

Assessment of anthropogenic disturbances on mangrove aboveground biomass in Malaysian Borneo using airborne LiDAR data

ABSTRACT

Mangroves are known for their carbon storage capacity, yet they are under immense pressure from human activities. This study assessed anthropogenic disturbances on mangroves' aboveground biomass (AGB) in northern Borneo, Malaysia, using airborne light detection and ranging (LiDAR) data. Three global or pantropical allometries were compared in the development of an AGB estimation model by regressing LiDAR metrics against the AGB. The best model predicted AGB from Saenger and Snedaker allometry with an R^2 of 0.85 and a root mean square error (RMSE) of 14.59 Mg/ha (relative RMSE: 7.24 %). The high-resolution AGB map revealed a natural AGB gradient in intact mangroves from the coast to the interior. However, only a weak correlation between the distance from shoreline and AGB in disturbed mangroves was found. The LiDAR estimated AGBs were 196.36 Mg/ha and 157.27 Mg/ha for intact mangroves and disturbed mangroves, respectively. Relatively high AGB areas were abundant in the intact mangroves but scarce in the disturbed mangroves. The LiDAR-based AGB assessment is accurate and high-resolution, supporting carbon stock conservation and sustainable management activities under climate change mitigation programs such as REDD + .