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Vendian Intraplate Volcanism of the Paleo-Asian Ocean: Implications from the Geochemical Study of Gorny Altai Basalts

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Two types of oceanic basalts are present in the 560-600 Ma Kurai accretionary wedge of the Gorny Altai province, SW Siberia, Russia. Ti-undepleted (oceanic island type basalts) and Ti-medium (mid-oceanic ridge basalts) varieties co-exist within this geological structure. The least altered Ti-undepleted basalts are characterized by variably depleted LREE and flat HREE patterns (La/Sm_N =0.67-1.3, Gd/Yb_N = 0.95-1.39). They have small negative Zr (Hf) anomalies relative MREE. Ti-medium basalts have slightly depleted LREE and flat HREE (La/Sm_N =0.6-0.8, Gd/Yb_N = 0.9-1.0) and Nb-Ta negative anomalies (Nb/La_N =0.3-0.7, La/Ta_N= 1.7-2.3). They feature slight Fe-depletion in comparison with Ti-undepleted basalts (Fe_2O_3 = 11-13 vs. 11-16 wt.%). Mg# varies from 36 to 53 over a relatively narrow range of SiO_2 (48-52 wt%). Fe, Ti, Zr and all REE increase erratically with Mg#. Compositionally these volcanic rocks are similar to Cretaceous ocean plateau basalts such as at Nauru. In suites of basalts from this area, Th anomalies relative to La vary from negative to positive (Th/La_n=0.4-3.7), while Nb anomalies relative to La remain negative (Nb/La_N =0.2-0.7). Mantle melting processes, crustal assimilation, alteration and metamorphism, or fractional crystallization can all be ruled out as the cause of such anomalies. The anomalies could have resulted from recycling of complementary recycled subarc mantle depleted in Nb or hot-spot-ridge interaction. Thus, the Kurai tholeiitic basalts are interpreted to have been an oceanic plateau derived from a heterogeneous multi-component mantle plume or an oceanic island formed from a hot spot interacted with a mid-oceanic ridge. Small negative Zr (Hf) anomalies do not contradict the idea that tholeiitic basalts melted at spinel facies depths. The plateau was fragmented and incorporated in a subduction-accretion complex formed at the SW margin of the Siberian continent. The work was supported by the RFBR grants no. 03-05-64668 and 05-05-64899.