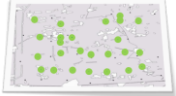


INTEGRATION OF SPACE LIDAR DATA TO MULTI-SOURCE FOREST INVENTORY

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What are multi-source forest inventories ?

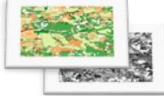
National Forest Inventory (NFI)



Tree species
Trunk diameters
Wood volume



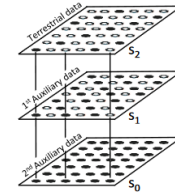
Remote sensing products



Land cover
Optical imagery

High variable precision
Low spatial resolution

Low variable precision
High spatial resolution



Improved forest inventory



Accurate assessment of forest resource (volume / biomass) at sub-regional scales

High accuracy of estimates
High spatial resolution

Correlations

Why relying on space LiDAR is challenging ?

Forests 3D structure measured by LiDAR is key for biomass estimation **but** correlations between space LiDAR products and NFI cannot be built due the absence of spatial overlays

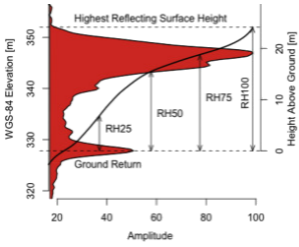
Objectives of the study

- 1) Evaluate the potential of space LiDARs for 3D description of forests and 2) circumvent absence of spatial overlay by simulating LiDAR signal on NFI reference plots



Global Ecosystem Dynamics Investigation

Full waveform spaceborn LIDAR (Dubayah et al.)



Data filtering

- Full power / half power beams
- Quality flags

3D structure products for vegetation:
Canopy height
Vegetation profile
LAD/LAI

Aerial LiDAR (ALS)

- ✓ 1m Digital Elevation Model (DEM)
- ✓ 1m Canopy Height Model (CHM)

Data qualification

Using ALS as reference for :

- 1) Improved footprint georeferencement with DEM

- ✓ Correction of Shifts >30 m
- ✓ No shift detected

- 2) Canopy estimate qualification with CHM

- ✓ 2.7 m Mean Absolute Error
- ✓ 3.5 m negative biases

Multi-source Forest Inventory (MFI)

National Forest Inventory (NFI)

- ✓ Composition
- ✓ Structure
- ✓ Ressource

sentinel-2

- ✓ Spatially continuous radiometry

References

- Dubayah R., GEDI L1B Geolocated Waveform Data Global Footprint Level V002, NASA EOSDIS Land Processes DAAC, 2021.
- Neuenschwander A., The ATL08 land and vegetation product for the ICESat-2 Mission, Remote Sensing of Environment, 2019

Conclusions and perspectives

- GEDI and ICESat2 vegetation products have the potential to enhance forest inventory within MFI approaches
- The geolocation of GEDI footprints needs to be corrected and both GEDI and ICESat2 products need to be filtered
- Advances in radiative transfer modelling will help circumvent the absence of spatial overlay to establish correlations between LiDAR products and forest attributes to make the most of space lidar data within MFI approaches