URSI GASS 2020, Rome, Italy, 29 August - 5 September 2020

THE ESA HYDROGNSS SCOUT MISSION: AN OVERVIEW

M. Unwin(1), D. Comite*(2), N. Pierdicca(2), K. Rautiainen(3), E. Cardellach(4), G. Foti(5),
P. Blunt(6), L. Guerriero(7), E. Santi(8), M. Kern(9), T. Burger(9), M. Tossaint(9), and E.Worsley(1)
(1)Surrey Satellite Technology Ltd, Guildford, UK,
(2)Sapienza University of Rome, Rome, Italy,
(3)Finnish Meteorological Institute, Finland,
(4)Institute of Space Sciences, Institute for Space Studies of Catalonia, Barcelona, Spain,
(5)National Oceanographic Centre, Southampton, UK,
(6)University of Nottingham, Nottingham, UK,
(7)University Tor Vergata Rome, Rome, Italy,
(8)Nello Carrara Institute of Applied Physics, Florence, Italy,
(9)European Space Agency, The Netherlands.

This contribution summarizes the scientific objectives of the HydroGNSS mission concept, selected by ESA as a Scout small mission candidate in 2020. It consists of a 40 kg satellite designed to study land hydrological parameters through GNSS Reflectometry (GNSS-R), a technique exploiting the L-Band navigation satellite signals reflected over the Earth surfaces [1]. The project targets four essential climate variables [2], which represent key parameters for the understanding of the climate evolution and human interaction. They comprise the study of the soil moisture, the wetlands, the high-latitude freeze/thaw dynamic, and the above ground biomass (see, e.g., [3], [4], [5]).

In the last decade, different studies and experiments have demonstrated the great potential of the GNSS-R technique. Surrey Satellite Technology Ltd. developed and flew the SGR-ReSI GNSS remote sensing instrument on the 160 kg UK TechDemoSat-1 (TDS-1) in July 2014 and, with sponsorship from ESA, collected data until TDS-1's drag-sail was deployed in May 2019. The relevant datasets have been released via the MERRByS website, making them freely available to the scientific community. Researchers worldwide recognized the great potential of GNSS reflectometry over land to monitor bio-geophysical parameters with improved resolution (from 1 to 25 km), including the unique capability to sense rivers under forest canopies.

HydroGNSS is designed to be a scientific demonstrator for a GNSS-R constellation that addresses the following set of land sensing requirements, adding new capabilities to those of the SGR-ReSI flown on TDS-1 and CYGNSS missions [3]: increasing coverage with fixed antenna gain, providing a 100% duty cycle over land and collecting both GPS and Galileo E1 reflections; separation of land cover and soil roughness effects adding dual-pol measurements; providing a greater sensitivity to different soil conditions, freeze/thaw effects, and wetlands by adding a coherent channel; improving the along-track resolution; separating ground from canopy in biomass and surface roughness exploiting a dual-pol receiver; improving the calibration of the reflection coefficient providing accurate antenna pattern information, as well as platform attitude, and better knowledge of direct GNSS signal powers; ability to collect high altitude DDMs incorporating elevation model for shifting DDMs.

Consolidation studies for the missions are in progress and will be discussed at the conference.

References

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