



Biomass estimation in tropical forests using L, C, and X-band Vegetation Optical Depth

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The contribution of tropical forests to the Earth's carbon balance and to the climate change mitigation is still uncertain [1]. For this reason, it is paramount to improve biomass estimates in tropical forests. Interestingly, satellite passive microwave sensors provide Vegetation Optical Depth (VOD) information, which is a measure of the attenuation of vegetation on microwave soil emissions, and consequently is related to the aboveground carbon biomass.

Previous studies have applied VOD derived from C and X-bands (4 to 12 GHz) to study forests biomass and carbon balance [2, 3]. VOD derived from L-band (1 to 2 GHz) could potentially provide more accurate information since the penetration of microwaves through the canopy is higher at lower frequencies [4]. Still, the enhanced capacity of L-band for biomass estimation has not yet been demonstrated over large regions. This study aims to evaluate the potential of biomass retrieval from VOD estimates at L, C, and X-bands over tropical forests in South America. In particular, the tropical forests in Peru, southern Columbia, and Panama are the case studies. VOD datasets from the Advanced Microwave Scanning Radiometer 2 (AMSR2; C and X bands [5]), and from the Soil Moisture Active Passive satellite (SMAP; L-band [6]), have been used. They are compared to Aboveground Carbon Density (ACD) measurements from airborne Lidar provided in [7, 8, 9].

Results show that VOD at L-band has a stronger statistical relationship with ACD than VOD at C and X-bands. This effect is especially remarkable in forests with larger biomass and larger proportion of forest surface cover.

References:

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