

Seasonal change of CO₂ concentration in soil layers throughout the year on Svalbard, high-Arctic Norway – model construction and first evaluation–

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The Arctic terrestrial carbon balance is still unknown. Climate change might result in a significant increase of CO₂ emissions to the atmosphere because of the thawing of previously frozen soil organic matter. Soil respiration is a major flux in the carbon cycle. Although there are some reports that significant soil respiration occurred during the winter season (Elberling, 2007; Björkman, et al. 2010), continuous measurements during winter are difficult in the Arctic because of a harsh environmental condition. To estimate more accurate annual soil respiration to evaluate annual carbon balance, continuous soil respiration measurement throughout the year is required.

To estimate soil respiration throughout the year, we have installed Vaisala CO₂ sensors from 0 cm to 50 cm into the soil in the summer season of 2016 at deglaciated area in the forefront of the East Brøgger Glacier near Ny-Ålesund, Svalbard, Norway (79°N). The study site can be characterized a semi-desert ecosystem (Uchida, et al., 2010) with dominant vascular plants and mosses at the study site such as *Salix polaris*, *Sanionia uncinata* and *Hylocomium splendens*. Based on year-round eddy covariance measurements, a low but persistent CO₂ release occurs during winter and spring (snow-covered ground), overlaid by considerable CO₂ exchange events in both directions associated with high wind speed and changes of air masses and atmospheric air pressure (Lüers, J et al., 2014).

Electricity for the sensors was supplied from AWIPEV enclosure about 70m distance from our study site. The CO₂ concentrations were recorded every hour by a data logger. We got soil CO₂ concentration of the first winter and summer (July 2016 - July 2017). Based on environmental factors such as soil temperature, soil moisture, snow thickness, we start to establish a simulation model to estimate soil CO₂ flux throughout the year. We will show the preliminary results and discuss reproducibility of the model.

References

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