Assessing the capacity of UAV-based LiDAR to support Operational-level Forest Inventory in different forest environments

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ABSTRACT

Forest inventories have been designed to provide the essential data used for long-term strategic management planning and decision making. Recently, Enhanced Forest Inventories derived from Airborne Laser Scanning or stereo Image Point Clouds have been extensively used to produce area-based estimates of growing stock (basal area, volume) and average tree size (diameter, height, volume). Although this development enables precision forest management on large scale and represents a prerequisite for the sustainable use of wood resources, there is a growing interest in adding information on wood attributes at the tree level for supporting Operational-level Forest Inventory (OFI). With increased LiDAR accessibility and advancement in small-scale technologies over the last few years, it is now possible to support a light weight LiDAR instrument (UAVL) on Unmanned Aerial Vehicles (UAVs). The operational flexibility, high spatial and temporal resolution of UAVs combined with the LiDAR signal’s capacity to break through forest canopy makes this technology promising tool for characterization of forest structure at a finer scale. This project aims to investigate how UAVL can be used to identify and estimate a core set of tree structural attributes that can support OFI (i.e. individual tree delineation, stem diameter distribution, volume) conducive to different forest ecosystems. Specifically, we consider test sites in the boreal deciduous forest (northwestern New-Brunswick), in the boreal coniferous forest (western Newfoundland), and in the tropical evergreen forest (Democratic Republic of Congo). Structural attributes will be derived from high density point clouds and correlated with field measurement to estimate the potential use of this technology for forest management.