

Master Thesis Project

Land-atmosphere exchange of water vapor and carbon fluxes in boreal ecosystems

Matthias Peichl
matthias.peichl@slu.se

Terrestrial ecosystems constantly exchange momentum, energy, and mass with the atmosphere above. These land-atmosphere interactions play essential roles in both local and global climatology. Complex interrelations exist between atmosphere and land surface influencing physical, biogeochemical, and biological properties and conditions. Moreover, these interrelations underlay a continuous change due to human interference and climate change.

This Master Thesis Project is focused on analyzing the water vapor and carbon (CO_2 and/or CH_4) exchange between boreal ecosystems and the atmosphere using mainly measurements obtained with the eddy covariance (EC) technique. Data from at least two EC sites are available since 2014 and measurements are continuing: a mixed forest site in Svartberget and a mire site in Degerö. In addition to the EC data, further measurements obtained with different techniques are available, e.g., measurements of biomass (e.g. wood cores), soil fluxes (soil chambers), or a 150 m tall concentration profile. Main work in this thesis will be to analyze and compare the different data sets, where some programming skills (e.g., basic knowledge of matlab, R, Python) are helpful.

Possible research aims:

- Estimation and analysis of H_2O , energy, CO_2 , and/or CH_4 fluxes in boreal ecosystems with various measurement methods
- Analysis of the interrelation between land-atmosphere exchange and meteorological and biological conditions
- Analysis of the water and carbon use efficiency
- Comparison of flux data obtained with the EC technique, the gradient method and profile data, and balance estimations
- Analysis of the effect of drought-periods on land-atmosphere exchange
- Comparison of various forest study sites in Sweden
- Comparison of a boreal forest and a boreal mire

