C_{32} *N*-Alkan-1-ol as specific indicator of C4 tropical plants in marine sediments

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Contents, distribution patterns and molecular stable carbon isotope composition of these compounds have been studied as markers of continental vegetation over the last 320 kyr in a set of samples from the tropical Indian Ocean core MD98-2165 (9°38'96S, 118°20'31E, 2100 m).

The concentration changes of these compounds show a general pattern dominated by the well defined glacial-interglacial oscillation. Eolian inputs were much stronger during the glacial periods. The *n*-alkanes range between C_{23} and C_{33} and are characterised by high odd-over-even carbon number preference and predominance of the C_{31} *n*-alkane, whereas the *n*-alkanols range between C_{20} and C_{32} and are dominated by even-over-odd carbon numbers with maxima at C_{28} or C_{32} *n*-alkanol. In this respect, warmer and wetter conditions appear to favour deposition and preservation of the C_{30} homologue and colder and drier conditions favour the C_{28} *n*-alkanol. However, the C_{32} *n*-alkanol becomes an additional major homologue during the glacial times, suggesting an expansion of C_4 plants during these arid conditions as reported by Rommerskirchen *(*2006). The stable carbon isotope weighted mean average of the *n*-alkanes (*n*-C_{27} to *n*-C_{33}) fall in the range between –30.5 and –34.5‰, typical of leaf-wax *n*-alkanes biosynthesised by C_3 plants. The lower $\delta^{13}C$ values are observed during warm and humid interglacial periods, when the estimated C_4 plants contribution decreased ~15 wt %. This is consistent with the negative relationship existent between $\delta^{13}C$ of C_3 plants and water availability (Liu *et al*., 2005). The weighted mean average $\delta^{13}C$ values of *n*-alkanols (C_{20}-C_{32}) fall in the range between –24.4 and –32.6‰, again with lower $\delta^{13}C$ values during interglacials. Amazingly, the $\delta^{13}C$ of C_{32} *n*-alkanol reveals a clear C_4 plant signature during cold and dry conditions. These results demonstrate that *n*-alkanes and *n*-alkanols, but most particularly the C_{32} *n*-alkanol, show a distinct pattern of contributions from C_4 plants to marine sediments during arid conditions and therefore, they can be used as indirect proxy of continental climate conditions in the tropics.

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Chemical weathering rates inferred from cosmogenic radionuclides and immobile element enrichment: Measurements in the Idaho Batholith

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Chemical weathering regulates many biogeochemical and Earth surface processes. It nourishes ecosystems by supplying nutrients to natural waters, promotes physical erosion by weakening bedrock, and buffers Earth's climate over geologic time by modulating atmospheric carbon dioxide concentrations. Long-term measurements of chemical weathering rates (and of their dependence on external factors such as climate) are thus important for understanding the biogeochemical and geomorphological evolution of the Earth's surface, and for quantifying the recent impact of humans on the environment. Chemical weathering fluxes can be measured in mountainous terrain using cosmogenic radionuclide measurements of long-term denudation rates, coupled with measurements of the rock-to-soil enrichment of chemically inert tracers (Kirchner *et al.*, 1997; Riebe *et al.*, 2001; Riebe *et al.*, 2003). This technique has two major strengths: (1) it can be applied to a wide range of actively eroding landscapes, whereas other methods typically require non-eroding, datable soils, and (2) it intrinsically averages over the long timescales of soil formation and denudation (typically 1000-100,000 years in soil-mantled hillslopes), and thus sheds light on landscape evolution processes. Here we use this method to measure chemical weathering fluxes along an altitudinal transect on Pilot Peak. This transect spans 1500 meters of altitude in the granitic Idaho Batholith, USA, and thus spans ~10 °C in mean annual temperature. Pilot Peak is unglaciated, exhibits little variability in bedrock mineralogy, and is mantled with well-mixed soil at all elevations. Our preliminary data suggest that rates of chemical weathering, as a function of total denudation rates, are not a strong function of elevation, and hence not a strong function of temperature. These results also imply that chemical weathering fluxes account for less than 20% of the total denudation flux at Pilot Peak, and thus point toward the dominance of physical processes over chemical processes in sculpting this landscape.

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