[JJ] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-TT Technology &Techniques

[A-TT32]Brand-new geoscientific observations by GNSS-Reflectometry

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GNSS-Reflectometry (GNSS-R) dares to use indirect GNSS signals reflected by an object, which cause multi-path errors in the positioning system, and extracts status information of the reflecting surface itself. It requires low-power and light-weight GNSS receivers alone, so that any platform can be adopted, including microsatellites or UAVs. This session will present various observations using GNSS-R, such as sea surface wind speeds, waves, sea surface height, soil moisture and ice detection.
In addition, possible scientific impacts are discussed with unprecedentedly frequent global observations by multiple satellites, such as NASA's eight-microsatellite CYGNSS GNSS-R mission.

[ATT32-P02]Error budget of GNSS-R altimetry on a multicopter

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Upward and downward GNSS receivers are deployed onto a multicopter in order to measure the path delay between the GNSS signals directly received and reflected at the water surface, which can be converted to the antenna height above the water surface (H_a) by assuming a simple geometry. The height of the water surface in a geodetic coordinate can be obtained by extracting the obtained H_a from the precise position of the multicopter in the given geodetic coordinate. Experimental flights have been conducted in Hirado Bay and at Lake Biwa, in which the multicopter was hovering about 130 m above the water surface for more than three minutes. In general, the estimated H_a changes in good accordance with the altitude of the multicopter, but H_a includes significant high-frequency variations of the order of several meters whose periods are several seconds. These periods are similar to those of wind waves, suggesting that the reflection point was displaced due to the slope of the water surface caused by wind waves, which deviates from the assumed simple geometry. After removing these high-frequency variations by temporal averaging, the estimated height of the water surface agrees well with the reference height independently observed by a gauge with only 0.07m difference. However, this accuracy depends on not only H_a but also the precise positioning of the multicopter that requires a reference site on land for differential GNSS, which may limit the applicable area of the GNSS-R altimetry on a multicopter.