What caused Mongolian Mesozoic magmatism: Was it crustal or mantle driven?

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Prior to the Himalayan orogeny, the last major phase of continent collision and amalgamation in mainland Asia was the mid-late Mesozoic closure of the Mongol-Okhotsk ocean. Rapidly following on from the collisional event came extensive and widespread basaltic magmatism that infilled extensional basins across parts of eastern and southern Mongolia, and northern China. The production of voluminous basalts soon after an orogenic event has led some to propose that a mantle plume may have interacted with the crust during this period [1]. Opposing this theory are suggestions of slab delamination[2], post-orogenic collapse[3] or lithospheric overthickening and delamination [4]. This study aims to assess the plausibility of these models by constraining the mechanisms of magma genesis for these mildly alkali basalts. Then, using these constraints, we plan to test local and regional tectonic syntheses.

To this end, a large suite of basaltic samples have been collected from the most western limit of the Mesozoic volcanism, from the Gobi, Mongolia. Samples have been analysed for major, trace and REE elements (XRF & ICP-MS) with results showing that the basalts are LREE enriched (high La/Ti) and slightly HREE depleted with variable Mg#'s, Pb & Nb anomalies and Th/Nb ratios. The chemistry and a limited amount of isotope data shows that fractionation and crustal contamination processes were important for melt generation. Further sampling and a more extensive isotope study will help to elucidate some of the processes that produced these enigmatic basalts and thereby test models for melt generation.

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Mg isotope evidence for early dolomite formation in a Marinoan cap carbonate

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The global deposition of cap carbonates after the Marinoan glaciation (635Ma) is key evidence supporting the Snowball Earth hypothesis [1]. The cap carbonate is almost exclusively composed of dolostone with rare occurrences of limestone [2]. Thus, this interval is the only time in the Earth's history when deposition of dolostone occurred globally, suggesting a unique marine geochemistry after the Marinoan glaciation. Here, we report the Mg isotopic composition (δ^{26}Mg) of the Zhamoketi cap carbonates from two sections in the Quruqtagh area, NW China [3], which contain both limestone and dolostone. Our data show an enrichment of heavy Mg in the cap limestone samples, indicating scavenging of light Mg from seawater consistent with global dolostone precipitation. Compared with their Phanerozoic counterparts, the Zhamoketi cap limestones and dolostones have very similar δ^{26}Mg values [4, 5], which may indicate early formation of Marinoan cap dolostone driving seawater to heavier δ^{26}Mg values. This study suggests that the sharp transition from extreme icehouse to extreme greenhouse conditions during the meltdown of Marinoan Snowball Earth might have created a suitable environment for global dolostone formation.

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