ABSTRACT

INTER-RELATIONSHIP BETWEEN GROUND AND SATELLITE PRECIPITATION MEASUREMENTS

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Situated in the tropics, the Philippines is an archipelago that receives huge amount of precipitation that varies significantly with the season and location. However, due to sparsely distributed synoptic stations in the country, representation of precipitation is inadequate. Thus, this study analyzed the inter-relationship between available ground and satellite-based measurements in order to better represent precipitation in the country.

The study utilized ground measurements from (1) synoptic stations managed by PAGASA and (2) rain gauges installed by DOST-ASTI. Satellite-derived precipitation products from TRMM and GPM were also used. Interpolation and iterative method was done on synoptic measurements to demonstrate if interpolated precipitation from synoptic data alone can represent precipitation in the country. Results show that the interpolated precipitation from synoptic stations agrees well with TRMM measurements over Luzon and Visayas. However, significant differences between the interpolated precipitation and TRMM were found in Mindanao during the months of November to March. This difference may be caused by the sparse synoptic stations in Mindanao having an average minimum distance of 1.093° between stations.

Precipitation data from a dense network of rain gauges were then used to compliment synoptic measurements. Comparing the two, results showed that as the rain gauge is situated farther from the synoptic station, the likelihood of their measurements decreases. The opposite is true for rain gauges located near the synoptic station. With this, inverse distance weighting (IDW) was done to combine rain gauge measurements to represent precipitation in a 0.1° cell. IDW values were found to correlate well (r = 0.58 to 0.97) with the overlapping synoptic station measurements inside the cell.

The IDW values of precipitation were blended with GPM data through regression kriging. The blended product showed least difference when compared to GPM during the months of February to May. Moreover, higher precipitation values (with respect to GPM) were observed from the blended product on places where dense rain gauges are situated. In contrast, lower precipitation values (with respect to GPM) were observed from the blended product on places of higher altitude.

Understanding the behavior of ground and satellite-derived measurements is the key to better represent precipitation over the country. With the use of various available datasets, this study investigated a method to combine ground and satellite measurements in consideration of their distribution and inter-relationships. This is significant to future studies involving satellite product calibration and ground-satellite data fusion.