

## **Application of P-band SAR in Estimating Tropical Forest Biomass**

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### **Abstract**

The amount and spatial distribution of forest biomass in the Amazon basin is a major source of uncertainty in estimating the flux of carbon released from land-cover and land-use changes. Direct measurements of above ground biomass are limited to small areas of forest inventory plots, and site-specific allometric regression equations that cannot be readily generalized for the entire basin. Future spaceborne radar remote sensing at P-band has the potential of mapping the above ground biomass over tropics. However, existing estimation methodologies and radar configurations have the limitation of being saturated at biomass values below 200 tons/ha. In this paper, we develop an algorithm based on polarimetric P-band radar data and texture measurements to map forest stands based on their structural attributes and biomass levels. The methodology combines radar backscatter models and various polarization and texture metrics to demonstrate the possibility mapping biomass values above 200 tons/ha over tropics. AIRSAR data collected over sites in Peru and Columbia are used to demonstrate the application of the methodology for a range of biomass values in terra firme and floodplain forest stands. Field data collected on forest structure and allometric equations from published literature are used to estimate the variability of ground data and its impact on the radar estimation errors. The results shows that in addition to polarimetric measurements texture metrics can contribute in improve the estimation of biomass. Theoretical results from model simulations also show that repeat pass interferometry data from a future P-band spaceborne system can improve the limitation of biomass saturation in radar measurements of biomass.

**Keywords:** P-band, SAR, Amazon, Biomass, Polarimetry, Interferometry

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