Assessing Soil Bacterial Tetraether Lipids as Tracers for Land-Sea Soil Organic Carbon Transfer

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Over the past years, branched glycerol dialklyl glycerol tetraethers (brGDGTs) have increasingly found use as tracers for soil-derived organic carbon (OC) in carbon cycle studies. Specifically, the proportion of brGDGTs in coastal marine sediments is used as a proxy for fluvial delivery of soil OC into a marine system, quantified as the Branched and Isoprenoid Tetraether (BIT) index. Records of brGDGT composition retrieved from continental margin sediments have also been used to provide an integrated climate history of the adjacent river basin. However, recent studies indicate that additional production of brGDGTs can take place in rivers, which may influence the initial distribution of soil-derived brGDGTs upon entering a river.

Here we monitored changes in the amount and distribution of soil-derived intact polar ('living') and core ('fossil') soil-GDGTs during an incubation experiment (t = 152 days), using river and ocean water as inocula, in order to evaluate the fate of the soil GDGT signature during fluvial transport from land to sea. Neither brGDGT production nor degradation was observed over the course of the experiment, and as a result the initial soil brGDGT distribution remained unaltered upon entering an aquatic environment. Notably, isoprenoidal GDGTs (isoGDGTs), probably produced by soil Thaumarchaeota, increase significantly during our incubation study, consequently influencing BIT index values when transport times are long (>80 days).