The 36th International Symposium on Remote Sensing of Environment,
11 – 15 May 2015, Berlin, Germany, ISRSE36-427-1

QUANTIFICATION OF BIOMASS VARIABILITY DUE TO DIFFERENT ENVIRONMENTAL FACTORS IN KALIMANTAN (INDONESIA) BASED ON AIRBORNE LIDAR DATA

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THEME: Forests, biodiversity and terrestrial ecosystems

KEY WORDS: Forestry, Ecosystem, LIDAR, Analysis, Correlation, Modelling

ABSTRACT:

Contributing to high carbon emission rates due to deforestation and forest degradation, tropical forests are in the focus of the UNFCCC programme to Reduce Emissions from Deforestation and forest Degradation (REDD). One requirement to support REDD+ projects is a continuous and accurate monitoring of these forests carbon stocks or aboveground biomass (AGB). In the field of remote sensing, the calibration of Light Detection and Ranging (LiDAR) with AGB estimates based on field inventory measurements is one of the most promising approaches. The ability of LiDAR to generate a three-dimensional representation of the vertical forest structure with a very high geometric accuracy permits an investigation of even small-scale variations. In order to increase the estimation and prediction accuracy, natural and anthropogenic factors affecting biomass variability need to be determined and quantified. In the context of the Indonesian-German Forest and Climate Change Programme (FORCLIME) AGB is being modeled for three Forest Management Units in Kapuas Hulu, Malinau and Berau located in Kalimantan, Indonesia. The study area is characterized by a variety of forest types with different degradation and elevation levels as well as degrees of slope. The objective of this study was to evaluate AGB variability due to different environmental factors within the 75,000 ha study area. AGB estimation models were created through correlating LiDAR metrics derived from height histograms to forest inventory data. High correlation coefficients ($R^2 \geq 0.8$) were obtained with the Centroid Height (CH) or the Quadratic Mean Canopy profile Height (QMCH), weighted with LiDAR point density, as correlation parameters. First results show a considerable AGB variability within the different forest types and indicate an influence of elevation level and degree of slope on AGB in both primary and secondary forests. Impact from logging operations and the associated AGB reduction dating back more than ten years could be assessed by LiDAR.