

A MULTI-CENTER EXERCISE ON THE SENSITIVITY OF PAZ GNSS POLARIMETRIC RO FOR NWP MODELING

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A better understanding of the thermodynamics of heavy precipitation events is necessary towards improving weather and climate models and quantifying the impact of climate variability on precipitation. However, there are limited observations available to assess the model structure within heavy precipitation conditions. Recently, it has also been shown that the Radio Occultations Through Heavy Precipitation (ROHP) GNSS polarimetric radio occultation (GNSS PRO) observations are highly sensitive to hydrometeors above the freezing layer, which expands the potential uses of the GNSS PRO dataset for weather-related science and applications.

An exercise is presented to analyze the sensitivity of PRO observations for NWP modeling applications. The ROHP experiment now provides over four years of coincident thermodynamic and precipitation information with high vertical resolution within regions with thick clouds. Murphy et al. (2019) simulated GNSS airborne polarimetric RO (GNSS PRO) events along an atmospheric river. These were modeled by the community WRF mesoscale model using two different microphysical parameterization schemes. The GNSS PRO observables simulated with the two schemes differed significantly, more than the actual GNSS PRO precision. The new exercise presented here reproduces this methodology for spaceborne data, using different global and regional NWP models, and it analyzes the results and divergences with the help of actual GNSS PRO data acquired aboard the PAZ satellite.

The objectives of the activity are: (1) To compare simulated GNSS PRO observables, generated with models from different centers and different microphysics schemes, against actual PAZ GNSS PRO observables. Can the models reproduce the main features of the actual data? (2) To assess whether different models/schemes result in different GNSS PRO observables, and whether these differences are larger than the measurement uncertainty. This effort provides insight on future methods to assimilate the PRO profile alongside other conventional (non-polarimetric) RO data. (3) To examine the utility of PAZ GNSS PRO observations for model validation and diagnosis.

The exercise includes comparisons with ECWMF reanalysis ERA-5 model, the operational NWP at the Japan Meteorological Agency, and a near-real-time implementation of the WRF regional model over the northeastern Pacific produced at the Center for Western Weather and Water Extremes (CW3E) called West WRF, among others.