Using lead isotopes in marine barite to understand intermediate water dynamics

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Lead isotopes in marine barite hold the potential to provide insight into changes in intermediate water circulation. Marine barite forms at intermediate water depths and incorporates Pb into the crystal structure at ~2ppm. As a result, the isotopic composition of Pb in marine barite represents the ratios of dissolved Pb in intermediate water. The ability of marine barite to document this elusive water mass makes this new proxy a powerful tool in understanding intermediate water dynamics.

Since anthropogenic pollution has irrevocably altered Pb concentrations and isotope ratios in the present day ocean, calibration of Pb proxies relies on a survey of Holocene sources. We will present results from marine barite separated from several cores in the equatorial Pacific. The ferromanganese grain coatings and detrital fractions for many of these samples will also be presented. By analyzing these three fractions from the same sample, we show that marine barite is recording a unique signature. This implies that the Pb in intermediate water is different that that of deep water or the bulk detrial fraction, potentially allowing us to deconstruct dust and circulation based Pb sources.

Additional work documenting potential source regions for intermediate water lead will be presented. Preliminary box modeling work will be shown to help resolve these source questions and illustrate the unique utility of this emerging proxy.

Geochronological and thermochronological evolution of the southern Gaoligongshan metamorphic belt, Yunnan (China)

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The Gaoligongshan metamorphic belt is located east of the Eastern Himalayan Syntaxis (EHS) and plays a key role in the evolution of southeastern Tibet. Here, we present geochronological data of orthogneisses and mylonites that pertain to the evolution, cooling and exhumation history of this mountain range. Zircon U/Pb dating allow us to distinguish between at least four different magmatic events at about ~486 Ma, ~282 Ma, ~136 Ma and ~76 Ma. Similar ages have been reported for ortho-derivative rocks of the adjacent Tengchong and the Baoshan blocks and suggest that the southern Gaoligongshan is composed of rocks orginally belonging to the Lhasa and the Sibumasu terrane derived rocks. Late Eocene to Early Miocene U-Pb zircon and Rb/Sr muscovite ages are coeval with the onset of lateral crustal displacement along major shear zones in Eastern Tibet and Indochina and post-collision volcanic activity in Western Yunnan. Main phase of crustal rotation in the Tengchong and Baoshan blocks and mylonitization along the Gaoligongshan shear zone started during the Miocene, between 19 and 12 Ma (Rb/Sr biotite and Ar/Ar mica ages). The final stage of exhumation of the Gaoligongshan is revealed by apatite FT and apatite (U-Th-Sm)/He thermochronology, with ages between 8 and 5 Ma, which was presumably triggered by crustal root delamination and backarc extensional processes as a consequence of the Andaman sea floor spreading.

Based on our results, we propose that the tectonometamorphic evolution of the Gaoligongshan was the result of Tibetan extrusion and escape tectonics around the EHS, the southeastward movement of Indochina and backarc-extensional effects of the Andaman seafloor spreading, which makes it to a junction point between Tibet Plateau and Indochina.