Geochemical constraints on the petrogenesis of Devonian arc picrites and associated lavas from the North Junggar terrane, NW China

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The Junggar terrane in Xinjiang Province, sits adjacent to the Siberian and Kazakhstan plates. Recently, we recognized a near 100-m-thick picritic lava flow in a Devonian arc in Jungguar terrain. The picritic lavas, which occur in the lower part of the Middle Devonian strata, are overlain by basalts and andesites. The picrites are highly porphyritic. Olivine, clinopyroxene and rare chrome spinel with Cr# (Cr/Cr+Al) values (0.63–0.86) are phenocrysts, embedded in a matrix of groundmass plagioclase, clinopyroxene, and Ti-magnetite. Glass does not appear to be preserved, but minor metal sulfides are present. All lavas are characterized by negative Nb, Ta and Ti anomalies with similar abundances of HFSE with MORB, exhibiting typical for island arc volcanic rocks. The Zr/Nb ratios (23–66) of the picrites and basalts resemble the MORBs (10–66), suggesting the MORB-like sources. However, the Ti/V (23–35) and Zr/Sm (18–23) ratios of basalts are higher than those of picrites (14–17 and 14–15 respectively), and the basalts display flat-type REE-chondrite patterns whereas the picrites are characterized by lower total REE concentrations and slight enrichment of light REE. In contrast, the andesites have much higher total REE abundances and LREE/HREE. All suggest that they are not cogenetic related. However, they have similar ($^{87}Sr/^{86}Sr$)t (0.70328–0.70433) and ε_{Nd}(t) values (6.4–7.3), overlapping with modern island arc field. Consequently, primary magmas were most likely generated in N-MORB-type mantle, which was modified by the addition of a fluid component derived from subducted basaltic crust. However, the basalts were generated by partial melting of amphibole-bearing spinel peridotite, and the picrites resulted from low degrees of partial melting of garnet peridotite with residual garnet, and the andesites may have been generated by partial melting of eclogites.

Continental paleotemperature reconstructions: Distribution of GDGTs in a variety of lakes

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In spite of the rising tide of using the TEX86 index in the reconstruction of marine sea surface temperature, applications to lake environments are still limited, with only a few large lakes surveyed. Calibrations of modern environmental conditions with surface sediment Tex86 temperatures in smaller lakes are lacking or not apparent in many settings. We have collected surface sediments from a variety of lakes extending from the Arctic, to southern Patagonia and northern Chile. These include Norwegian cirque lakes, a maar lake in Patagonia, Argentina, a meteorite impact crater lake in Siberia, and a glaciated valley lake in England. In each case, we collected a suite of measurements of the physical parameters of the lake, such as temperature, salinity, pH, etc, in order to determine how the modern distribution of GDGTs correspond to the current environmental conditions across a large range of limnologic conditions. Preliminary results indicate the temperatures calculated from the TEX86 index are consistent with the measured annually averaged surface water temperature, although complications related to soil-derived sources are apparent in some cases. A complete set of data and selected downcore reconstructions of late Holocene conditions will be reported at the conference.