MMM SEMINAR SERIES

Evaluating Cloud Microphysical Parameterizations in Tropical Cyclones with Polarimetric Radio Occultation

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A novel radio occultation (RO) technique, polarimetric RO (PRO), has recently been developed to measure differential polarimetric phase shift together with traditional RO products such as bending angle and refractivity. PRO observations have been shown to be associated with the vertical structure of cloud hydrometeors. With this unique measurement capability, the PRO soundings could potentially be used to evaluate model microphysics parameterization. This study compared PRO observations with WRF simulations of three typhoon cases in 2019 and 2021, initialized with ERA5 and NCEP FNL global analysis, respectively, with five microphysics parameterizations (Purdue Lin, WSM6, Goddard, Thompson, and Morrison). There is notable variability in the distribution of the model's hydrometeors, which could be affected by the initial conditions, microphysics parameterization schemes, typhoon locations, circulation, and rainbands. The results in this study show that WRF simulations using the Goddard, Thompson, and Morrison schemes generally place the peak differential phase at the altitudes close to those observed by PAZ PRO. Among them, the Goddard microphysics scheme performs best in typhoon track prediction and the simulation of maximum differential phase shift when compared with PRO observations. The ensemble mean from 36 ensemble forecasts also exhibits consistent results with the deterministic run. The comparative results demonstrate that PRO data have the potential to evaluate the performance of different microphysics schemes in numerical models.

Thursday, 7 August, 2025, 2:00PM
Refreshments 1:45PM
Please also join colleagues for refreshments and informal discussion after the seminar until 3:30PM
NCAR-Foothills Laboratory, 3450 Mitchell Lane
FL2-1001, Small Seminar
Seminar will also be live webcast
https://sundog.ucar.edu/public/page/MMM
Participants may ask questions during the seminar via Slido.