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PREPARING FOR THE OPERATION OF THE GNSS-R PAYLOAD OF THE TRITON MISSION

Abstract

The omnipresence global navigation satellite system (GNSS) signals have not only provided high accuracy navigation but also encouraged several remote sensing missions. In a GNSS reflectometry (GNSS-R) mission, the reflected signals are processed to form delay Doppler maps (DDMs) so that the properties including roughness, ocean wind speed, and soil moisture can be retrieved. NCKU is developing the primary payload, GNSS-R receiver, for the National Space Organization TRITON GNSS-R mission. The TRITON GNSS-R payload distinguishes from other GNSS-R receivers in its capability in processing multi GNSS signals, generating 2x DDMs, and providing finer resolution in observation. As a result, the observables may render better retrieval results in the estimation of ocean wind speed and other remote sensing variables. The GNSS-R payload that is developed has undergone several flight tests and the functionality and performance are verified. The TRITON satellite is scheduled to be launched in late 2022.

The paper emphasizes on the analysis of the flight test data of the GNSS receiver payload. In the past three years, more than 10 flight tests have been conducted to verify the functionality and performance of the GNSS-R payload. In the meantime, the associated ground processing software has been developed to streamline the data collection, processing, and utilization chain. The flight test verifies the link budget analysis for both the direct line-of-sight signals and scattered signals for both GPS and QZSS satellites. The generation of the DDM is also verified by comparing flight test results and post-processing results. Moreover, a signal processing scheme for data retrieval is proposed and assessed. The ground processing system in terms of payload operation and payload data analyses has also been established. The latter encompasses data calibration and wind speed retrieval modules. The flight tests and relevant tasks thus pave the way for the preparation of the TRITON satellite.