ICP Forests

LRTAP
Long-range Transboundary Air Pollution

PROJECT INFORMATION

Project title: Global forest biomass mapping: integrating regional allometry, profiling LiDAR, and satellite imaging

Project ID: 24

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PROJECT DESCRIPTION

Scientific background of the project

My research focuses on the development of a concept for developing a global forest biomass information system. The project aims to combine the best available ground data, spatial datasets, and remote sensing imagery to develop global forest biomass maps that could be updated in predetermined time intervals.

The concept for the proposed system relies on the use of the global coverage produced by the Geoscience Laser Altimeter System (GLAS) sensor onboard Ice, Cloud, and land Elevation Satellite (ICESat), as well as optical and radar sensors. The GLAS sensor emitted laser pulses each ~172 m along its orbit, generating millions of footprints around the globe with ~65 m of diameter (~0.35 ha), from which the mean canopy height can be estimated (Lefsky, 2010).

The objective is to develop different regional allometric models at plot level to estimate above ground biomass (AGB) from the mean canopy height estimated using the GLAS footprints. Then, the models can be used in combination with the GLAS global coverage to obtain millions of 'biomass sample plots' around the world. Together with other optical and radar imagery, these estimations will be used to develop global biomass maps and test advantages and shortcomings of each method. Imagery from the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard Terra and Aqua satellites, as well as from the Phased Array type L-band Synthetic Aperture Radar onboard the Advanced Land Observing Satellite (ALOS PALSAR) will be assessed in this study.

Research questions and objectives

1. To what extent do regional allometric models reduce the uncertainty of biomass maps using GLAS?
   a. Development of regional allometric models using ground biomass data: AGB=f(hL)
   b. Development of global biomass map using allometry from previous study (Saatchi et al., 2011)
   c. Development of global biomass map using regional allometry
   d. Assess improvement comparing both maps
2. What is the uncertainty when using MODIS VCF (250m) and GLAS for biomass change maps? (regional case study)
   a. Estimation of forest cover area in specific locations using high-res TerraSAR-X scenes
   b. Assessment of forest cover area derived from MODIS VCF (250m) against TerraSAR-X
   c. Generate and evaluate biomass change maps

3. What is the improvement in accuracy of biomass maps using higher resolution forest cover area derived from spaceborne SAR (50 m) over lower resolution forest cover area derived from MODIS VCF (250 m)? (regional case study)
   a. Generate forest biomass map using forest cover area derived from 50 m spaceborne SAR (ALOS PALSAR)
   b. Assess the improvement in comparison with previous approach (MODIS VCF-250 m)