

Estimation of biomass of a mountainous tropical forest using Landsat TM data

Abstract

Estimation of biomass of a mountainous tropical forest using satellite data is an alternative approach to extensive field surveys. However, sampling of the biomass can be expensive, time-consuming, and difficult depending on the nature of field conditions. Instead of directly estimating the biomass from the satellite data when the sample size is small, it is intended to estimate the biomass of the mountainous tropical forest in Kinabalu Park, Sabah, Malaysia, using the well-established biophysical relationship between crown diameter and biomass. Landsat thematic mapper (TM) data are corrected for geometric distortion and are georeferenced to facilitate satellite data extraction. Path radiance for atmospheric correction is derived using the histogram method, and the Minnaert correction approach is employed to correct for topographic effects. Correlation and regression analyses are carried out with the six original bands and several derived satellite variables (several vegetation indices, tasseled cap transformation variables, and coefficients of pattern decomposition). When the sample size of the biomass is small, estimation using a biophysical relationship between the biomass and other structural variable such as crown diameter is more appropriate and reliable. Owing to biomass data availability, the biophysical relationship between biomass and crown diameter can only be established for closed forest. The closed forest is distinguished using percent crown cover, which is estimated from the wetness indicator. Under the closed forest condition, a significant inverse correlation between band I and crown diameter is found. Using the biophysical relationship, biomass is then estimated from crown diameter, which is estimated from band 1.