

Fractionation of hydrogen isotopes in biosynthesis of fatty acids by piezophilic bacterium *Moritella japonica* DSK1

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We examined stable hydrogen isotope fractionation in biosynthesis of fatty acids of a piezophilic bacterium *Moritella japonica* strain DSK1. DSK1 was grown to stationary phase at 30 MPa in media prepared using sterile-filtered natural seawater supplied with glucose with the sole carbon source. Saturated, monounsaturated, cyclopropane and polyunsaturated fatty acids were identified. All fatty acids were depleted in D relative to growth water and glucose, but in different extent. Saturated fatty acids exhibited less fractionation than monounsaturated fatty acids which had less fractionation than polyunsaturated fatty acids. There was significant difference in δD between different groups of fatty acids. Polyunsaturated fatty acids were more depleted in D, ranging from -127 to -215‰ relative to saturated FA, and from -150 to -173‰ relative to monounsaturated fatty acids. This pattern of δD discrepancy between different groups of fatty acids is similar to that of carbon isotopes we observed in the same bacterium before [1], further suggesting that the interpretation of carbon and hydrogen isotope signatures of marine lipids must be based on principles derived from piezophilic bacteria.

[1] Fang *et al.* (2006) *Geochim. Cosmochim. Acta* **70**, 1753–1760.

Zircon oxygen and Hf isotopic constraints on 150 m.y. of subduction magmatism, South Patagonian Batholith, South America

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Magmatic and inherited zircon in the South Patagonian Batholith (SPB) provides a rare opportunity to examine a 150 my record of subduction-related magma genesis in the Cordilleran margin of south-western South America. It also enables us to track changes in plate configurations and movements. U-Pb dating has shown that the oldest intrusions are late Jurassic (150–157 Ma), in part coeval with the waning stage of more widespread, mainly silicic, Jurassic volcanism in southern South America. Thereafter, magmatic events were episodic through to the Neogene. Whole-rock Sm-Nd data highlighted a general progression through time from more crust-derived magma sources to those that are more juvenile. SHRIMP oxygen isotope and LA-MC-ICP-MS Lu-Hf data provide a far greater insight into the evolution of the SPB. $\delta^{18}O$ values are high in the late Jurassic (ranging to +8) indicating crustal magma sources. $\delta^{18}O$ values decline rapidly during the Late Jurassic and early Cretaceous to indicate mantle-derived sources (from +5.0 to +5.6) and even lower to values typical of hydrothermally-altered sources. With the passage of time, crustal sources were relatively quickly consumed by magma generation. Involvement of crustal melting gave way to primitive, and hydrothermally altered sources for the generation of the middle Cretaceous and younger plutons. The ϵ_{Hf} data support this model; Late Jurassic magmas have negative values (ranging to -9), rising to positive values by early Cretaceous and remaining so through to the Neogene. Significantly the Hf data indicate that whilst sources were primitive from the middle Cretaceous, they had already had a significant crustal residence time. The sympathetic behaviour of zircon $\delta^{18}O$ and ϵ_{Hf} with time can be linked to larger scale changes in plate configurations and movements, such as the closure of the Rocas Verdes Basin in the early Cretaceous.