**The European Forest Information Network (EFINET): toward a forest monitoring system based on remote sensing and ground data integration.**

Forests stand as a foundational ecosystem across Europe, pivotal for citizen health, human well-being, and environmental balance. They are key for both adapting to and mitigating climate change. Nevertheless, Europe currently lacks a unique and comprehensive forest monitoring system that integrates both ground-based observations and remote sensing. Presently, official statistics heavily rely on ground-based surveys conducted through national forest inventories (NFIs). While these surveys provide valuable data, they do have limitations in a pan-European context, including the relatively high costs associated with data collection, insufficient standardization efforts, infrequent updates, and often, restricted access to raw data.

As remotely sensed data become more accessible and cloud computing advances, sophisticated algorithms can now be applied over vast areas. This development creates new opportunities for producing comprehensive and updated information on forest structures and dynamics in Europe. To leverage this potential, the European Forest Institute has allocated funding for the European Forest Information Network (EFINET) project. This initiative aims to develop a prototype European forest monitoring system by integrating ground-based observations with remote sensing data.

EFINET concentrated its efforts on adapting existing methodologies and devising novel approaches within five diverse and significant study areas: Bialowieza Forest in Poland, Tuscany in Italy, the Canton of Grisons in Switzerland, the Vindelaven Juhtatdahka biosphere reserve in Sweden, and the entirety of the Netherlands. Metrics derived from Airborne Laser Scanning were utilized as reference data, given their well-established strong correlation with various forest parameters of interest. These parameters include canopy cover, diameter at breast height, tree height, basal area, biomass, growing stock volume, carbon content, and temporal changes resulting from disturbances. Subsequently, temporal patterns extracted from Landsat data were employed to establish a robust set of predictors for estimating forest three-dimensional metrics. These predictors were then utilized to produce spatially explicit estimates of forest disturbances and structural variables, complementing the estimates derived from NFIs.

Our findings demonstrate that forest height metrics can be accurately predicted through automated analysis of remotely sensed imagery, highlighting their significance within the context of a European forest monitoring system. Indeed, our approach constitutes a fundamental component of a fully integrated forest monitoring system, bridging the spatial consistency and temporal frequency of remote sensing data with the precision of ground-based observations.