Early Cretaceous forearc volcanism related to ridge subduction in the Kitakami Mountains, Japan

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Subduction of a thermally-active oceanic spreading ridge must give abrupt change in thermal structure of subduction zone, which might result in various chemical compositions of arc magmas. The Lower Cretaceous igneous rocks in the Kitakami Mountains, Northeast Japan, related to westward subduction along the eastern margin of the East Asian continent, consist mainly of calc-alkaline (rarely tholeiitic) rocks, adakitic granites, and sporadic shoshonitic rocks (Tsuchiya and Kanisawa 1994). Since the presence of adakitic magmas of slab melting origin indicates the subduction of young oceanic crust, the Lower Cretaceous igneous rocks in the Kitakami Mountains is of particular importance to understanding arc magmatism related to ridge subduction.

Lower Cretaceous Harachiyama Formation near Hachinohe, Kitakami Mountains, crops out 1500 to 2000m in total thickness. The Harachiyama Formation consists mainly of hypersthene-olivine-augite basaltic lava and volcanic breccia, biotite dacitic seet, augite dacitic volcanic breccia, and olivine-augite basaltic lava in ascending order. These volcanic rocks, associated with small amounts of intercalated shale and sandstone, dip eastward and are right-side-up. The hypersthene-olivine-augite basaltic lava commonly shows pillow structure. The biotite dacitic seet intrudes into the shale and sandstone with irregular contact, and rarely forms peperite. The olivine-augite basaltic lava commonly occurs as hyaloclastite. These occurrence of the volcanic rocks indicate their submarine origin. The Harachiyama volcanic rocks are made up of bimodal association of tholeiitic basalt and calc-alkaline dacite. Petrochemical features of these rocks are resemble to those of Cenozoic volcanic rocks related to ridge subduction in western California (Cole and Basu, 1995), although the Harachiyama volcanic rocks are slightly poorer in Ti and Nb.