Initialization of the Environment of Tropical Cyclogenesis by Assimilating Radio Occultation Refractivity with an Ensemble Filter

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The remote synoptic environment (water vapor, temperature, and winds) of tropical cyclogenesis is very important but generally not well observed. In this study we explore the initialization of the environment of tropical cyclones by assimilating radio occultation (RO) data using an ensemble filter. The ensemble filter has an ability to spread the refractivity information of the RO profiles to the model variables of water vapor, temperature, winds, and cloud water through the multi-variate covariance of ensemble forecast. As one example, COSMIC RO refractivity profiles are assimilated in the WRF/DART mesoscale ensemble system during Hurricane Ernesto (2006)’s genesis period. It is found that assimilation of a few key RO profiles in the upstream of the storm and about 0.5-2 days before the genesis of the storm significantly reduces the dry bias of WRF analysis and enhances the initial perturbation (eastly wave) of the storm. The subsequent forecast of the storms intensification is also improved by the RO data. The results suggest that RO data has great potential to improve the analysis and forecast of tropical cyclogenesis.