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DEMONSTRATING THE FEASIBILITY OF A 500 MHZ SYNTHETIC APERTURE INTERFEROMETRIC RADIOMETER ONBOARD A CUBESAT PLATFORM TO RETRIEVE SEA SURFACE SALINITY MEASUREMENTS OVER THE ARCTIC REGIONS

Abstract

This paper outlines the design of a space-based synthetic aperture interferometric radiometer working at frequencies under the lowest protected band for passive earth remote sensing (1.4 GHz). The focus of this work is to assess the retrieval of Sea Surface Salinity (SSS) measurements in the Arctic regions at low frequencies from space. Remote sensing outside of the dedicated frequency bands can be difficult due to radio frequency interference (RFI). Nevertheless, the expected RFI levels in the Arctic are low enough to obtain useable remote sensing observations, as demonstrated by recent airborne radiometric measurements at 500 MHz in the polar regions. Interferometric radiometry has proven its capability to provide valuable observations of SSS from space, through the Soil Moisture and Ocean Salinity (SMOS) mission. However, the use of frequencies between 500 MHz and 1 GHz improves the sensitivity of brightness temperature to changes in the salinity concentration, enhancing the accuracy of the delivered SSS maps. This work aims twofold: to point out the design issues arising from the use of very low frequencies, and to demonstrate the feasibility of using a CubeSat platform as a viable option for this type of system. In this respect, design solutions to maximize the radiometric sensitivity, the most stringent requirement to retrieve SSS, are discussed. These include the design of a broadband deployable antenna compatible with CubeSat applications, selecting the orbit fulfilling the requirements of coverage and exposure time over the Arctic regions, and sizing the most critical satellite subsystems.