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Methane fluxes and isotopic signatures from plant community to ecosystem scale

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Methane fluxes from peatlands show considerable temporal and spatial variation across different scales. These variations have been observed by e.g. manual and automatic chamber measurements, and more recently with eddy covariance measurements. The spatial variations in the microtopographic scale can be due to e.g. differences in methane production/oxidation due to local water table, or differences in carbon sources and subsequent methanogenic processes. The temporal variations in seasonal scale can be due to carbon input, or temperature control of methanogenesis.

Most molecular and biological processes discriminate the heavier isotopes thus altering the isotopic signature of the emitted methane. Thus, stable isotopic signatures of emitted methane can constrain the on the theories on the variation of methane emission. With the recent advances of the laser spectrometry, measurements of e.g. stable carbon isotope ^{13}C in methane has become more feasible.

Within a new project, we will study both the temporal variation of ^{13}C signature of emitted methane ($\delta^{13}C-CH_4$) in ecosystem and plant community scale, and spatial variation of $\delta^{13}C-CH_4$ in microtopographic scale in a hemi-boreal bog ecosystem, Myckelmossen (see Skogaryd station within SITES, www.fieldsites.se), in South-Western Sweden. These will be connected to methane emission measurements conducted at the same bog ecosystem using eddy covariance and automated chamber measurements.

Here we will present the first results of the $\delta^{13}C-CH_4$ measured in ecosystem and plant community scales. The ecosystem scale $\delta^{13}C-CH_4$ was determined using the nocturnal boundary-layer accumulation approach, and the plant community scale $\delta^{13}C-CH_4$ using manual chambers.