Very-high-resolution diameter, biomass and carbon stock mapping on the two-thousand hectare mangroves of the Cameroon estuary

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Abstract

In the current context of climate change, along with the sea level rise, mapping coastal vegetation such as mangroves constitute an important topic. In this context, several efforts have been made to map the structural and functional parameters of these coastal forests. But, they solely focused on mapping leaf area index (LAI), tree height and standing biomass. In this contribution, we have used parameter inversion from satellite image (Very High Resolution QuickBird data) texture (performed via Fourier Transform Textural Ordination (FOTO) method) to produce a landscape scale map of mangrove tree diameter and carbon stocks over a study region of *ca.* 2260 ha in Cameroon estuary. Moreover, in agreement with previous publications, we used the same methodological approach to map the mangrove canopy and aboveground biomass. The resulting map clearly depicted canopy heterogeneity across the mangrove forest. These different patterns represented the areas covered by medium (9 m ≤ tree height ≤ 15 m) and high (up to 15 m height) stature forests. The trends in landscape features, instead of being the result of human-induced disturbances or different soil characteristics, are mostly related to the past history of the studied forests. The estimates indicate that most of the standing biomass (100-200 t DM ha^{-1}) resides in medium-stature mangrove stands (7-14 cm). Aboveground C storage shows two well-defined peaks around values of 100 t ha^{-1} and 200 t ha^{-1}. Comparison between the FOTO-inverted and ground truth data revealed that mean tree diameter and aboveground biomass had a bias of about -0.007 cm and 1.06 t DM ha^{-1}, respectively. With regard to the REDD (reduction of carbon emissions due to deforestation and forest degradation) policies, these findings would serve local policy-makers as a way to monitor and manage mangrove forests. Interestingly, they are in a straight line with the interesting prospect of recording several regional databases featuring field-measured forest parameters and corresponding forest canopy images.

Keywords
remote sensing, fast Fourier transform, canopy texture, mangrove diameter, aboveground biomass, carbon storage, Cameroon estuary