Deep crustal and uppermost mantle lithology of the Honshu arc

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The detailed seismic velocity structure of the Japanese island arc is shown by the recent seismic studies, and the constituent rocks and minerals of the lower crust of the island arc have been estimated by comparing the elastic wave velocity of the rock and the seismic wave velocity. Especially Vp/Vs of rocks and minerals can be determined with high accuracy by simultaneous measurement of P wave velocity (Vp) and S wave velocity (Vs) under high temperature and high pressure conditions. From the comparison of Vp/Vs of rocks and minerals and Vp/Vs tomography detailed constituent rocks and minerals can be inferred. For example, the velocity structure of the lower crust of the Northeast Honshu arc is well correlated with its tectonic history, and the lower crustal lithosphere of the Northeast Honshu arc is divided into three types; (1) pyroxene hornblende gabbro along eastern margin of the Japan Sea, (2) hornblende gabbro beneath Ou Backbone Range and Kitakami Lowland, and (3) large amount of quartz-bearing rock (granitic rocks) beneath Kitakami Belt. The velocity structure of the upper crust of the Northeast Honshu arc also correlates well with its tectonics history. The upper crust of the Oga Peninsula, Ou backborne range and the Kitakami Mountains is characterized by low Vp/Vs, and the upper crust is estimated to be composed of quartz-bearing rock like granitic rocks. In contrast, the upper crust of the Cenozoic Miocene rift areas is characterized by a relatively high Vp/Vs, and the upper crust is interpreted as a mafic crust formed by the Miocene lift activity. The velocity structure of the uppermost mantle of the Northeast Honshu arc also reflects its tectonics. In particular, the uppermost mantle of the Kitakami Belt is characterized by low Vp/Vs, and the uppermost mantle in the Kitakami Belt is presumed to be composed of orthopyroxenite. This is interpreted to be an evidence of mantle metasomatism by reaction with mantle peridotite and silisic melt from Cretaceous slab melting. In this way, it is becoming clear that the constituent rocks of the deep crust and the uppermost mantle of the Northeast Honshu arc are heterogeneous than previously thought. In this presentation, the constituent rocks of the lower crust and the upper mantle of the Japan arc will be discussed.

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