Development of a Real-Time Thunderstorm Monitoring and Information System in Metro Manila, Philippines

*Alvin Estoquia Retamar[1], Joel Joseph Marciano[1], Glenn Vincent Lopez[1], Felan Carlo Garcia[1], Jericho Capito[1]

1. ASTI

The geographic location of the Philippines along the tropics and Northwestern Pacific Basin makes the country prone to weather related hazards. Aside from multiple typhoon occurrences and heavy torrential rainfall brought about by the southwest monsoon, thunderstorms contribute largely to weather-related hazards all year long. In the context of Metro Manila, which is settled alongside major tributaries such as Marikina and Pasig, thunderstorms introduce localized heavy rainfall lasting for hours and has induced heavy flooding and structural damage to communities across the metropolitan area.

This proposed project calls for research, development and deployment of a dense lightning detection network scattered throughout Metro Manila to gather, analyze, and archive lightning data to help bring about thunderstorm “nowcasting” and supplement weather-related research and disaster response studies and strategies. As basis for the deployment of said detection network, studies found that there is a strong correlation between extreme rainfall and lightning discharges and that rainfall generally lagged temporally behind the occurrence of lightning. As such, detection and analysis of lightning data is useful to understand thunderstorms and generate necessary information for public warning. In addition, satellite imagery thru the Philippines’ own DIWATA microsatellite will be used to perform 3D cloud reconstruction and provide complementary information on thunderstorms. The lightning sensing network will be part of the expanding environmental sensing infrastructure that includes the nationwide network of automated rain gauges, water-level sensors, multi-parameter weather stations that have been developed and deployed by the Advanced Science and Technology Institute of the Department of Science and Technology (DOST-ASTI). The data repository and high performance computing facility in DOST-ASTI will provide back-end resources for data integration, processing and analytics.

The establishment of a dense lightning detection and information system in the Philippines allows various intelligent applications to be developed. While numerical models are the de-facto standard for weather prediction, this project will utilize machine learning methods on lightning data so that these can be used for applications such as thunderstorm “nowcasting” and crisis informatics. Lastly, to share information with appropriate agencies, a web-based delivery system will be developed to foster the effective and efficient transfer of information among stakeholders.

Keywords: disaster mitigation, thunderstorms, lightning

