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Impact of cloud microphysics schemes on typhoon forecast over the western North Pacific

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In high-resolution numerical modeling, cloud microphysics parameterization schemes play an important role in forecasting typhoon structure
changes depending on how many hydrometeors are used in schemes. It controls the phases of the water such as water vapor, rain, snow, cloud water, cloud ice. Thus, we investigate the sensitivity of track and intensity forecasts to cloud microphysics schemes in real-time typhoon forecast using a Weather Research and Forecasting (WRF) with moving nesting method. The WSM3, WSM6 (WRF-single-moment-microphysics classes 3, 6), and WDM6 (WRF-double-moment-microphysics classes 6) microphysics schemes are selected for the sensitivity test. Also, 22 forecasts for 11 typhoons occurred from 2012 to 2017 are conducted using high-resolution (2 km for core region) weather research and forecasting (WRF) with moving nesting method. The model outputs are validated using the best track from the Joint Typhoon Warning Center (JTWC).
Both track and intensity errors are overall decreased in the experiments with 6 hydrometeors-based schemes (i.e. WSM6 and WDM6) compared in that with 3 hydrometeors-based scheme (i.e. WSM3), in particular for typhoons northward moving to the mid-latitude. In the experiments with the WSM3 scheme, typhoon intensity is prominently underestimated compared to the best track. Thereby, simulated track tends to be shifted eastward, since steering wind is more affected by the western North Pacific Subtropical High. However, the sensitivity of typhoon tracks to microphysics schemes is not relatively significant for typhoons moving westward. This indicates that numerical prediction for typhoons moving to the mid-latitude requires more sophisticated cloud microphysics schemes.