC) is one of the most important regions for lightning observation in the world. Thunderstorm activity causes enormous human and economic damage to countries in MC. However, until now, only few statistical studies on the lightning activity with scale information of lightning discharge have been done.

In this works, lightning observation network in the MC based on electromagnetic measurement in 0.1-40 kHz band is summarized. This network is developed to estimate not only spatial distribution but also scale one of lightning discharges. We have already constructed observation stations at Tainan in Taiwan (23.1N, 121.1E), Saraburi in Thailand (14.5N, 101.0E), Pontianak in Indonesia (0.0N, 109.4E), Los Banos in Philippines (14.2N, 121.25E) and Son Tay in Viet Nam (21.1N, 105.5E). Data obtained by multipoint observation is synchronized by GPS receiver installed at each station.

At the presentation, we show evaluation of accuracy for geolocation and detection efficiency of signal radiated from lightning discharge based on comparisons with World Wide Lightning Location Network (WWLLN) data.

Keywords: lightning discharge, thunderstorm, severe weather, VLF, the Maritime Continent