SURFACE AND DOUBLE-BOUNCE DISCRIMINATION BY MEANS OF POLINSAR SINGLE- AND ALTERNATE- TRANSMIT MODES

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1. ABSTRACT

The main contributions in the ground component of a polarimetric interferometric random volume over ground (RVoG) model consist often of surface and double–bounce scattering. By means of only polarimetry, it is not possible to separate these two contributions ambiguity–free. However, when acquiring the PolInSAR data in single–pass single–transmit interferometric mode, the degree of coherence for the double–bounce component degrades, providing with it an element of diversity with respect to surface scattering. This has two important consequences for vegetation parameter inversion using the RVoG model.

At first, it permits to separate the ground contribution ambiguity-free into surface and double–bounce terms. This would enable to analyze the soil under the vegetation, examining soil moisture and surface roughness parameters without the double–bounce contamination. Also, the double–bounce coherence constituent is related to the height of the layer responsible for the double–bounce scattering. For example, in forests this would enable to estimate the effective height of the trunks, independently of the total vegetation height. Secondly, it makes the parameter inversion more difficult, since the RVoG coherence function, in dependence of polarimetry, does not follow a line anymore, but is mere a weighted linear combination of three dominant centers (surface, volume, and double–bounce). In this paper we examine these two aspects, which are of importance for air–borne and space–borne SAR platforms and constellations capable of single–pass polarimetric interferometry, such as DLR's F–SAR sensor, or ONERA's SETHI, or the Tandem–X, Tandem–L missions, or the cart–wheel configuration.