DOUBLE-BOUNCE CONTRIBUTION EFFECT IN THE ESTIMATION OF BIOPHYSICAL PARAMETERS OF VEGETATION BASED ON POLINSAR TANDEM-X BISTATIC DATA

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ABSTRACT

The inversion of the well-known Random Volume over Ground (RVoG) model [1, 2, 3] is employed for the estimation of physical parameters of scenes with vegetation by exploiting Polarimetric SAR Interferometry (PolInSAR) data [4].

Data gathered by the TanDEM-X satellite formation [5] are characterised by a single-pass bistatic configuration, where one satellite is transmitting and both of them are receiving, i.e. there is one monostatic image and one bistatic image. As a result from this bistatic configuration, the formulation of the interferometric coherence accounts for an extra decorrelation term: a double-bounce contribution at the ground which entails also volume effects from the interferometric point of view [1]. This double-bounce decorrelation factor has been overlooked in previous works exploiting TanDEM-X data on vegetation height estimation in forests [6, 7, 8, 9], and only considered in the inversion of the RVoG model over rice fields [10].

In this work we provide a detailed analysis of the effect of the double-bounce decorrelation factor on the inversion of scene parameters, with particular focus on the vegetation height. The study employs both simulated data as well as real data acquired over rice fields during the science phase of the TanDEM-X mission. The potential limitations of current inversion approaches are assessed, and the influence of both system parameters (i.e. incidence angle) and scene parameters (i.e. extinction coefficient and ground-to-volume ratios) is evaluated. Results show that the bias in the estimation of scene parameters is higher when the incidence angle is above 30 degrees, i.e for shallow incidences. The normalised vegetation height, i.e. expressed as k_v, is used in order to extrapolate the results to other scenarios, e.g. forests.

1. REFERENCES

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