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Polarimetric mountain based radio-occultation for rain detection: The ROHP-PAZ ground campaign

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The Radio Occultation and Heavy Precipitation experiment aboard the PAZ Low Earth Orbiter (ROHP-PAZ) is a mission of opportunity: The Spanish Ministry of Science and Innovation (MICINN) approved in 2009 a proposal to include a polarimetric Global Navigation Satellite System (GNSS) Radio-Occultation (RO) payload on board of the Spanish Earth Observation satellite PAZ. This will be a new technique that has never been tested before, that aims to improve the knowledge of precipitation through simultaneous thermodynamic and vertical rain profiles.

Prior to the launch of the satellite, expected for 2014, a ground experimental campaign is being conducted with the goal of starting the process of identifying and understanding all the factors that might affect the polarimetric RO observables.

The campaign is being carried out at the top of Puig Sesolles, a 1667m peak in the Natural Park of Montseny (41º46'24 N, 2º26'17 E), 50 km N-NE from Barcelona, with clear views over the horizon to the South (East to West) direction, an area in which intense precipitation events tend to occur a few times per year.

The campaign uses a ICE-CSIC/IEEC's GOLD-RTR open-loop receiver initially designed for collecting GNSS signals reflected off the sea surface. The receiver has been adjusted to track occulting GNSS radio-links.

A double polarization (H and V) GNSS antenna has been designed and manufactured by the Polytechnic University of Barcelona (UPC) team for this particular ground-based experiment. The antenna is a phase-array made of 7 elements, each of them being a square patch built using a Rogers 4003 substrate, and symmetrically fed by four probes. It provides a pattern of 12.9 dB peak gain, 45 degrees half-power beam-width, and <-35 dB cross-polar isolation at the peak (better than -30 dB in the main lobe).

The preliminary results show that not only precipitation, but also other factors are affecting the GNSS signal, wich means that the polarimetric signal is richer than expected. The identification of all this factors will help us to understand the mechanisms behind the concept. The ground-based campaign and its analysis will be presented.