

## **PRETTY- ESA's GNSS Reflection Technology for Remote Sensing of the Earth**

H. Nahavandchi (1), M. Semmling (2), M. Asgarimehr (3), E. Cardellach (4), W. Li (4), F. Zus (3), M. Moreno (2, 5), A. Dielacher (6), J. Wickert (3), M. Moser-Moritsch (6)

(1) Department of Civil and Environmental Engineering, NTNU, Norway

(2) German Aerospace Center (DLR), Institute for Solar-Terrestrial Physics, Germany

(3) German Research Centre for Geosciences (GFZ), Germany

(4) Institute of Space Sciences (ICE-CSIC) and Institute for Space Studies Catalunya (IEEC), Spain

(5) Technische Universität Berlin (TUB), Germany

(6) Beyond Gravity Austria (BGA), Austria

PRETTY (Passive REFlecTometry and dosiomeTrY) is a small satellite project of the European Space Agency (ESA). The PRETTY CubeSat is a nanosatellite, measuring 30 cm by 10 cm by 10 cm in the launch configuration. On 9 October 2023, the satellites was launched into a sun-synchronous polar Low Earth Orbit (LEO) with an inclination of  $97.66^\circ$ , a low orbit eccentricity and a mean orbit height of 564 km. PRETTY includes a demonstrator payload for passive Global Navigation Satellite Systems (GNSS) based Reflectometry (GNSS-R) focusing on low elevation angles whereby the direct and reflected signal are received via the same antenna. PRETTY also includes a novel dosimeter to measure the Total Ionizing Dose (TID). The main scientific goal of the mission is the precise altimetric determination of water and ice surfaces. High-precision results are expected with a phase altimetric approach. However, phase altimetry using reflected GNSS signals requires coherent reflection conditions that are dependent on surface roughness conditions and usually limited to smooth surface over calm ocean, sea-ice, and inland water bodies. A second approach will use group delay measurements to investigate the altimetric application under higher ocean roughness conditions. Possibility of making use of PRETTY's scatterometry data to study wind, ocean and soil moistures will also be investigated as the secondary scientific goal.

Three levels of data are produced within the data recording and processing steps of the PRETTY. The lowest level of data, i.e., Level 0 includes the correlation sums at In-phase and Quadrature (I/Q) channels produced by the PRETTY onboard processor. Level 1 data includes the complex delay waveforms and power Delay-Doppler Maps (DDM) accompanied by different pieces of ancillary information and metadata. The scientific data products of PRETTY, i.e., altimetric and scatterometric measurements, are being tested now, and they will be provided as Level 2 data. The Level 1 and Level 2 data products are released in the form of NetCDF files.

On 15 February 2024, we witnessed PRETTY's first light over a lonely polar island in the Canadian Arctic. Quality of the result was very good as this was basically the first time the PRETTY'S software was turned on since reaching orbit. More data are gathered since February and testing and cross-checking of results are performed. The initial data sets, tracks, the signal strength as a function of coherent integration, the recording of the carrier phase, and the level 2 altimetric products will be presented.

**Topic group:** (1) New instruments, concepts and recent missions

**Email contact:** [hossein.nahavandchi@ntnu.no](mailto:hossein.nahavandchi@ntnu.no)

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