L-band Imaging Radiometry with Airborne HUT-2D Interferometer – From the Performance to Remote Sensing Applications

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Airborne radiometer system HUT-2D, operated by Helsinki University of Finland (TKK), stands for a new technology in the field of remote sensing. Applying the novel principles of interferometry and aperture synthesis, the instrument is capable in multi-angular airborne measurements at L-band, 1.41 GHz to be exact [1]. The most important environmental parameters desired from the measurements of this low frequency band are soil moisture and ocean salinity, both essential to climatology.

After finalization of instrument's construction and functional tests in 2007, HUT-2D has participated in several soil moisture and ocean salinity measurement campaigns. The instrument performance has given valuable new information on the new technology it stands for [2], [3]. HUT-2D resembles European Space Agency's (ESA) Soil Moisture and Ocean Salinity (SMOS) mission payload. ESA has been an important subscriber of instrument's measurements, as well as co-operator in the development and design of the instrument and its test campaigns.

Measurements of soil moisture and ocean salinity require progressive radiometric performance from the system measuring them. On a conceptual level, aperture synthesis radiometer provides improved angular resolution and simultaneous multi-angular measuring capability with the cost of system complexity, and especially, decreased sensitivity and radiometric resolution. In fact, applicability of the technology on the demanding retrieval of the climatologic parameters hasn't been well demonstrated. One purpose of HUT-2D is to consolidate this retrieval, and the related algorithms.

In this paper, we present the general characteristics of the HUT-2D instrument and introduce the scientific test campaigns, in which the instrument has participated. We present the recently updated radiometric performance characteristics of the system, assessing instruments sensitivity, resolution, accuracy and stability. We analyze the instrument performance from the remote sensing applications point of view, and propose guidelines in the planning of future measurement campaigns with the instrument.

References

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