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BayCEER Kolloquium

Vortragsreihe Ökologie und Umweltforschung

Extra Termin Mittwoch 04.04.2012, 16:00 Uhr, H6

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Bacterial tetraether membrane lipids in peatlands: application as temperature and pH proxies

The environmental and ecological significance of peat soils is immense. Even though their total cover only extends to 3-5% of the world's land area, northern peatlands contain 20-30% of the world's soil carbon stock. In the perspective of global climatic changes, it is not known how a moderate temperature rise would affect the pool of peat OM and hence the long term carbon sequestration potential.
Within the PEATWARM project, we investigated vulnerability of a Sphagnum peatland from the Jura Mountains (France) to climate change using an experimental system (Open Top Chambers – OTCs) to simulate in situ an increase in average temperature. The effect of the OTCs was especially apparent in spring and summer, with an increase of mean and maximal air temperatures of ca. 1 and 3°C respectively. We examined the effects of temperature increase along a narrow fen-bog gradient on the vegetation, above- and belowground gas fluxes, microbial diversity and activity in Sphagnum mosses and in peat and the dynamics of labile and recalcitrant OM of peat. We especially investigated the effect of the OTCs on the abundance and distribution of branched glycerol dialkyl glycerol tetraethers (GDGTs). These compounds are complex lipids of high molecular weight, recently discovered in soils. They are produced by still unknown bacteria and are increasingly used as palaeoclimate proxies. Their degree of methylation, expressed in the MBT, was shown to depend on mean annual air temperature (MAAT) and to a lesser extent on soil pH, whereas the relative abundance of cyclopentyl rings of branched GDGTs, expressed in the CBT, was related to soil pH.
Results showed that despite the short duration of the climate experiment (26 months), branched GDGT distribution was significantly affected by the temperature rise. In addition, the applicability of the MBT/CBT as proxies for the reconstruction of temperature and pH in peat was examined by analyzing branched GDGTs in a 4 m peat core collected in covering the last 7,400 yrs BP. The MBT/CBT proxies were shown to overestimate temperature and pH, especially in the top part of the bog.
A new calibration of the MBT/CBT specific to peatlands could improve the accuracy of temperature and pH reconstruction in these environments.

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