

Tetraether biomarker records for the last 60 kyr from a loess-paleosol sequence in the western Chinese Loess Plateau

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In this study we present records of glycerol dialkyl glycerol tetraethers (GDGT)-derived proxies for the last 70 kyr from the Yuanbao LPS, western CLP. Temperature record reconstructed from the cyclization and methylation index of branched tetraethers (CBT-MBT) displays that the onset of deglacial warming at ~20 kyr BP precedes the strengthening of summer monsoon, which is in agreement in timing with previous CBT-MBT temperature records from the southeastern CLP. The maximal deglacial warming of ~10 °C is slightly higher than those in the southeastern CLP, perhaps due to the higher latitude and farther inland of the study site. The late Holocene temperature of ~8 °C is consistent with present mean air temperature from spring to autumn, not including winter temperature and suggesting that the growth of GDGT-producing bacteria in winter is retarded by the low temperature, and hence contributing insignificantly to its annual production. The branched/isoprenoid tetraether (BIT) Index shows higher values in the glacial loess and lower values in the Holocene paleosols, with a steady decreasing trend since the early Holocene. The decreasing trend could suggest that archaea production exceeded that of the branched GDGT producing bacteria since the early Holocene, but other possibilities, such as preferential degradation of isoprenoid GDGTs or upward increase in living archaea relative to bacteria in the paleosol profile, cannot be fully excluded. Our results thus demonstrate the need of future study on regional calibration of the CBT-MBT temperature proxy, microbial community structure in soil column and differential degradation of GDGT molecules.

A dustier world since MIS12 inferred from Sr and Nd isotopes of sediments in the western Philippine Sea

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Asian dust deposition in the tropical Pacific has supplied essential nutrients (e.g. Fe) to fuel bioproductivity and allows reconstruction of East Asian continental paleoclimate. Here we report a high-resolution record of dust supply to the tropical northwest Pacific over the past one million years derived from the analysis of radiogenic Sr and Nd isotopes in the marine sediments of core MD06-3050, located on Benham Rise in the western Philippine Sea.

The down-core variability of the Sr and Nd isotopic composition of the lithogenic fraction documents climatically induced changes in sediment supply from two isotopically distinct end-members: (1) Eolian dust from Asia and (2) volcanic material from the Luzon islands. The dust flux over the past one million years was closely coupled to glacial-interglacial climate cycles and showed a pronounced 100kyr periodicity. Eastern Asia has become overall dustier since MIS12 (0.47 Ma) as reflected by a marked increase of the average Asian dust flux from 0.27 to 0.45 g/(cm²-kyr). The “dustiest” conditions occurred during MIS12, MIS10 and the LGM. We suggest that this reflects increasing aridity of the Asian continent and an enhancement of the atmospheric circulation forced by changes in the eccentricity of the Earth's orbit. The higher dust flux may have amplified the internal feedbacks of the climate system and may thus serve as an explanation for the strong 100kyr glacial/interglacial cyclicity of the Late Quaternary.