EXPERIENCES WITH LIDAR GROUND PENETRATION IN DENSE TROPICAL RAINFORESTS

Martin Isenburg

Rapidlasso GmbH, Germany

ABSTRACT

Measuring the height of trees using Light Detection And Ranging (LiDAR) technology is commonly done for management of natural forests, tree inventories in timber, fruit, or palm tree plantations, and a fundamental part of estimating the biomass. A fundamental necessity for these measurements is to first generate an accurate Digital Terrain Model (DTM) that can then be used to compute the relative heights of the tree canopy from the first LiDAR returns that hit the highest part of the canopy.

In order to create an accurate DTM it is imperative to have sufficiently many so called ground returns that are elevation measurements from the bare-earth terrain. For this the laser pulse needs to be able to penetrate all the way down through the forest canopy to the forest floor. For dense tropical forests with a high canopy and many layers of vegetation this can be a challenging tasks as the light of a typical laser pulse has so many opportunities to be reflected before hitting the ground. Often none of the light energy will reach the forest floor or the reflected ground echo will be too weak to be registered back at the plane. Other conditions such as leaf-on/leaf-off conditions as well as presence of low clouds or fog can further hamper ground penetration of the LiDAR.

In this talk we present our ground penetration results of operating a RIEGL LMS Q680i LiDAR system above dense primary rainforest canopy in Thailand that has an average canopy height of 45 meters. Although leaf-on conditions and low clouds were affecting the LiDAR penetration negatively sufficiently many ground returns were captured to model the bare-earth terrain.