1. Context

Enhanced Forest Inventories derived from Airborne Laser Scanning (ALS) 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) on large area.

There is a growing interest in adding information on wood attributes at the tree level for supporting Operational-level Forest Inventory (OFI). UAV-based lidar (ULS) has the ability to provide high density data on a finer scale with great operational flexibility with a high spatial / temporal resolution and can potentially support OFI.

2. Objectives

(A) Estimate diameter distribution of trees by direct and indirect methods using the lidar point cloud;

(B) Identify and estimate a core set of ULS metrics that can support OFI conducive to different forest ecosystems:

- Northern Hardwoods forest (NB, Canada)
- Coniferous boreal forest (NL, Canada)
- Evergreen tropical forest (Congo)

3. Study site

Edmundston (NB)

4. Material

- ULS Riegl-Vux (leaf-on)
- ULS Velodyne (leaf-off)
- Terrestrial lidar (13 plots leaf-on & off)
- Field inventory (Treemap (RTK), DBH, Ht, ...)

5. Method

ULS point cloud

- Direct measurements
- Individual tree based measurements
- Regression based measurements

- DBH
- DBF
- DBH

- Point cloud
- DBH
- DBF
- DBH

- Velodyne laser lidar
- ULS metrics

- Height distribution
- DBF distribution
- Canopy cover

- Validation
- Field inventory
- Terrestrial lidar

6. Preliminary results

DBH extraction on ULS Velodyne data (leaf-off)

- Cylinder fitting and DBH extraction on ULS Velodyne

7. Next steps

- Improve the process to estimate diameter distribution from ULS;
- Extract and identify the most relevant ULS metrics for supporting OFI and investigate the added value of ULS metrics compared to ALS;
- Adapt the methodology to investigate the potential of ULS data in boreal coniferous and evergreen tropical forest for the extraction of forest structural attributes.

8. References


Acknowledgments

Thank you to:
- Gaetan Pellier from NHRI for providing the ULS dataset;
- The AWARE project (a NSERC CRD initiative) for funding the project;
- My directors Richard Fourrier and Philippe Jolais;
- My co-director Udayalakshmi Vepakomma from FPInnovations;
- The research team of ULS.