Project acronym: FLUOSYNTHE

Project title: Fluorescence Across Space and Time - Focus on Leaf Optical Properties

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Discipline: Earth Sciences & Environment

Station(s): Hyytiälä Forest Research Station SMEAR-II (Finland)

The FLUOSYNTHE project is directly related to the FAST campaing (Fluorescence Across Space and Time) which will take place in SMEAR-II station between February and July 2017. The goal of the FAST campaign is to co-register the optical signals of the spring recovery of photosynthesis in a boreal forest and at multiple scales (from the molecular level to the landscape level). Optical, biochemical and functional properties will be monitored over five boreal species and across light gradients throughout the campaign (PHASE I). In addition, measurements will be expanded over 20 boreal species during summer 2017 (PHASE II) in an attempt to better understand the interspecific and vertical variability of leaf optical properties in boreal species. We propose to join the campaign during PHASE II and collect directional-hemispherical reflectance and transmittance covering the spectral range from 350nm to 2500 nm. Our two main objectives are: - Linking leaf optical properties of a selection of boreal species to pigment composition measured with HPLC during the FAST campaign. We have expertise in physical modeling using the leaf model PROSPECT. Recent advances allow to precisely estimating chlorophyll, carotenoid and anthocyanin content from leaf optics. Flavonoids will also be measured during the FAST campaign, which may contribute to further improve PROSPECT by including this pigment to the pigment pool currently taken into account by the model. - Describing vertical gradients of leaf properties for tree species. Vertical heterogeneity of leaf optics and related chemistry influences the resulting canopy reflectance. Fine description of these gradients would be beneficial both for modeling purpose and for interpretation of experimental airborne acquisitions as planned in the frame of the FAST campaign. To achieve these two objectives, the facilities offered by the SMEAR-II infrastructure will be of critical importance to better characterize vertical heterogeneity within canopy. This campaign will also be the opportunity to contribute to an optimal coordination among the different teams deployed on the field for data acquisition at different scales.