

Estimation of Lightning Location Using V-POTEKA Lightning Observation Network

*Loren Joy De Vera Estrebilló¹, Mitsuteru Sato², Yukihiro Takahashi², Hisayuki Kubota², Kozo Yamashita³, Junichi Hamada⁴, Joel Marciano⁵

1. Department of CosmoSciences, Hokkaido University, 2. Faculty of Science, Hokkaido University, 3. Faculty of Engineering, Ashikaga University, 4. Graduate School of Urban Environmental Sciences, Tokyo Metropolitan University, 5. ASTI/DOST

The Philippines is one of the most disaster-hit countries in the world. Its location in the western North Pacific (WNP) subjects it to numerous tropical cyclones (TC) each year that pose risk to lives, properties and infrastructures. There has been a significant development in the accuracy of TC track forecast that cross and/or make landfall within the Philippine Area of Responsibility (PAR) over the years with the use of ground-based synoptic observations, weather radars, and meteorological satellites. However, prediction of TC intensity remains a significant challenge. Lightning activity is an indicator of the dynamics and microphysics in thunderstorms, as well as severe weather phenomena, such as TCs and torrential rainfall among others. Recent studies suggest that lightning activity in tropical cyclones can give predictive information about its intensity development. Thus, a ground-based lightning observation system (V-POTEKA) has been developed, and it has been installed at three stations in the Philippines, Guam, and Palau to continuously monitor lightning activity in the WNP region since September 2017. The V-POTEKA system uses an event-trigger method that detects radio wave pulses from lightning discharges in the very low frequency (VLF) range of 1-50 kHz. It also consists of an automatic weather station (AWS), VLF sensors, and an automatic data-processing unit. The V-POTEKA system analyzes lightning data, extracts pertinent information, i.e., peak amplitude and time of the triggered waveform, and transmits data to a server through 3G communication. A geolocation software using the time-of-arrival method is being developed using the 3 sites along the WNP region. Further analysis will be conducted by incorporating data from other stations (Sapporo, Japan and Los Banos, Philippines), and an improved geolocation software will be used to investigate the relationship between the lightning activity and typhoon intensification during the dropsonde observation campaign conducted in September 2018.

Keywords: lightning location, V-POTEKA