EVALUATING THE POTENTIAL OF ALOS/PALSAR FOR MONITORING FOREST RESOURCES IN CENTRAL AFRICA

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Abstract. In the light of the 'Reduced Emissions from Deforestation and Degradation' (REDD) debate in the post-Kyoto climate change negotiations, it is important to investigate the spatio-temporal variation of carbon stocks stored as vegetation biomass in tropical forests. Obtaining sufficient ground-data to do so is an expensive and time-consuming task. The sensor 'PALSAR' (Phased Array type L-band Synthetic Aperture Radar) of the satellite 'ALOS' (Advanced Land Observing Satellite) can provide information which can be used for above-ground biomass estimation. To derive forest biomass from satellite measurement it is imperative to acquire *in situ* above-ground biomass estimates by ground-based surveys. The objective of this study is to assess the capability of ALOS/PALSAR data (HH and HV polarisation) to estimate above-ground forest biomass in Gabon using logging inventories provided by the private sector. Gabon has an area of 225,000 km^2 of which 75 % is covered by tropical forest, i.e. some 22 million ha. The Gabonese forests form part of the Congo Basin forests in the central African region that represents the second largest contiguous area of humid tropical forests after the Amazon, or approximately 20% of the world's remaining tropical forest. The data acquired consists of the management inventories of five different logging companies with nine concessions operating in Gabon. All these inventories were undertaken by the same study bureau (SylvAfrica) and the methodologies used are identical. In total, we acquired data for 2,115 plots of 0.3 ha (total of 634.5 ha) spread over an area of 886,843 hectares. ALOS/PALSAR images were acquired for each of the concessions. To calculate the aboveground biomass of the individual trees and the plots, we used the allometric equation for moist forest stands provided by Chave *et al*. (2005) [1]. A multiple linear regression approach based on the work of Saatchi *et al.* (2007) [2] is used to relate

forest biomass as a function of ALOS/PALSAR HH and HV variables and apply to the image to produce a biomass map at 100 m spatial resolution. The map is evaluated using spatial and statistical bootstrapping with the large number of available plots and all errors and uncertainties are quantified. The results are discussed in terms of sources of error, spatial scale of measurements, and limitations of L-band radar to separate logged and unlogged forests. Finally, the case study in Gabon will be used to demonstrate the feasibility of ALOS/PALSAR for monitoring changes of forest resources and logging activities and its potential application in implementing REDD in Central Africa.

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[2] Saatchi, S.S., Houghton, R.A., dos Santos Alvalá, R.C., Soares, J.V., Yu, Y. (2007) Distribution of aboveground live biomass in the Amazon Basin. *Global Change Biology* 13, 816-837.