Submitted Abstract

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Abstract

Understanding the main interactions between the biosphere and the atmosphere, including for example weather and climate feedbacks, is important for climate modeling and predictions. For this, long-term measurements of land-atmosphere exchange of mass and energy and investigating the driving forces are critical. Here, we introduce our recently established research site in Mieming (about 40 km to the west of Innsbruck) where we aim for long-term measurements of micrometeorological and ecophysiological data. The site is located in a ca. 3.25 km2 largely unmanaged Scots pine (Pinus sylvestris L.) stand at about 950 m a.s.l.

The overarching goal is to capture the main components of the ecosystem carbon and water balance and relevant meteorological data. To that end, a 30 m tower was set up which is equipped with meteorological sensors to measure top of canopy precipitation and radiation as well as vertical profiles of air temperature, relative humidity, and wind speed and direction. Latent and sensible heat fluxes as well as CO2 and other gas fluxes are estimated continuously using the eddy covariance method below and above the canopy at 2 m and 20 m height, respectively, while certain fluxes are also estimated based on chamber measurements. Additionally, sap flow and radial growth is measured at individual trees and current carbon stocks in soil and vegetation and their changes over time will be quantified. Episodically, drone-based proximal sensing measurements will be made in order to quantify the spatial variability in forest structural and functional attributes. Currently, measurements also include active and passive chlorophyll fluorescence and hyperspectral reflectance.

Overall, measurements at the site take a very holistic approach comparing different methods and including processes at the soil, understory, and canopy level - scaling from single leaf to the extensive ecosystem. For example, data obtained at this site since last year is used in combination with process-based modelling in order to explorer the potential of satellite-based remote sensing of sun-induced chlorophyll fluorescence as an early warning stress indicator and first results of this approach will be presented.