# STATISTICAL FORECASTING OF THUNDERSTORMS IN METRO MANILA

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## ABSTRACT

Thunderstorm is a weather system that commonly affects tropical areas like the Philippines. Understanding its pattern and accurate forecasting of its occurrence are keys to mitigating its impacts. This study characterized the spatio-temporal distribution of thunderstorms in Metro Manila and investigated its relationship with monsoon periods and phases of El Niño Southern Oscillation (ENSO). Daily, monthly and monsoonal patterns of thunderstorm occurrences were analyzed using synoptic reports from four synoptic stations (Sangley Point, NAIA, Port Area and Science Garden) of Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) in Metro Manila from 2006 to 2015. Additionally, outputs of WRF numerical model were used in the analysis. Variability in the spatio-temporal distribution of thunderstorms in Metro Manila was found to be linked with diurnal cycle and monsoon periods.

The application of a statistical tool for predicting thunderstorms in Metro Manila for different monsoon periods was also investigated in this study. Five (5) meteorological indices from reports of PAGASA's synoptic weather stations in Metro Manila and twenty four (24) indices from sounding data of the nearby upper air station of PAGASA in Tanay, Rizal, were used as thunderstorm predictors. Several statistical models with the 29 predictors combined were developed using logistic regression technique. They were evaluated based on forecast accuracy and other commonly used forecast skills verification metrics. It was found that there is no significant difference in forecast skills whether a single generalized model or several models fitted for different periods of the year were used. The logistic models developed from this study achieved higher forecast skills in all periods compared to the existing thunderstorm prediction of PAGASA. The forecast skills when predictors were used individually were also analyzed. Among the 29 predictors, precipitable water yielded the highest accuracy yet this was still comparatively lower than the accuracy obtained when multiple predictors were used. This proved that use of composite predictors can improve the accuracy of the model.

While this study is just an initial attempt on the use of logistic regression technique for predicting a broad type of thunderstorms in Metro Manila, its results show that statistical models are promising tools for operational thunderstorm forecasting.