Experimental climate warming in a French peatland: impact on the abundance and distribution of branched GDGTs

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Branched glycerol dialkyl glycerol tetraethers (GDGTs) are complex lipids of high molecular weight, recently discovered in soils and produced by still unknown bacteria. They are increasingly used as paleoclimate 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. Northern peatlands contain approximately one third of the world's organic carbon and may play an important role in the responses of the global carbon cycle to climate change. The aim of this work was to study the effects of experimental climate warming on the abundance and distribution of branched GDGTs in a *Sphagnum*-dominated peatland (French Jura Mountains). Air temperature was experimentally increased using a warming system consisting of in situ open mini-greenhouses (Open-Top Chambers – OTCs). 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. Branched GDGTs either present as core lipids (CLs; presumed of fossil origin) or derived from intact polar lipids (IPLs, markers for living cells) were analysed. Results showed that despite the short duration of the climate experiment (26 months), branched GDGT distribution was significantly affected by the temperature rise, supporting the empirical relationship between MBT and MAAT established from a large range of soils. The difference in branched GDGT-derived temperatures between the control and the OTC plots was in the same range as the increase in maximal temperature induced by the OTCs in spring and summer, suggesting that branched GDGT-producing bacteria might be more active during the warmest months of the year. The OTC treatment had no significant effect on the abundance of branched GDGTs, mainly present as "fossil" CLs (70 to 85% of the total extractable branched GDGTs). Furthemore, no significant differences in branched GDGT distribution were observed between CLs and IPLs, which both provided higher MBT and MAAT values for the OTCs. This suggests that the fossil pool of branched GDGTs has a very fast turnover (less than the 2 year duration of the experiment) at peat surface and that branched GDGT distribution may rapidly reflect changes in environmental conditions.

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Dissolved platinum in major rivers of East Asia

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Dissolved platinum concentrations of eleven large pristine river systems in East Asia (~200 samples) were determined to better constrain the oceanic platinum budget. Most samples had concentrations less than 1.4 pM, and relatively high concentrations up to 5.8 pM were measured in only approximately 6% of the samples. Principal component analysis was carried out using Pt, major elements (Na, K, Mg, Ca, HCO_3^-, Cl^-, SO_4^{2-}, Si), Sr, and $^{87}Sr/^{86}Sr$ of the dissolved load to derive the potential sources of Pt. The Pt in the main (<1.4 pM) group was best clustered with Mg, HCO_3^-, Ca, Sr, and SO_4^{2-}, interpreted as weathering of carbonates and associated gypsum. The Pt in the outlier group was best clustered with Si, K, $^{87}Sr/^{86}Sr$, Ca, and HCO_3^-, interpreted as weathering of silicates. The median Pt concentrations of the individual river systems had only a small range, from 0.18 pM (Duman) to 0.63 (Huang He), and the difference in Pt yield mainly resulted from the difference in runoff. The rivers draining the eastern Tibetan Plateau – the Salween, Mekong, Chang Jiang (Yangtze), Hong (Red), and Huang He (Yellow) – had relatively higher Pt yield than the rivers of the Russian Far East – the Amur, Lena, Yana, Indigirka, and Kolyma. The discharge-weighted mean Pt concentration was 0.36 pM for the eleven river systems of East Asia. If this value is extrapolated globally, the estimated riverine flux of dissolved Pt to the ocean is 13×10^3 mol y^{-1}. Based on this riverine flux, the estimated oceanic residence time of Pt is 3×10^4 years.