Paper ID: 25246

EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Sensors and Technology (3)

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GPS RADIO OCCULTATION FOR TROPICAL SPACE WEATHER APPLICATION

Abstract

Radio occultation has become one of the important techniques for weather monitoring. The sources of radio occultation mission can be provided by multiple global navigation satellite systems (GNSS) including GPS, Galileo, GLONASS, as well as several regional navigation and space-based augmentation systems. In this paper, a satellite mission named as VELOX-CI which has a primary radio occultation payload is presented. In addition, the satellite carries several experimental payloads including radiation harden electronics, navigation and attitude determination based on GPS signals etc. Weighing about 135kg, it is the fifth satellite mission to be completed by the Satellite Research Centre in the Nanyang Technological University. For weather monitoring mission, VELOX-CI carries a GPS receiver payload to perform radio occultation for atmospheric sounding purpose. Moreover, VELOX-CI will be launched into a near equatorial orbit that provides the advantage of a high revisit rate over tropical region. Thus this leads to significantly more radio occultation observability in the tropics. The vertical ionospheric profiles could be derived from VELOX-CI onboard radio occultation payload. In addition, the slant ionospheric total electron content (TEC) can be measured with the use of two-frequency receivers of the International GNSS Service (IGS) network. Hence, combination of these vertical profiles and ground based measurements, a study of space weather monitoring could be achieved. In this paper, the concept of radio occultation and the VELOX-CI radio occultation payload will be presented. A preliminary analysis has been conducted for the satellite tropical orbit based on the onboard GPS antenna configuration. Some unique features of the design are highlighted.