Special Seminar 特別セミナー

日時：3月14日14時から 14:00 p.m. on March 14th

場所： 地学棟503号室 Geoscience Building Room 503

Boron mobility and isotopic fractionation during the first 50 km of sediment subduction and dehydration in the Nankai Trough, Japan

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Subduction zones are the primary locus for recycling of crustal material into the Earth's mantle, with important implications for mantle and crustal evolution. Subducted sediments contribute volatiles, trace elements, and unique isotopic signatures to arc magmas and some mantle domains. While some elements appear to be conservative during sediment subduction, others may be mobilized and isotopically fractionated during the first several tens of kilometers of subduction - well before reaching sub-arc depths. Characterization of the geochemical processes occurring in this early stage of subduction is relatively limited and largely based on the compositions of fluids expelled from the accretionary prism. In order to better understand the life cycle of boron as it is processed through the subduction system, B concentrations and isotope ratios were measured in a suite of greenschist-facies mudrocks from the Shimanto Belt, Shikoku Island, Japan, and compared with existing data for higher grade pelitic schists from the nearby Sanbagawa Belt. The mudrocks and schists represent pelagic and neritic sediments from the Nankai Trough that have been partially subducted, underplated, and exhumed. As a counterpoint to the mobile and potentially fractionated boron isotopes, Pb isotopes (which are not expected to be fractionated by shallow subduction processes) were used to ensure that the sediments studied were derived from a homogeneous source. Peak temperatures of 140–280˚C in the mudrocks are constrained by offshore vitrinite reflectance studies, while peak temperatures of 300–500˚C are constrained by geothermometry in the schists. We find that $\delta^{11}B$ in the subducted sediment ranges from –6.6 to –9.9‰, with a negative correlation between $\delta^{11}B$ and temperature. In contrast, B concentrations show no systematic relationship with temperature. Measured $\delta^{11}B$ of –9.7‰ in the Sanbagawa schist, possibly a high-pressure-temperature analog of the Shimanto shale, is consistent with previous studies and suggests an evolution toward lighter boron in the solid residue with progressive dehydration. However, $^{208}Pb/^{204}Pb$ and $^{207}Pb/^{204}Pb$ ratios suggest that the pelitic schist analyzed in this study was not derived from the same source rock as the Shimanto shale. Further work is needed to determine if there exists an appropriate analog in the Sanbagawa Belt for high-temperature (300–500˚C) evolution of the Shimanto shale.

どなたでも参加できます。Contact person: Tatsuki Tsujimori or Takeshi Kakegawa