Molybdenum isotope fractionation in the mantle

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Molybdenum is a refractory and moderately siderophile element that is highly redox-sensitive and has mainly been used to study changes in marine sedimentary environments [1,2]. So far little is known about mass dependent isotope fractionation of Mo at high temperatures in the Earth, in particular during mantle processes.

We have analyzed 42 mafic (mainly MORB and OIB) and 7 ultramafic rocks from diverse locations, using a double-spike technique and MC-ICPMS. The $\delta^{98/95}$Mo values exhibit a significant range from +0.53 ± 0.21 to -0.56 ± 0.01‰ relative to NIST SRM 3134. The compositions of MORB (+0.03 ± 0.07‰, 2s.d.) and ultramafic rocks (+0.38 ± 0.15‰, 2s.d.) are each relatively uniform and distinct from each other, providing clear evidence of fractionation associated with partial melting. In contrast OIBs display significant variability within a single locality. The most extreme values measured are for nephelinites from the Cameroon Line and Trinidade, which also have anomalously high Ce/Pb [3] and low Mo/Pr relative to normal oceanic basalts [4]. The observed relationships between δ^{98}Mo and Ce/Pb, U/Pb, and Mo/Pr provide evidence that sulfide plays a critical role, not just in in fractionating chalcophile elements [5], but also in preferentially incorporating heavier Mo isotopes. Residual immiscible sulfide liquids lead to the eruption of magmas with relative light Mo isotopes and low Mo/Pr relative to the source composition. Therefore, the Mo isotopic compositon of the bulk silicate Earth and mantle will be best represented by values for peridotites.

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Tectonic control on the distribution of Paleogene deep-lake syn-rift deposits in Qikou sag, Bohaiwan Basin, Eastern China

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The tectonic control on subaqueous sediment routes and stacking patterns is not well understood although the resulting deposits may form potentially important hydrocarbon reservoirs. In this study, an area of lacustrine syn-rift succession in the Qikou sag is examined in detail to unravel the interplay between fault geometries evolution and sediment transport paths and infilling patters.

Qikou sag is a tpyical superimposed rift basin at the center of Bohaiwan Basin, Eastern China. Structurally, it is characterized by a linked system deep NEE-SWW striking half-grabens. This study focuses on the eastern part of the Qikou sag and it is bounded to the north by the overlapping Gangdong, Gangxi and Binhai normal faults. Syn-rift succession of the Qikou sag comprises Oligence Shahejie Formation (EsF), Dongying Formation (EdF) and is mostly dark-grey mudstone interbedded with fine to coarse-grained sandstone deposited by large-scale turbidity currents in deep-lake. Using strata pattern, fault activity hsitory, seismic attribute and heavy mineral analysis based on three-dimensional seismic and well logging data, our study demonstrate that the growth and propagation of main border normal fault segments associated with paleogeomorphology changes (particularly subaqueous relay ramps) have a marked influence on dispersal and localization of the turbidity currents during the syn-rifting phase. The main sediment supply is interpreted to be sourced from the basin marginal Cangxian uplift and the significant coarse-grained materials were transported to the deep-lake over long distance. In subqueous settings, however, no clear evidence of channel incision on the relay ramp is obseved, and turbidity currents are likely to by-pass the relay ramp and flow down the inner fault slope directly into the basin. Therefore, Locating subqueous syn-rift sediment and relating them with evolutional relay ramps need further investigation.

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