Inter-comparison of GNSS-Reflectometry measurements from CYGNSS and Spire’s satellites with SMAP soil moisture product

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The potential of space-borne GNSS-Reflectometry (GNSS-R) technique for soil moisture retrieval has been demonstrated in recent studies using observations from the NASA’s Cyclone Global Navigation Satellite System (CYGNSS) and the UK’s Technology Demonstration Satellite, TechDemoSat (TDS-1).

Spire Global operates a constellation of CubeSats performing GNSS based science and Earth observation. In December 2019, Spire launched two new satellites with GNSS-R payloads with plans to launch two more follow-on GNSS-R missions in January 2021. In this study, we highlight the capabilities of the Spire’s current and future GNSS-R missions compared to CYGNSS for global soil moisture monitoring and present the results of an inter-comparison between CYGNSS and Spire GNSS-R observables over land with NASA’s Soil Moisture Active Passive (SMAP) observations. The comparison of level-1 data and various statistical parameters was performed after data collocation both trackwise and also within a 6km regular grid. The results of the study were used for intercalibration of CYGNSS and Spire’s GNSS-R measurements for developing a combined GNSS-R soil moisture product.