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Impact of seasonal hydrological variation on the distributions of branched and isoprenoid tetraether lipids along the Amazon River in the central Amazon basin: Implications for the MBT/CBT paleothermometer and the BIT index

Claudia Zell (1), Jung-Hyun Kim (1), Rodrigo Lima Sobrinho (2), Patricia Moreira-Turcq (3), Gwenaël Abril Abril (4), and Jaap S. Sinninghe Damsté (1)

(1) Royal Netherlands Institute for Sea Research (NIOZ), Den Hoorn (Texel), Netherlands , (2) Department of Geochemistry, Universidade Federal Fluminense, Niteroi, Rio de Janeiro, Brazil, (3) Institut de recherche pour le développement (IRD), Centre IRD d'Ile de France, Bondy, France, (4) Laboratoire Environnements et Paléoenvironnements Océaniques et Continentaux (EPOC), Centre National de la Recherche Scientifique, Université de Bordeaux, Talence, France

We assessed the effects of hydrodynamical variations on the distributions and sources of branched and isoprenoid glycerol dialkyl glycerol tetraethers (brGDGTs and isoGDGTs, respectively) transported by the Amazon River in the central Amazon basin. Particulate suspended matter was collected in the Amazonian rivers and floodplain lakes at four different seasons (rising water, high water, falling water, and low water) at 6 stations along the main stem of the Amazon River, 3 tributaries (Negro, Madeira, and Tapajós) and 5 floodplain lakes (Manacapuru, Janauacá, Marituba, Canaçari and Curuai). The concentration and distribution of brGDGTs of both core lipid (CL) and intact polar lipid (IPL)-derived fractions were investigated applying IPL-derived brGDGTs as an indicator of brGDGTs derived from recently-living cells. The organic carbon (OC)-normalized concentrations of CL brGDGTs mimicked the trend of the hydrological variation with highest concentrations during the high water season. The CL brGDGT distributions were most alike those of lowland Amazon (terra firme) soils during the high water season, indicating that input of soil-derived, allochthonous brGDGTs to the Amazon River was highest at that period. Accordingly, the methylation index of branched tetraethers (MBT) and the cyclization ratio of branched tetraethers (CBT) varied corresponding to the hydrological changes, with the increasing influence of in situ produced brGDGTs in rivers and floodplain lakes during the low water season.
The concentrations of CL crenarchaeol were highest during the low water season, due to increased autochthonous production. The concentration changes of both brGDGTs and crenarchaeol lead to a variation of the branched and isoprenoid tetraether (BIT) index between 0.4 (low water) and 0.9 (high water). Hence, our study hints at the effect of hydrodynamical variations on the source of brGDGTs and isoGDGTs transported by rivers to the ocean and emphasized the importance of a detailed study of a river basin before applying the MBT/CBT paleothermometer and the BIT index in the adjacent marine setting.