EGU2020-11452
https://doi.org/10.5194/egusphere-egu2020-11452
EGU General Assembly 2020

Soil CO2 fluxes and surface microtopography in a mixed hemiboreal forest: space, time and models.

Dmitrii Krasnov, Alisa Krasnova, and Steffen Noe
Estonian University of Life Sciences, Institute of Agricultural and Environmental Sciences, Chair of Crop Science and Plant Biology, Tartu, Estonia (dmitrii.krasnov@emu.ee)

The understanding of biophysical mechanisms influencing the spatial and temporal distribution of CO_2 flux is important for predicting the response of forest ecosystem on any environmental changes. It has been shown, that the most important controlling factors responsible for CO_2 flux fluctuation from the forest soils are soil moisture, temperature and the type of the forest stand. In our work, we present three years of soil CO_2 flux measurements in the hemiboreal forest that is characterized by high spatial heterogeneity of vegetation and soil. Three sample plots that represent the main common tree species (Pinus sylvestris, Picea abies and Betula sp) were chosen to assess the influence of tree species composition on the soil CO_2 flux. The chosen sample plots have clear microtopographical structure with depressions, elevations and flat zones. The data were collected from three sample plots according to forest floor microtopography using manual closed dynamic chamber equipped with IRGA sensor (The Vaisala GMP343 probe), humidity and temperature sensors (Vaisala HMP155). Obvious temporal resolution limitation of manual chamber method is compensated by higher spatial coverage.

Previous research has indicated that one of the major sources of uncertainties in the flux estimation is the choice of the model for flux calculation. We compared the commonly used models (linear, exponential and HMR) using two available R packages: “gasflux” and “flux” packages. Additionally, we developed the algorithm that allows for automatically choosing the best model based on widely used criteria (MAE, RAE, AIC, RMSE).

The results showed that in most of the cases linear and exponential models performed better. The comparison of sample plot showed that the biggest influence of microtopography was in the birch forest but the moisture had a bigger effect in the pine forest stand.