EGU21-9405
https://doi.org/10.5194/egusphere-egu21-9405
EGU General Assembly 2021

Sounding Heavy Precipitating Vertical Cloud Structures with Polarimetric Radio Occultations aboard PAZ

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The Radio Occultation and Heavy Precipitation (ROHP) experiment aboard the Spanish PAZ satellite was activated in May 2018 with the objective to demonstrate the Polarimetric Radio Occultation (PRO) concept for rain detection. This technique enhances standard RO by measuring GNSS signals at two orthogonal linear polarizations (H and V). Owing to hydrometeor asymmetry, electromagnetic signals propagating through regions of heavy precipitation would experience a differential phase delay expected to be measurable by the ROHP experiment.

After 2+ years of operations, the initial hypothesis has been verified and the main scientific goals have been achieved. Soon after the activation of the experiment it became clear that PRO observables were sensitive to heavy precipitation, showing positive signatures correlated with the presence and intensity of precipitation. After a thorough on-orbit calibration, it has been demonstrated that the PAZ polarimetric observable can be used as a proxy for heavy precipitation. Furthermore, PRO measurements were shown to be sensitive to the horizontally oriented frozen hydrometeors present throughout the vertical cloud extent, providing valuable information on the vertical structure of precipitating clouds.

In addition, PRO can retrieve standard thermodynamic RO products such as temperature, pressure, and water vapor. These products, provided with high vertical resolution, globally distributed and seamlessly over ocean and over land, make PRO observations a unique dataset, with potential applications ranging from the study of deep convection processes to the evaluation and diagnosis of NWP forecast models.

In this presentation we will report on the status of the experiment and current data availability. We will also show the results of the sensitivity studies to heavy precipitation and frozen particles, performed using collocated observations between PAZ and GPM-DPR, GPM-GMI, and other radiometers from the GPM constellation, as well as a-priory information from the Cloudsat radar. Finally, we will address potential level-2 products we can expect from PAZ observations.