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IMPACTS OF GEOPHYSICAL PARAMETERS ON THE P-BAND RADAR BACKSCATTER FROM TROPICAL FORESTS

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ABSTRACT

P-band microwaves (wavelength around 70 cm) can be used for their capability to penetrate through dense media, such as tropical forests. Being sensitive to the whole vegetation volume, measures derived from P-band SAR (Synthetic Aperture Radar) acquisitions such as the backscattered intensity or the effective canopy height can be correlated to the forest above ground biomass (AGB). These features are the basis of the Biomass spaceborne mission (cf. [1]) which aims at mapping globally biomass stocks and changes using a SAR operating at 430 MHz.

However, various geophysical parameters independent from biomass are liable to impact SAR measures and therefore can perturbate the retrieval algorithms. For instance, temporal variations linked to vegetation water content (VWC) and wind conditions have been emphasized by the TropiScat and the TropiSAR Radar experiments, recently conducted over the Paracou test site (French Guiana). Variations of temporal Radar coherences acquired during the TropiScat campaign (scatterometer on the top of the Guyaflux tower, cf. [2]) have been related to daily changes in terms of water content within the vegetation. Likewise, the sensitivity of temporal Radar coherences to wind conditions have been put forward using data from the TropiSAR airborne campaign (cf. [3]).

For a better understanding of these phenomena, a sensitivity analysis has been achieved by electromagnetic simulations, performed with MIPERS (Multi-static Interferometric and Polarimetric Electromagnetic model for Remote Sensing). This model is based on a discrete description of the natural scatterers, ensued from in-situ data and allometric relations. Being coherent, temporal coherences as well as Pol-InSAR coherences can be simulated and enable to quantify the impact of dielectric changes (linked to VWC) or to displacements of the scatterers (due to wind conditions). These results are then discussed in terms of performance analysis and requirements in the framework of the Biomass mission.

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