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Revealing Philippine Climate Type Using Remotely-sensed Rainfall Estimates

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Rainfall variability is a key feature of climate. Understanding rainfall distribution over space and time is particularly of interest because it impacts several aspects of human activities. It has been known that rainfall variations in the Philippines is influenced by an interplay of various synoptic systems affecting the country – southwest and northeast monsoons, easterlies and tropical cyclone activity. In a 1920 report, Coronas was able to identify and map four distinct climate types based on monthly rainfall time series obtained from synoptic stations over the Philippines. Using the same source of data, subsequent studies by various authors demonstrated similar results.

A common challenge in utilizing ground observations for climate analysis, especially when dealing with rainfall, is the spatial resolution of the ground station network. Taking into consideration the sparsity of the stations, the geographical delineation between climate types must have been determined by the archipelago's topographical features such as mountain ranges blocking passages of rain-producing systems (rain shadow) and other factors known to the authors. Satellite-based technology overcomes this limitation.

In this work, we demonstrate the viability of satellite-based rainfall estimates in capturing rainfall variations in the Philippines. Performing K-means clustering algorithm onto Tropical Rainfall Measuring Mission Multi-satellite Precipitation Analysis (TRMM/TMPA) 3B43 rainfall data revealed four climate types with unique characteristics: (Type 1) two pronounced season with peak rainfall occurring during JJA; (Type 2) no dry seasons with extreme rainfall during DJF season; (Type 3) relatively dry from January to April with rainfall amount gradually increasing until December; and (Type 4) evenly distributed rainfall throughout the year. These rainfall patterns can be explained by southwest monsoon, easterlies, tropical cyclone visits, position of the inter-tropical convergence zone and topography. It is also interesting that the spatial extent of each climate type naturally manifested during the classification process and that the effect of topography was inferred from the results.

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