

Asian Monsoon Years (2007-2012): The effect of tropical cyclones on southwest monsoon rainfall in the Philippines

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Intense southwest monsoon (SWM) rainfall events causing massive landslides and flash floods along the western sections of the Philippines were studied. These rainfall events, are not directly coming from the tropical cyclones (TCs) for they are situated far north to northeast of Luzon Island. The heavy rainfall is hypothesized as caused by the interaction of strong westerlies with the mountain ranges along the west coast of Luzon that produces strong vertical motion and consequently generates heavy rainfall. Four of heavy SWM rainfall cases were examined to determine how the presence and position of tropical cyclones in the Philippine vicinity affect these SWM rainfall events; three cases with TC of varying positions within the Philippine area of responsibility (PAR) and the fourth case without TC. Using a spatial Fourier decomposition approach, the total streamfunction is decomposed into two flow regimes: monsoon basic flow (Waves 0 - 1) and tropical cyclone perturbation flow (Waves 2-23) over a domain of (20°E-140°W, 5°S-35°N). The purpose of this flow decomposition is to determine the latter's effect on or contribution to the monsoon activity. The analysis utilized the NCEP Final (FNL) data with 1° long. X 1° lat. resolution. Results show that the tropical cyclones over the Pacific Ocean located northeast of Luzon generate strong southwesterly winds over the west coast of Luzon. These in addition to the southwesterlies from the basic flow strengthened the southwest winds that interact with the high Cordillera Mountain ranges along the west coast of Luzon. When the tropical cyclone is located north or north-northwest of Luzon, it generates northwesterlies which converge with the southwesterlies from the basic flow. This results to enhancement of rising motion over western Luzon. The much stronger westerlies are then forced to rise above the mountains resulting to strong vertical motion that brings about heavy rainfall.