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Submission Type:
Poster Session

Title:
Gain and loss: predicting tropical forest biomass dynamics using multi-temporal airborne lidar

Main Topic :
Long-Term Dynamics of Tropical Forests

Abstract:

Understanding complex processes of gain and loss that govern carbon dynamics in tropical forests is essential for assessing and predicting future changes, informing management decisions, and developing effective strategies to address climate change challenges. High-resolution airborne laser scanner (ALS) is an effective approach to assess aboveground biomass (AGB) stocks in tropical forests. However, few studies have evaluated the potential of multitemporal ALS to accurately estimate AGB change in tropical forests. We studied AGB dynamics of a tropical old-growth forest landscape (1,000 ha) in Brazil using two ALS acquisitions (2012 and 2017) and coincident forest inventories (n = 9 sites). We tested two approaches to estimate AGB change using ALS: (i) the indirect method, which models and predicts biomass change from lidar metrics considering two points in time, and (ii) the direct method, which uses differences between corresponding lidar metrics in time to model the AGB dynamics components (gain and loss, and net change) at 1.0 ha scale. The best predictor of AGB stock was the 80^{th} percentile of height returns in meters (r^2_{adj} = 0.75, RSE = 22.68 $Mg.ha^{-1}$). Both direct and indirect methods captured the observed variance in AGB change (> 73%). However, the direct method had a better precision for predicting AGB dynamics components (gain and loss) separately than the indirect method. The best lidar-based predictors of AGB gain and loss were (positive) changes in the percentage of all returns above mean 20 m height (r^2_{adj} = 0.85, RSE = 0.097 Mg ha^{-1} $year^{-1}$) and (negative) changes in 10^{th} percentile

of height (r^2_{adj} = 0.73, RSE = 0.32 Mg ha^{-1} $year^{-1}$), respectively. Our findings highlight the ability of multitemporal lidar as a predictive tool for detecting fine-scale variability of biomass dynamics in tropical forests.

Keywords:
tropical forest; dynamics; biomass; lidar

One sentence summary:
Our study demonstrates that multitemporal airborne laser scanning (ALS) effectively predicts aboveground biomass dynamics in tropical forests, highlighting its ability to detect fine-scale variability in biomass gain and loss.

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No, I do not wish to apply / Not Eligible