

# Evidence for slab melt/mantle reaction from the Early Cretaceous and Eocene high-Mg andesites, Kitakami Mountains, Japan

# Nobutaka Tsuchiya[1]

[1] Dept. Geology, Iwate Univ.

Lower Cretaceous and Eocene igneous rocks in the Kitakami Mountains, northeast Japan, attract special interest because of the occurrence of adakitic rocks (Tsuchiya and Kanisawa, 1994). In addition, high-Mg andesites (HMAs) were discovered from the Lower Cretaceous dike rocks and from the Eocene Jodogahama rhyolitic rocks in the Kitakami Mountains. The petrogenesis of the HMAs and adakites in the Kitakami Mountains is of particular importance to understanding slab melt/mantle reaction and further the evolution of continental crust.

The Lower Cretaceous HMAs occur as several small dikes (less than 5 m thick, rarely up to 70 m) from Ubaishi, Shizugawa, Numazu, and Oshika, southern Kitakami Mountains. Among these HMAs, the HMA dike from Gongen, Shizugawa, characteristically contains ultramafic inclusions. These dikes intrude slightly older than the Lower Cretaceous plutonic rocks (ca. 120 Ma) in the Kitakami Mountains. Eocene HMA occurs only in Matsuhashi, Iwaizumi, northern Kitakami Mountains, and is associated with hornblende rhyolite belonging to the Eocene Jodogahama rhyolitic rocks. The Matsuhashi HMA is a small intrusive mass (observed maximum diameter is 300 m) consisting of aphyric andesite and olivine andesite.

The Lower Cretaceous and Eocene HMAs show similar petrochemical characteristics to those of Cenozoic adakite (high LREE/HREE ratios and Sr contents, low Y and HREE contents; e.g., Defant and Drummond, 1990) except higher Cr, Ni, and Mg contents. In addition, the Eocene HMAs and the ultramafic inclusions in the Lower Cretaceous HMAs show less radiogenic Nd-Sr isotopic characteristics than those from the adakitic granites in Kitakami, and similar to those of the Cenozoic adakite. On the other hand, the Miocene Setouchi HMAs in southwestern Japan (e.g., Tatsumi et al., 2001) are characterized by lower Sr/Y ratios, less fractionated REE patterns, weak negative Eu anomalies, and more radiogenic Nd-Sr isotopic characteristics than those of Cenozoic adakite.

The ultramafic inclusions from Gongen has clinopyroxene characterized by high Sr concentrations and high LREE/HREE ratios. These clinopyroxenes are considered to be crystallized during interaction of slab derived adakitic melt with overlying wedge mantle. The olivine phenocrysts of the Eocene HMA show extremely high NiO contents (maximum 0.58 wt%), which may be an evidence for slab melt/mantle reaction. Concludingly, the petrochemical features of HMA magmas in Kitakami can be explained by reaction of slab derived adakitic melt with overlying mantle peridotite to equilibrate with mantle olivine. The difference between the chemical compositions of the Kitakami and Setouchi HMAs can be explained by the difference in compositions of initial slab melt resulted from the difference in depth of slab melting.