**Recent achievements on global forest biomass mapping and characterization of errors**

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Aboveground biomass, one of the terrestrial Essential Climate Variables, plays a key role in the carbon cycle and climate processes, and biomass maps constitute key inputs for regional to global scale vegetation monitoring and modelling analysis. In the last few years there has been a large effort to use remote sensing observations to improve the spatial assessment of forest biomass, but large scale mapping is challenged by the complex relationship between biomass and satellite data, which varies with biome and forest structure, and by the scarcity of reference data used for calibrating this relationship. In addition, the accuracy assessment of biomass maps is a crucial but still problematic step, and currently a standard validation strategy for biomass products is not yet available. The scope of this presentation is to report on recent achievements related to global estimates of forest biomass and strategies for characterizing the accuracy of large-scale biomass maps. In the context of the EU GEOCARBON project we mapped forest biomass globally at 0.01 degree (c. 1km) resolution by developing two regional approaches and combining the respective products. In the tropical region we compiled and harmonized a variety of high-quality local biomass reference data to assess the spatial accuracy of existing regional maps and to optimally integrate them using a fusion approach into an improved pan-tropical biomass map (Avitabile et al., 2015). In the boreal region we quantified forest biomass on the basis of hyper-temporal observations of Envisat Advanced Synthetic Aperture Radar (ASAR) backscattered intensity using the BIOMASAR algorithm (Santoro et al., 2015) and biomass conversion and expansion factors. In the context of the ESA GlobBiomass project we propose a validation protocol to assess the uncertainty and accuracy of the biomass datasets. The validation concept consists of an internal uncertainty analysis, an independent validation, a product inter-comparison and a user assessment. We present a methodology to use different types of existing biomass data in a harmonized manner and propose the quality criteria to select the reference data, the procedures to harmonize and upscale the reference data, and the metrics to assess product quality. The methodology is partly benchmarked with the synergistic global biomass map to provide a first validation of the data product and understand the advantages and disadvantages of the validation strategies here reported.