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

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

convener:Kaoru Ichikawa(Research Institute for Applied Mechanics, Kyushu University), Kosuke Heki(Department of Earth and Planetary Sciences, Faculty of Science, Hokkaido University)
Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
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-P01]GNSS-R Remote Sensing with Open-Source SDR Platforms

★ Invited Papers
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It has been shown that the reflected Global Navigation Satellite System (GNSS) signals contain valuable information remote sensing. This technique is called GNSS reflectometry (GNSS-R) and can be used to determine important geometric and physical properties of the reflecting surface. These include ocean surface wind, wave height, biomass, and soil moisture.

Since there is no commercial GNSS receiver supporting specific signal processing for reflected GNSS signals, many research teams have developed their custom built receivers. However, recent advances in RF IC design for mobile communication systems realize low-cost RF transceivers operating in several-hundred MHz to a few GHz. They provide digitized baseband samples, and all the signal processing can take place in the software domain in an ordinary personal computer. This architecture is generally known as software-defined radio (SDR).

There are several open-source SDR platforms available for a community of researchers and professionals. Some even support MIMO communication and provide phase-coherent signal reception from multiple antennas. This could be an ideal platform for carrier-phase based GNSS-R applications such as altimetry.

On the other hand, none of GNSS-R signal processing software is publicly available. The GNSS-R signal processing requires full access to low-level observables including the complex I/Q correlations. In order to develop and test innovative GNSS-R algorithms, an open-source software tool is highly desired.

This research summarizes some of the major custom-built GNSS-R instruments and discusses the future development of an open-source software GNSS-R receiver with the latest SDR platforms.