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Author: Mr. Benjamin Southwell
University of New South Wales, Australia

ORBIT AND CONSTELLATION DESIGN CONSIDERATIONS FOR GNSS-R RECEIVERS.

Abstract

The use of Global Navigation Satellite System signals reflected off the Earth's surface for remote sensing, known as GNSS-R, is a promising technique and is currently the subject of much research. One advantageous feature of GNSS-R is the lack of a transmitter required on the sensing platform due to the bi-static radar configuration. This allows low cost platforms to be used for GNSS-R contrasting the high mass, power and volume budgets of traditional mono-static remote sensing platforms. Lower platform costs mean that the deployment of more GNSS-R receivers in space is feasible and we can expect constellations of receivers being utilised for Earth observation in the future.

In this paper, we investigate the impact orbit and constellation design has on GNSS-R systems with a focus on wind vector retrieval from ocean scatterometry. Initially, the temporal and spatial resolution of ocean scatterometric measurements is investigated as a function of the bi-static geometry alone. Then, the region of validity of the scattering models currently employed for GNSS-R and its impact on the achievable resolution is explored. We show that the development of models that capture the scattering mechanisms significant at low grazing angles will result in substantial improvements in the operational efficiency of a GNSS-R system.