High resolution of three-dimensional dataset for aboveground biomass estimation in tropical rainforests

Abstract

Remote sensing is a highly effective technological tool used in sustainable natural resources management with the capability to assess large forest areas in different periods of time. These capabilities permit the development of a monitoring system for certain forestry purposes such as aboveground biomass (AGB) estimation, where regular updating is essential under the measurement, reporting, and verification (MRV) system of reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries (REDD+) scheme. The development of high-resolution three-dimensional data sets of digital photogrammetry and airborne laser scanning (ALS) have enhanced the estimation accuracy for height-related forest variables such as AGB. In this chapter, we discuss the elements of the methodology using a combination of remote sensing data sets and ground-based inventory for AGB estimation. Then, we demonstrate the capability of using aerial photographs and ALS data sets in estimating AGB from a case study conducted in the tropical montane forest environment of Northern Borneo, Malaysia. We also discuss the use of other remote sensing data for the same purpose of AGB estimation, including the potential and limitation in the context of the Southeast Asia region. In the case where there is an existing regular flight campaign of aerial photographs acquisition, it is cost-effective way using an aerial photographs data set in updating and monitoring AGB on a national or subnational scale once a detailed ALS-digital terrain model is available. The research implication of this study demonstrates the capability of using high-resolution three-dimensional data sets with a combination of a ground data set to estimate AGB for the MRV system.