P199-TU

MOLECULAR ISOTOPIC COMPOSITION AND DISTRIBUTION PATTERNS OF LONG-CHAIN *N*-ALKANES AND *N*-ALKANOLS FROM C_3 PLANTS GROWING IN DIFFERENT TROPICAL HABITATS

Angela VOGTS[1], Heiko MOOSSEN[1], Florian ROMMERSKIRCHEN[1] and Jürgen RULLKÖTTER[1]

1. Institute of Chemistry and Biology of the Marine Environment (ICBM), Carl von Ossietzky University of Oldenburg, P.O. Box 2503, D-26111 Oldenburg, Germany

Contents, distribution patterns and molecular stable isotope compositions of long-chain *n*-alkanes and *n*-alkan-1-ols have been used as indicators for the contribution of terrestrial organic matter to dusts, soils and sediments (e.g. Schefuß et al., 2003; Rommerskirchen et al., 2003, 2006a). These parameters vary according to the proportions of land plants with different metabolic pathways (C_3 versus C_4). Most grasses of the arid grasslands are C_4 plants, and thus a higher contribution of C_4 plants is related to a larger proportion of organic material from arid environments. Tropical vegetation may change from arid grasslands over shrubby to woody savannas and finally to rain forests. Trees, shrubs, lianas and most herbs of these habitats are C_3 species. There are many suggestions regarding the lipid composition of these plants but no study has evaluated all the necessary parameters. The present study closes this gap and provides significant background information relevant to the use of long-chain aliphatic biomarkers in studies of palaeovegetation changes.

We analysed leaf waxes of 50 savanna plants (28 trees, 11 shrubs, 11 herbs) and 22 rain forest species (8 trees, 8 shrubs, 6 lianas) collected in several African countries. Averaged *n*-alkane distribution patterns for trees, shrubs and herbs of the savanna show significant similarities. The same is evident for the patterns of trees, shrubs and lianas of the rain forest. Hence it is possible to average the distribution patterns of all species collected in the same habitat. A comparison of the averaged *n*-alkane distribution patterns from C_3 rain forest and C_3 savanna species with the distribution pattern of C_4 grasses (Rommerskirchen et al., 2006b) shows a shift to longer chain length of the *n*-alkanes. This can be numerically displayed, e.g., by an increase of the mean average carbon chain length of the odd carbon numbered *n*-C_{27} to *n*-C_{33} alkanes ($ACL_{27\text{-}33}$, Fig. 1). The same shift to longer chain lengths is also evident in the *n*-alkanol distribution patterns. The molecular stable isotope compositions of C_4 and C_3 plants differ due to their metabolic pathways. Among the C_3 plants variations originate from different isotopic compositions of the source CO_2 caused by recycling effects in the closed canopy of the rain forest. The molecular $\delta^{13}C$ values decrease from C_4 grasses over C_3 savanna vegetation to C_3 rain forest plants.

The results of the present study verify distribution patterns and molecular stable isotope composition of long-chain *n*-alkanes and *n*-alkan-1-ols to be suitable indicators to assess the changing contribution of land plants with different metabolic pathways. Also for biomass input from plants of the same metabolic type information can be obtained about the different climates the plant material came from. Thus, these parameters are useful indicators for palaeoenvironmental climate studies.

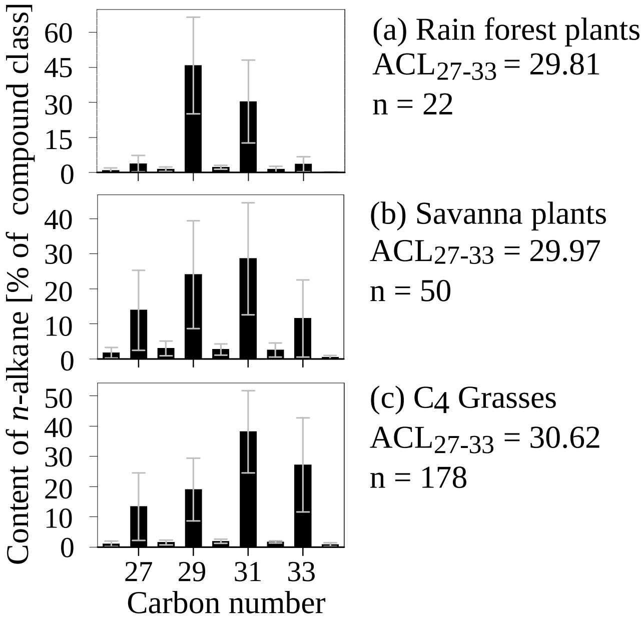

Figure 1. Averaged histogram representation for (a) rain forest plants, (b) savanna plants and (c) C_4 grasses of contents of *n*-C_{26} to *n*-C_{34} alkanes. C_4 grass data are from Rommerskirchen et al. (2006b). The diagrams are individually normalised to the most abundant homologue. ACL: mean average carbon chain length of the odd-carbon-numbered *n*-C_{27} to *n*-C_{33} alkanes. n: number of species used for the averaging.

REFERENCES

Rommerskirchen, F., Eglinton, G., Dupont, L., Güntner, U., Wenzel, C., Rullkötter, J., 2003. A north to south transect of southeast Atlantic continental margin sediments: relationship between aerosol transport and compound-specific $\delta^{13}C$ plant biomarker and pollen records. Geochemistry, Geophysics, Geosystems 4 (12), 1101. doi: 10.1029/2003GC000541.

Rommerskirchen, F., Eglinton, G., Dupont, L., Rullkötter, J., 2006a. Glacial/interglacial changes in southern Africa: Compound-specific $\delta^{13}C$ land plant biomarker and pollen records from southeast Atlantic continental margin sediments. Geochemistry, Geophysics, Geosystems **7** (8), Q8010. doi: 10.1029/2005GC001223.

Rommerskirchen, F., Plader, A., Eglinton, G., Chikaraishi, Y., Rullkötter, J., 2006b. Chemotaxonomic significance of distribution and stable carbon isotopic composition of long-chain alkanes and alkan-1-ols in C_4 grass waxes. Organic Geochemistry 37, 1303. doi:10.1013/j.orggeochem.2005.12.013.

Schefuß, E., Rathmeyer, V., Stuut, J.-B.W., Jansen, J.H.F., Sinninghe Damsté, J.S., 2003. Carbon isotope analyses of *n*-alkanes in dust from the lower atmosphere over the central eastern Atlantic. Geochimica and Cosmochimica Acta 67, 1757-1767.