



Project acronym: SPARSE

Project title: Remote Sensing of plant physiological traits in Arctic vegetation

Project leader: Holly Croft, University of Sheffield, UK

Discipline: Earth Sciences & Environment: Global change & Climate observation

Station(s): Abisko Scientific Research Station (Sweden)

The Arctic is predicted to warm faster and to a greater extent than anywhere on earth. Environmental drivers such as increased temperature and atmospheric CO₂ concentration, are resulting in unprecedented changes to the structure, function and/or species composition of Arctic vegetation. Changes in vegetation dynamics have been documented from a range of sources, including atmospheric CO₂ data, forest inventories and other field measurements. However, accounting for the spatial-dependence of climate-vegetation-ecosystem feedbacks to model plant carbon uptake is challenging over biome scales. Accurately quantifying the photosynthetic carbon uptake by vegetation is important to carbon budgets, due to its magnitude and inter-annual variability. Recent developments in remote sensing (RS) methods and satellite technologies and has opened up exciting new opportunities to use chlorophyll fluorescence and leaf chlorophyll content as indicators of plant physiological status, in order to address biome-scale questions on climate-induced changes in vegetation productivity. The project will examine species-specific leaf-level relationships between remotely sensed parameters and plant physiology, at sites across a latitudinal transect at Abisko Research Station. Empirical models derived at the leaf level, will be upscaled to site-level using a UAV platform carrying an Ocean Optics spectrometer, which samples reflectance and chlorophyll fluorescence measurements. Vegetation productivity and physiological parameters will be mapped using the data collected by the UAV, and validated using leaf-level gas-exchange measurements collected using a Licor Li-6400 instrument. The data collected at Abisko, and the empirical models derived, will be used to model plant photosynthetic capacity and vegetation productivity at the biome scale.