**Estimating Forest Metrics in interior Alaska: Mobile, Terrestrial, and Aerial LiDAR.**

Boreal Forests make up 30% of global forested area and are warming four times faster than the global average. To understand how these dense boreal forests are responding to climate change, accurate models of forest structure are needed. Fine scale remote sensing platforms such as terrestrial and mobile Lidar sensors, can fulfill this need by providing high resolution models of individual trees. However, the modality of Lidar acquisition, measurement scale, and forest type on model performance is not well understood in boreal forests. In this study, we investigate the capabilities of ground-level local extent Lidar instruments and its utility in upscaling to the regional extent of aerial Lidar. Our study area was in Campbell Tract Special Recreation Management Area near Anchorage Alaska. Field work collecting MLS and TLS scans was conducted in September 2022. ALS scans were collected the same year using NASA Goddard's Lidar Hyperspectral and Thermal (G-LiHT) airborne remote sensing system. This location was chosen for its accessibility, for having forests with characteristics typical of interior Alaska, and for having pre-established Forest Inventory Analysis (FIA) sites. The FIA program is a nationwide inventory of all forested lands lead by the US Forest Service, they collect individual tree data such as species, height, and diameter. All Lidar scans were collected on FIA plots. First, we compare the usability of different ground level instruments in the field and the accuracy and of calculating forest structural metric such as diameter, height, and volume in boreal forests. We collected scans with a multi-scan stationary terrestrial laser scanner (TLS) and hand-held mobile laser scanners (MLS). Second, we upscale our structural metrics to the regional extent by calibrating the metrics calculated from an aerial laser scanner (ALS) to those from the ground-level instruments. Preliminary analysis indicate MLS devices are more practical and efficient for data collection, they are approximately 5x faster at collecting complete plot scan than the TLS devices. Single scan MLS devices also require less pre-processing time than multi-scan TLS. We applied a segmentation algorithm for stem detection in dense vegetation on the MLS and TLS scans providing metrics for height, stem count, volume, and DBH. For ALS we used a top-down approach to segment trees and calculate height and stem count. We created a model using the observed relationship between height and DBH calculated from the MLS and TLS, and used it to estimate DBH for the ALS scans. Then using the estimated DBH and height we estimated volume for the ALS scans and compared it the TLS and MLS findings. We validated our findings with Forest Inventory Analysis census data collected the same year by comparing calculated DBH, height, and stem count with manually measured values. Preliminary results indicate MLS and TLS devices provide more accurate structural metrics at the tree and plot level. However, ALS estimations can be improved with calibration to ground level scans. These comparisons will inform the development of a long-term monitoring strategy and direct future management strategies for boreal forests.