A Comparative Study of GPS RO Data Assimilation with 3DVAR and 4DVAR Methods on the Simulations of Typhoons and Mei-Yu Heavy Rainfall Event

Pay-Liam Lin, Ju-Mou Huang, Ying-Jhen CHEN, Ching-Young Huang

Department of Atmospheric Sciences
National Central University
Jhong-Li, Taiwan

Using WRF three-dimensional variational data assimilation (3DVAR) to assimilate GPS radio occultation data (refractivity) has been confirmed as an easy and reliable way for the improvement of regional weather forecasts. At the same time, the four-dimensional variational data assimilation (4DVAR) have been developed and applied for improving the numerical prediction of typhoons and other severe weather systems. In this research, 3DVAR and 4DVAR with WRF have been conducted to assimilate FORMOSAT-3/COSMIC radio occultation (GPS RO) data in simulations of typhoon Morakot, Typhoon Maggie, Typhoon Fanapi and the heavy Mei-Yu rainfall event in June 11-12, 2012. The simulation results with the WRF 3DVAR and 4DVAR will be compared and discussed. The impacts of FORMOSAT-3/COSMIC GPS RO data assimilation with those two different methods on numerical simulation of Typhoons and heavy Mei-Yu rainfall event will also be investigated. Our results show that the WRF 4DVAR assimilation method could be used to simulate typhoon central pressure much better than the WRF 3DVAR method. For the rainfall forecast, the simulation results of WRF 4DVAR method also could be better than using the WRF 3DVAR assimilation technique. The physical processes responsible for the improvement of regional weather forecast of typhoons and the heavy Mei-Yu rainfall case will be also discussed in this research.