

Bagtasa, G., 2019: Enhancement of summer monsoon rainfall by tropical cyclones in northwestern Philippines. *J. Meteor. Soc. Japan*, **97**, 967-976.

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**Plain Language Summary:** The Philippines' location makes it vulnerable to the hazards of tropical cyclones forming in the western North Pacific Ocean. This study looks at how distant tropical cyclones can cause heavy rainfall in the northwestern region of the Philippines. Though almost all heavy rainfall events in that region of the Philippines are caused by tropical cyclones during summer season, only about 10% are due to tropical cyclones directly hitting the area. 90% of heavy rain events are due to cyclones that are hundreds of kilometers away, particularly, around the region between Okinawa and Luzon. The presence of tropical cyclones are able affect the monsoon circulation leading to heavy rainfall along the northwestern coasts of the Philippines.

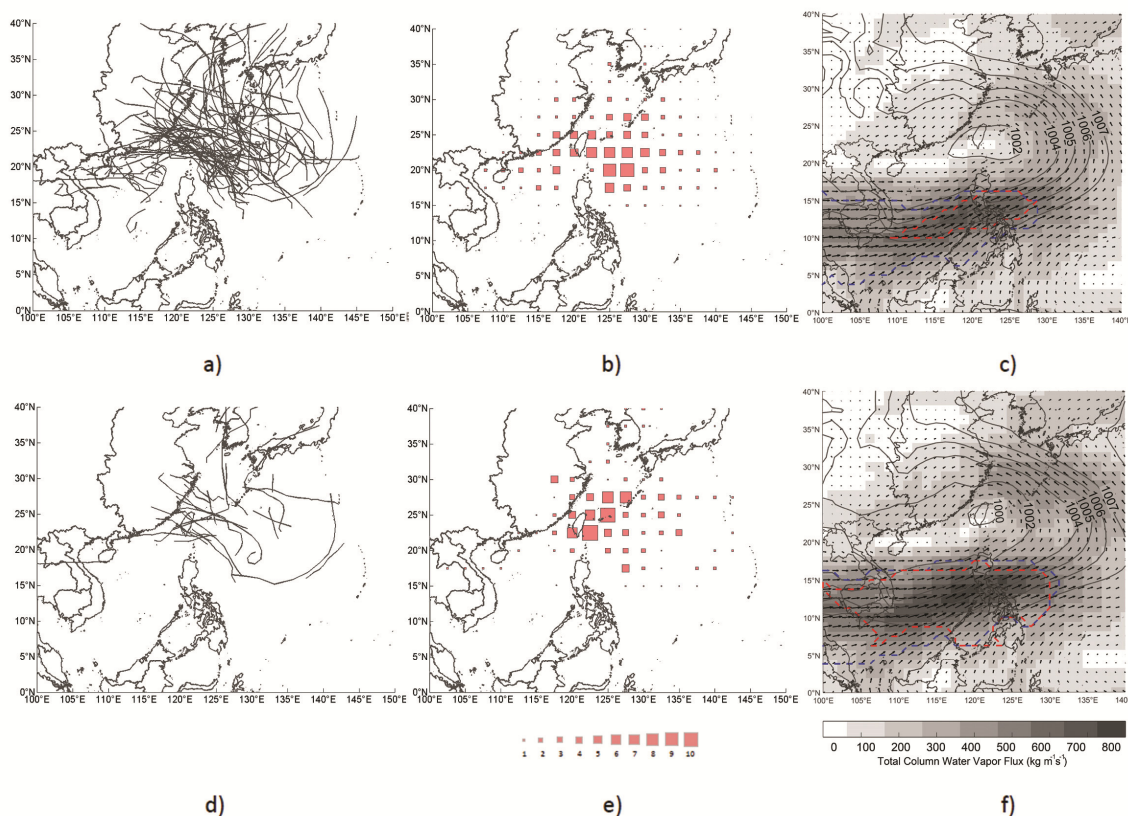


Figure 1: a) Tropical cyclone (TC) tracks, b) TC density count in  $2.5^\circ \times 2.5^\circ$  grids and c) synoptic environment during days in northwest Philippine with rainfall in the upper 95th percentile. d) TC tracks, e) TC density count and f) synoptic environment during days with rainfall in the upper 99th percentile. Synoptic environment includes Total column water vapor flux magnitude (gray shading), 850 mb wind (arrow) and mean sea level pressure (dark gray line) derived from the JRA55 reanalysis. Dashed lines show 95% significance level for difference of zonal wind (blue) and column water vapor flux (red) from the JJAS mean.

- Most tropical cyclones that bring heavy rainfall to northwestern Philippines are distant TCs.
- TCs near the line segment connecting Okinawa and Luzon can lead to the formation of the “moisture conveyor belt” where high amounts of water vapor move along a narrow path in South China Sea and the Philippines.
- Recent changes in TC tracks have led to more heavy precipitation event days due to this TC-monsoon interaction.