**Estimation of aerodynamic roughness length and zero plane displacement over tropical region using airborne LiDAR data**

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**ABSTRACT:** LiDAR data has been widely utilized to support multi-resolutions of vegetation inventory and forest mapping. The aim of this study is to estimate aerodynamic roughness length (*Z0/H*) and zero plane displacement (*d/H*) of forest area based on geometric properties of trees and available estimation models. These parameters are very useful to understand the role of carbon and hydrological cycles, land cover and land use change, habitat fragmentation, the control of water vapor and CO2 fluxes by vegetation and bio-geographical modeling. The point clouds are separated into ground and non-ground features using Progressive Morphological filtering method. The point clouds are then used to generate detailed Digital Terrain Model (DTM), Digital Surface Model (DSM), and Canopy Height Model (CHM). Individual tree segmentation based on an Inverse Watershed segmentation was performed on the CHM, in which individual tree attributes were estimated (i.e. tree height, crown dimension, height to crown base (HCB) and diameter at breast height (DBH)). HCB and DBH are estimated based on available allometric equations developed for forest in Malaysia. *Z0/H* and *d/H* are estimated using models developed by Lettau, Counihan and MacDonald. The individual trees were separated into different regions defined by the spatial resolution of *Z0/H* and *d/H* mapsi.e. 50m and 100m. For each region frontal area index and plan area index are estimated based on the location and geometry of the trees and ground area. The estimation was done for two assumption of wind direction i.e. 0 degree to the North and 45 degrees to the East. The results show strong agreement with the results produced by previous studies. It is also noted that simple averaging can’t be used to produce coarse *Z0/H* value from fine spatial resolution. The standard deviation of point clouds can be used to estimate *Z0/H* value with the regression coefficient of 0.65.