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FOREST ABOVEGROUND BIOMASS MAPPING IN MEXICO USING SAR, OPTICAL AND AIRBORNE LIDAR DATA

Abstract

Information on the spatial distribution of aboveground biomass (AGB) over large areas is needed for understanding and managing the processes involved in the carbon cycle, and supporting international policies for climate change mitigation and adaption. Furthermore, these products provide local stakeholders with important baseline data for the development of sustainable management strategies. Using remote sensing techniques it is possible to provide spatially explicit information of AGB from local to global scales. In this work we present a two-stage up-scaling approach to estimate forest aboveground biomass in Mexico at national scale based on multi-sensor remote sensing data. For this, we estimate firstly AGB along the airborne LiDAR transects using Mexican National Forest Inventory data collected by CONAFOR and very high resolution NASA G-LiHT LiDAR data. We calculated from discrete-return LiDAR data 88 LiDAR metrics that are then related to field-estimated AGB. In the next step, we calibrate active (ALOS PALSAR) and passive satellite imagery (Landsat) with LiDAR-based AGB estimates in a non-parametric Random Forest model to create a national wall-to-wall AGB map. Finally, the generated AGB product is validated using independent Mexican National Forest Inventory (NFI) data that were not used for model training. Furthermore, we modelled AGB at national scale using satellite imagery and NFI data only and compared to the results from the two-stage up-scaling approach. The estimated AGB products showed similar goodness-of-fit statistics at different scales compared to the independent validation data set. However, we observed different AGB spatial patterns in two products, especially in regions where NFI data are not available, but where high AGB values occur.