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GEOCHEMISTRY, ZIRCON U-PB GEOCHRONOLOGY, ND-HF ISOTOPIC CHARACTERISTICS AND TECTONIC IMPLICATIONS OF THE SOUTH MUYA BLOCK METASEDIMENTS (NORTHEASTERN CENTRAL ASIAN OROGENIC BELT)

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The Neoproterozoic to Cenozoic collage of the Central Asian Orogenic Belt is well-known to include Precambrian continental blocks and microcontinents traditionally attributed to rifting of Siberia or Gondwana prior to CAOB assembly that significantly contributed into the geochemical and isotopic composition of younger subduction- and accretion-related crustal lithologies via processes of crust-mantle interaction and crustal recycling. In the Neoproteorozoic Baikal-Muya terrane, the Anamakit-Muya zone has been found to resemble variable to profound isotopic signatures of the ancient crust recently confirmed by whole-rock Nd and in-situ zircon studies of the high-grade Muya block rocks [*Shatskii et al., 2014; Shatsky et al., 2015; Skuzovatov et al., 2016a, 2016b, 2017*]. More specifically, the ancient crust might serve as a basement for a Neoproterozoic continental arc possibly related to a single Tuva-Mongol-Muya continental domain [*Skuzovatov et al., 2016b*]. Here we report the results of whole-rock trace-element (ICP-MS) and Nd isotope geochemistry (TIMS) coupled with (MC)-LA-ICP-MS U-Pb geochronology and Hf isotope composition of detrital zircons from high-grade metasedimentary sequences of the Kindikan series, South Muya block, which has been yet considered as possible Early Precambrian basement for the Muya subduction-related complexes.

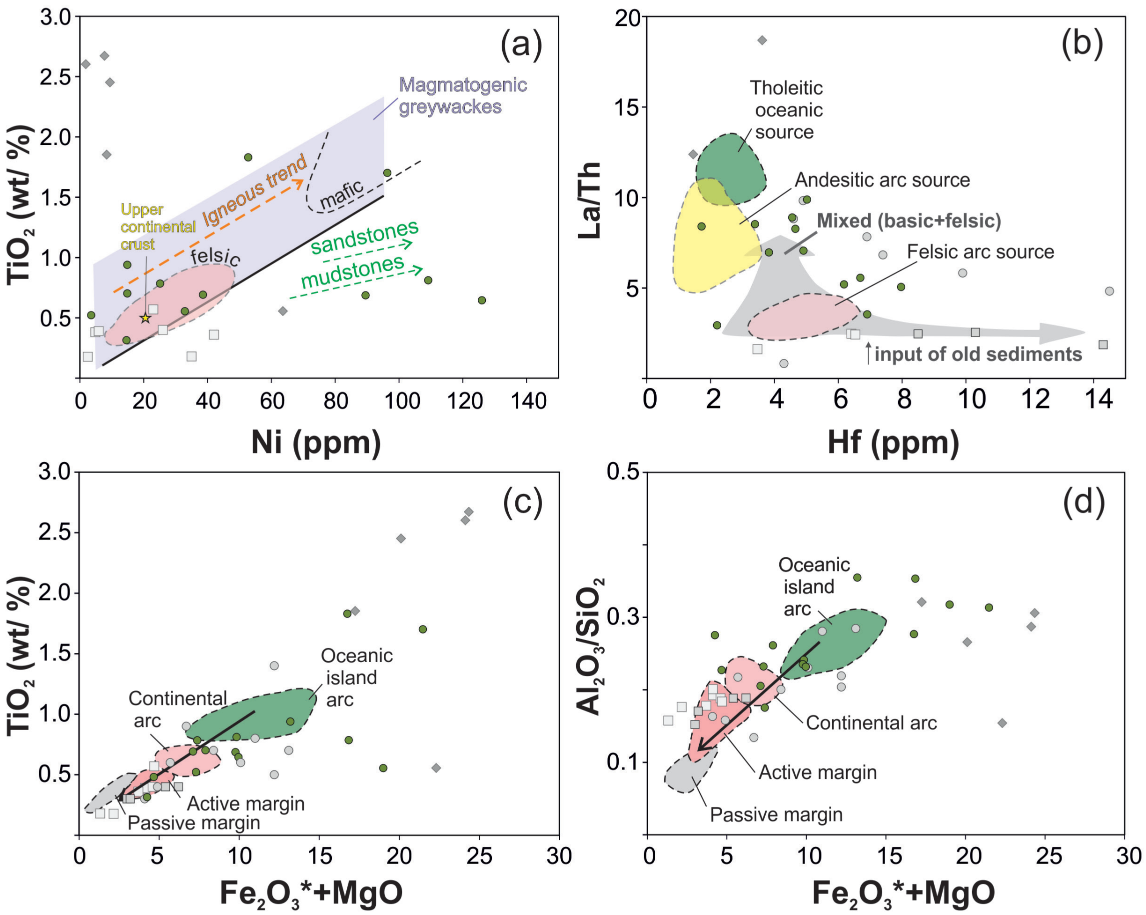

Fig. 1. Representative major and trace element variation plots with different types of suggested sediment source regions.

Results and discussion. Within the area of the current study (Serebryakovsky and Dlinny tributaries of Tuluya river, the South Muya range), Kindikan (Tuluya) metamorphic sequence is composed mainly of high-grade schists (mostly within the amphibolite and granulite facies, 600–900 °C, 8–15 kbar) and gneisses interbedded with paraamphibolites, marbles and calc-silicate rocks, quartzites. The studied rocks are mostly layered quart-albite-biotite-garnet±amphibole schists and quartz-ablite-K-feldspar-biotite gneisses, with some of the schists showing notable amount of Mg-Fe-minerals, and minor calc-silicate rocks. Based on major and trace element chemistry, the sedimentary protolith for most of the schists had a nature of poorly sorted, immature and weakly weathered greywackes with $Na_2O/K_2O>1$, with silty matrix and resembling geochemical signatures of mixed (felsic + mafic) oceanic island arc or active continental margin provenance (Fig. 1). The Qtz-Ab-Bt-Grt schists have LREE- and LILE-enriched trace-element patterns with Eu/Eu*<1 similar to the upper crust, enriched with LREE and with Nb-Ta and Ti minima, whereas the rocks with significant amount of mafic minerals (especially, amphibole and garnet) and increased total $MgO+Fe_2O_3^*$ and K are relatively depleted in Th-U, show lower La/Ybn, and some have none or positive Eu-anomaly. Nonetheless, all rocks show positive Pb and Sr anomalies typical for subduction-related rocks.

Six of the studied samples were analyzed for whole-rock Nd isotopes. Three schists with $^{147}Sm/^{144}Nd$ close to the average crustal value (0.1160–0.1223) exhibit clearly negative εNd(800) of –4.7…–7.0 and Paleoproterozoic two-stage Nd model ages of 1.88–2.06 Ga. One sample with similar $^{147}Sm/^{144}Nd$ (0.1123) has a less radiogenic Nd isotope composition leading to notably “younger” εNd(800) of –1.9 and model age (1.65 Ga). Two remaining samples with evidently higher $^{147}Sm/^{144}Nd$ (0.1303–0.1401) lead to εNd(800) –0.2…–1.5 and Mesoproteorozoic model ages of 1.5–1.61 Ga.

For U-Pb studies, ~240 detrital zircon grains have been separated from five samples. Two Mg-Fe-poor and Mg-Fe-rich samples have bimodal age distribution dominated by the Cryogenian igneous and partially recrystallized/reset zircons related to Early Neoproterozoic suprasubduction magmatism (720–800, 730–780, 700–820 Ma), with minor to notable amount of Ediacarian metamorphic grains (630–650, 600–620, 560–640 Ma), while in one sample two discordant grains of clearly Early Precambrian affinity were

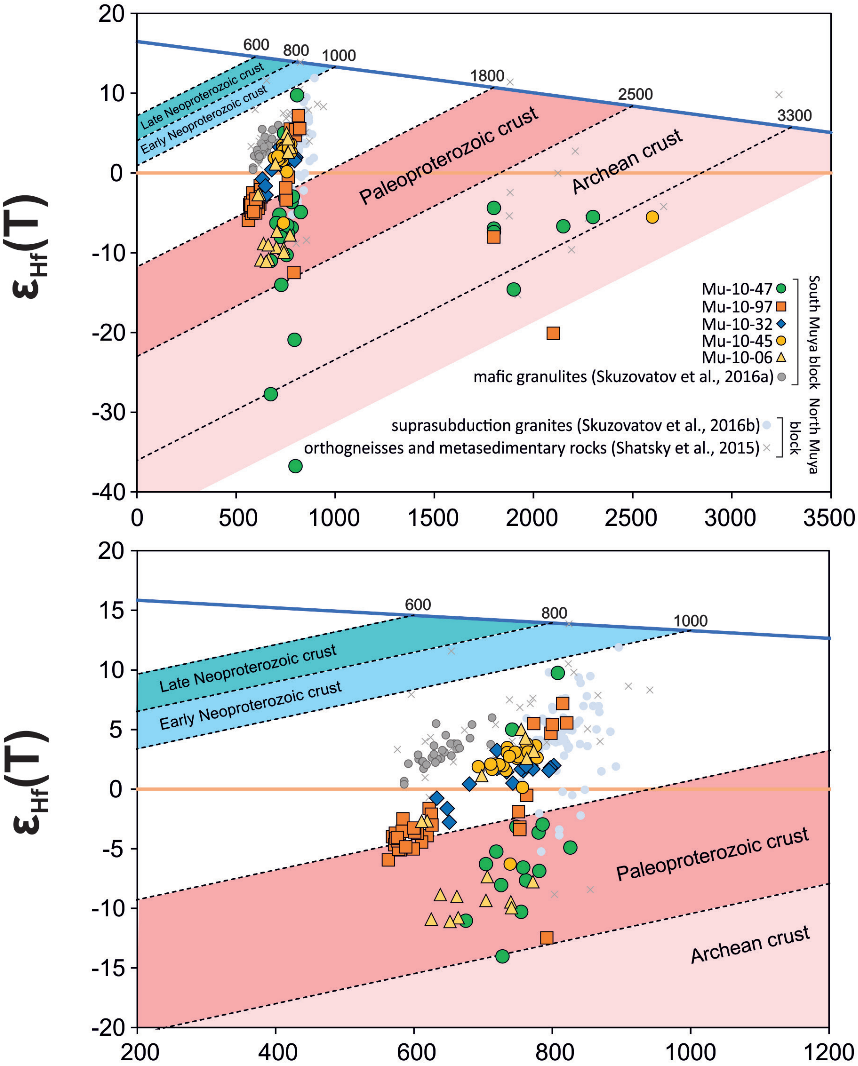

Fig. 2. $^{176}Hf/^{177}Hf$ (*a*) and εHf_T (*b*) versus U-Pb age plots for studied zircons with concordant ages obtained.

detected. The other two Mg-Fe-rich samples have magmatic zircons exhibit more uniform distribution with the dominate age range of 680–800 and 710–780 Ma, respectively, with one of the samples showing a notable amount of discordant Early Precambrian zircons. As revealed by in-situ Hf isotopes, most of zircons have slightly positive to positive to strongly negative εHf(T) signatures reflecting the (a) reworking by the Early Precambrian crust (evident from the Paleoproterozoic and Archean εHf(T) and $T_{DM\text{-}2ST}$ values of both discordant Early Precambrian and Cryogenian grains), and (b) metamorphic recrystallization with Pb removal but without any input of juvenile radiogenic Hf component due to Late Ediacarian (probably 550–560 Ma) juxtaposition of the Baikal-Muya composite terrane to oceanic island-arc structure in the southern Siberia (Fig. 2). Considering the whole-rock geochemistry and Nd isotopes, we may suggest that the sediment chemistry could be controlled by processes of mechanical mixing and subsequent reworking of subduction-related mafic (zircon-poor) volcanogenic substrate with the Early Precambrian terrigenous sediments, as well as – vice versa – zircon derivation from subduction-related felsic rocks mixed with strongly reworked Early Precambrian sediments as a rock matrix.

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