Causes for anamolous oxygen and strontium isotope compostions of marbles from Skallen, East Antactica

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Coupled oxygen and strontium isotope studies can elucidate fluid-rock history as well as clues for metamorphic processes in the continental crust. Advective fluid infiltration, diffusion and dissolution/reprecipitation are the major fluid-rock interaction processes related with regional metamorphism, which influence the rheology and material transport in the deep crust. It is therefore significant to quantify the role of fluids in the deep crust. In this study, we have found gigantic oxygen isotope variation in grain scale, and large scale alteration of the strontium isotopic composition in regionally metamorphosed carbonates that are interlayered with metasedimentary rocks from Lutzow-Holm Bay region of the East Antarctic Shield.

The rock types of this region comprises of orthopyroxene-granulites (charnockites), garnet-biotite gniesses, aluminous metapelites, metacarbonates and quartzites, metamorphosed at around 760-830°C and 7-8 kbar during Pan-African orogeny following a clockwise P-T path. The metacarbonate rocks are separated from adjoining metapelitic rocks by decimeter scale coarse grained skarn zones of calc-silicate minerals, such as phlogopite, spinel and scapolite. Millimeter to micrometer scale oxygen isotope investigation in several pure calcitic marble samples, indicates more than 10‰ variation in sub-millimeter scale, corresponding to grain boundary migration of aqueous fluids having a meteoric component. Micrometer scale stable isotope profile across grain boundaries suggest to a dissolution-re-precipitation mechanism for the constant depleted part whereas a smooth diffusion profile is observed between the original core and the re-precipitated rim.

Strontium isotope composition of calcite from exactly the same loci of marble slabs for stable isotope measurements gave surprisingly high $^{87}Sr/^{86}Sr$ ratios (0.72484 ~ 0.72556), suggesting a complete resetting of the original carbonate sedimentary signatures (“normal” marble in the same tectonic block ~ 200 km away is 0.70731). The scenario for large scale isotope resetting can be related with the interaction of deep circulating surface fluids along lithological contacts, interacting with metapelitic rocks. The gigantic heterogeneity in oxygen isotope values, limited but coupled variations observed in carbon isotope values and the complete resetting of strontium isotope ratios, thus, suggests the independence of fluid enhanced recrystallization and diffusion rates for respective isotope system.

Cenozoic volcanism inner Sikhote Alin, Khingan, and Stanovoy in Far East Russia

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Introduction

The Cenozoic magmatism in Sikhote Alin is important to think about the Japan sea opening that the region was attached to the NE Japan arc. In order to document the magmatic activity more comprehensively, the analyses will cover in the inner Sikhote Alin, Khingan and Stanovoy. For comparing previous works, which focused solely on the coastal range, it is able to be discussed a linkage between an intraplate magmatism and a backarc opening event.

Result and Discussions

K-Ar ages and major/trace element compositions were obtained from 12 fresh lavas from the inner Sikhote Alin, Khingan and Stanovoy, Far East Russia, in order to document the secular variation in volcanism and upper mantle process. This region is distinct in that it was the home of the NE Japan arc sliver before the opening of the Japan Sea backarc basin. Also, the distribution of lavas from the coastal region versus the inner continent is the characteristic feature of this region. Cenozoic intraplate volcanism can be including local volcanic provinces, that is, the inner Sikhote Alin, Khingan and Stanovoy. Inner continental volcanisms have been little active in this hiatus interval during 25-20 Ma, and the volcanism is active little longer than the costal side during 20-1 Ma. However, the costal side volcanism in the north Sikhote Alin took place during 40-25 Ma and 20-5 Ma, and was separated by a marked hiatus in volcanism during 25-20 Ma, which is synchronous to the period of the major opening event.

Summary

It should be stressed that the volcanic activity during the pre-opening stage of the Eastern margin of Asia occurred in the entire inner continent of East Asia, whereas volcanism in the inner continent during 25-1 Ma. An arc-like signature may not suggest the location of an arc-trench system in this region. In particular, the volcanism during 20-1 Ma exhibits spot-like signatures appeared including some costal side of Sikhote Alin and inner continent. Intraplate-type lavas with typical hotspot magma compositions typify the inner continent volcanism and may be caused by mantle upwelling beneath the Cenozoic intraplate basalt province in the northeast China and Far East south Russia.