EGU2020-12311
EGU General Assembly 2020
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Evolution from lithospheric to sub-lithospheric potassic liquids with sulfide droplets in Wudalianchi, NE China

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On the diagram of uranogenic leads, we define 1.88 Byr locus of lithospheric sources for low-Mg rocks from Wudalianchi and a non-lithospheric recently homogenized material (referred to the Molabu source) for moderate-Mg rocks. Lithosphere-derived liquids were characteristic of the initial Laoshantou and Old Gelaqiushan lava flows erupted along a north-south volcanic line 2.5–2.0 Myr ago. Due to eastward expansion of the Wudalianchi melting anomaly, its NNE limit was designated by lithosphere-derived liquids erupted in North Gelaqiushan and Weishan volcanoes between 0.6 and 0.4 Myr ago. In the evolution of the melting anomaly, other volcanoes showed compositions derived due to mixing lithospheric and non-lithospheric components. The only exception was moderate-Mg rocks from East Longmenshan volcano that yielded peculiar compositions modified after liquids from the Molabu source. Decreasing Pb, S, and Ni abundances, Ni/Co, Ni/MgO ratios as well as increasing $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, Ce/Pb, Th/Pb, and U/Pb ratios are indicative for liquids likely affected by segregating small amounts of sulfide droplets. We infer that the Wudalianchi melting anomaly was firstly generated in the lithosphere and was evolved to melting of the sub-lithospheric medium.

This work is supported by the RSF grant 18-77-10027.