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The Radio Occultations and Heavy Precipitation (ROHP) experiment, orbiting onboard the Spanish PAZ satellite since May 2018, has demonstrated the capability to simultaneous detect the presence of precipitation along the same radio occultation (RO) ray paths used to estimate the conventional thermodynamic (temperature, moisture, and pressure) profile. While conventional RO does not directly provide this capability, PRO enhances standard RO by receiving the GNSS signals in two orthogonal linear (H/V) polarizations. Owing to hydrometeor asymmetry, the H- and V-polarized radio signals propagating through a precipitation media will experience differential phase delays, measurable via the ROHP polarimetric antenna. The induced cross polarization $\Delta\phi$ represents a cumulative effect arising from the presence of aspherical hydrometeors along each ray path. Analysis has been carried out with 2+ years of coincidences of ROHP and GPM, and ROHP and various passive microwave (MW) radiometers such as GMI and SSMIS. These data have revealed the expected depolarization from the liquid phase (oblate-shaped) precipitation hydrometeors, but also positive $\Delta\phi$ signatures into and extending well above the freezing level, indicating possible sensitivity to frozen hydrometeors and the cloud vertical structure. This knowledge of the presence of heavy precipitation and its associated vertical extent may be useful for the evaluation and diagnosis of NWP forecast models. Examples from ROHP-GPM coincidences are presented, using a simplified observation operator to simulate the contributions to the differential phase delay from the 3-D precipitation structure along the RO propagation paths. The results provide an indication of the levels of

sensitivity to the associated ray path-averaged water content, and to along-path hydrometeor asymmetry from comparisons of ROHP $\Delta\phi$ and simulated $\Delta\phi$ using various ice crystal shapes.

Presentation file

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