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Geochemical investigation of mafic rocks from the Archean Olondo greenstone belt on the Aldan Shield, Siberian Craton

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The Olondo greenstone belt locates in the western part of the Aldan Shield, the largest basement of the Siberian craton. This Archean greenstone belt is unique by its abundant mafic-ultramafic rocks (>30%) comparing to other greenstone belts worldwide, and one of the best preserved areas that provide a window into an ancient geological past. In this study, we focus on mafic rocks that underwent greenschist to amphibolite facies metamorphism, composed of hornblende-tremolite-actinolite-chlorite-epidote mineral assemblage. The mafic rocks comprise komatiitic and high-Fe tholeiitic basalts, characterized by variable Mg# (0.44-0.74) representative of both differentiated and near-primary magma. On the basis of chondrite-normalized REE pattern, these basalts are subdivided into two groups. Group I is characterized by flat to slightly enriched LREE (La/Sm_N=1.4 – 2.5; La/Yb_N=1.3 - 3.2) and LILE, as well as depleted in HFSEs (Nb, Ta, Ti), suggesting either their mantle source might be influenced by subduction-related processes or result of crustal contamination. Group II is characterized by depleted LREE pattern (La/Sm_N=1.0-1.3; La/Yb_N=0.7-1.8) with no Nb-Ta depletion, similar to the REE pattern of mid-ocean ridge basalts (MORB). Trace-element modeling suggests the rocks were likely derived by 10-30% partial melting of a depleted mantle or primitive mantle-like source with the melting temperature around 1420-1540^{o}C. The initial $^{87}Sr/^{86}Sr$ ratio is between 0.702045 and 0.705961 together with positive initial ε_{Ndi} (+0.09 to +3.91), are indicative of heterogeneous depleted mantle with no significant crustal contamination. The new geochemical data above suggest typical modern tectonic processes such as sea-floor spreading and subduction might be in operation in the Archean time.