

Diverse biological sources of isoprenoid GDGTs in terrace soils of southwest China and implication for organic proxies

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Archaea are one of the important participants in soil biogeochemical cycling. The membrane lipids of Archaea are usually composed of isoprenoidal glycerol dialkyl glycerol tetraethers (iGDGTs), which are ubiquitously detected in diverse environments. However, their biological sources and environmental control were not well constrained in soils. We reported the archaeal lipid composition and community structure in an altitudinal soil transect of terrace wetland by using combining organic geochemical and Illumina Miseq high-throughput sequencing approaches. Our results showed that the precursor of CL-iGDGTs preserved in soils was likely from monoglycosidic lipids rather than phosphorous lipids. Secondly, the biological sources of iGDGTs were diverse in soils. The thaumarcharotal 1.1b was dominant in non-paddy soils that mainly contributed to the crenarchaeol and its isomer, while MCG, Methanobacteria and Methanomicrobia were dominant in most water saturated paddy soils that contained additional GDGT-0. The close relationship between thaumarcharotal 1.1c and GDGT-1,-2,-3 suggested that thaumarcharotal 1.1c were potentially extra biological sources for these compounds in soils. The RDA analysis revealed that the relationships between environmental variables and iGDGT composition can be influenced by archaeal community structure, thus the application of iGDGT proxies to reconstruct past environments should be taken with caution before the influence of genetic variations is well constrained.