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COMPARISON OF DATA PROCESSING METHODS FOR GNSS REFLECTOMETRY

Abstract

The GNSS-Reflectometry (GNSS-R) technique has been widely applied for Earth observation, in particular for remote sensing of oceans, land and ice. In order to utilize this technique for determination of Earth surface properties from Low Earth Orbit (LEO), a GNSS Reflectometry & Occultation Experiment (GNSS-ROX) payload is planned to be hosted on-board the Seamless Radio Access Networks for Internet of Space (SeRANIS) mission, a small satellite mission of the Bundeswehr University Munich. In the context of GNSS-ROX payload development, a field test campaign (GNSS-ROX FTC) is performed to evaluate the hardware and software processing chains. The planned test campaign is conducted using an air-borne (drone) setup at a height of up to 120m. Direct and reflected signals in L1 and L5 frequency bands will be collected in order to finally obtain geophysical surface characteristics such as reflectivity, soil moisture content, and ocean wind speed. This paper mainly deals with the post-processing (offline) of raw data into Delay-Doppler Maps (DDMs) and surface characteristics. Two different data acquisition methods, namely conventional GNSS-R and interferometric GNSS-R are investigated during the test campaign. Finally, we also describe the generation of DDMs in real-time on-board the drone and measure the performance of the hardware for real-time signal processing. The results of the campaign shall then be used to evaluate the performance of the developed processing hardware and software. In addition, the findings will be incorporated into future designs, as well as into the development process for the spaceborne GNSS-ROX. The experiment setup and measurement planning of GNSS-ROX FTC are also briefly described in this paper.