A study on the effects of heavy precipitation on Polarimetric Radio Occultation (PRO) bending angle observations

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GPS Polarimetric Radio Occultation (GPS-PRO)
- GPS-PRO is an effective technique to profile vertical moisture and precipitation structure simultaneously [Cardellach 2019].

Up to now, the PRO has been studying using polarimetric phase shift assuming geometric optics propagation through ray tracing techniques.
- GPS-RO bending angle observations are more commonly used in data assimilation process
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- the propagation of the PRO signals is likely to suffer the multipath effect due to large moisture variance at lower troposphere
- Modern PRO data and statistics
  - The phase and bending angle shift due to precipitation are shown after calibrating the phase difference [Padullés 2019] on the impact parameter domain (20180620_0658paz_g56, 6.26 mm/hr)
  - Statistical results show that the mean phase shift and the bending angle shift variance is sensitive to different level of precipitations.

MPS Simulation and Phase Matching method
- Multiple Phase Screen (MPS) simulates the wave propagation of PRO signals through hydrometeors:
  - The sensitivity tests based on MPS show that both phase and bending angle shift on impact parameter domain are sensitive to the range, height, and strength of the precipitation and above the statistical noise level (~2µrad).

Reference