

Quantity and spatial distribution of aboveground biomass carbon in Colombia's forest

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In-situ national forest inventory data - NFI (IDEAM, 2018) as well as multispectral optical and synthetic aperture radar (SAR) satellite imagery were used to characterize the spatial distribution of forest aboveground biomass carbon (AGBC) stocks in Colombia. ALOS-2 PALSAR-2 gamma-0 backscatter annual mosaics (2015-2017) provided by JAXA were normalised and corrected using previous ALOS PALSAR annual mosaics (2007-2010) as reference. A multi-temporal Landsat 7 & 8 composite over the whole of Colombia was used for the year 2016 \pm 1. The national forest inventory in-situ plots used to train our model consisted of 5-subplots each and were collected during the period 2015-2017 in the main biomes of the country. A sample of permanent 1 ha plots (PPMs) were also measured. Pan-tropical allometries (Chave et al, 2014) using diameter, height and specific wood gravity (type I) and a biomass-to-carbon ratio of 0.5 were used to estimate AGBC. A non-parametric random forests (RF) algorithm was used within a k-fold framework to retrieve AGBC at 30m spatial resolution for the whole of Colombia. The algorithm was trained using forest inventory plots and validated at plot (0.35 ha) and PPM level (1 ha). The accuracy assessment found coefficients of determination (R^2) of 0.70 and 0.68, and root mean square errors (RMSE) of 29.93 t C ha⁻¹ and 24.79 t C ha⁻¹ at plot and at PPM level, respectively. The results were also compared to the NFI estimates, and to current pantropical and global aboveground biomass carbon maps.

Keywords: biomass, carbon, SAR, machine-learning, multispectral, forest inventory