A Compact, Reconfigurable Polarimetric, Interferometric SAR System for the UAV Platform

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Abstract

A study was done to develop a compact L-band polarimetric radar for repeat-pass and along-track interferometry. This radar will be installed on an unmanned airborne vehicle (UAV) or a lightweight, high-altitude, and long endurance platform. Upon surveying the capabilities and availabilities of such aircrafts, the Proteus aircraft and the ALTAIR UAV appear to meet our criteria in payload capabilities, flying altitude, and endurance. We particularly like the Proteus aircraft because it provides many options for mounting the L-band antenna(s), more payload capacity for future upgrades, and its ease of integration. However, more study is needed to determine if the Proteus aircraft will provide the flight path accuracy necessary for repeat-pass interferometry.

In this paper, we will overview the radar design based on the Proteus and the ALTAIR's altitude of 13.7 km. This 80 MHz bandwidth radar has an active electronic beam steering antenna to achieve the Doppler centroid stability that is necessary for repeat-pass interferometry. Based on our initial performance analysis, the displacement accuracy of this radar system should be better than 0.5 mm. The design philosophy of this radar testbed is to develop a modular, compact, lightweight, and flexible system such that the system can easily accommodate future additions such as L-band and Ku-band single-pass cross-track interferometry. The system should also be able to demonstrate new radar technologies for future spaceborne missions. Finally, the system or subsets of the system may be installed on different platforms for different science data collection campaigns with minor modifications.