Vp, Vs and Poisson`s ratio images beneath Japan Islands and their relationship to seismic and volcanic activity

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We have attempted to determine Vp, Vs and Poisson's ratio structures beneath the Japan Islands by applying the tomographic method of Zhao et al. (1992) to 80,364 P-wave and 27,340 S-wave arrival times from 3717 local

earthquakes recorded by the Japan University Seismic Network. Significant variations amounting to 6% for the velocity and 10% for Poisson's ratio are revealed in the crust and the uppermost mantle beneath Japan Islands. In the lower crust and the uppermost mantle, prominent low-velocity and high Poisson's ratio zones are visible beneath active arc volcanoes, which may represent magma-related partial melting bodies and may result from the dehydration reactions of the subducting Pacific and Philippine Sea slabs and the convective circulations of the mantle wedge.

So far many researchers have studied the P-wave velocity structure beneath the Japan Islands using seismic tomography methods. However, very few studies of S-wave velocity and Poisson's ratio structures have been carried out in this tectonically active island arc system. Investigations of S-wave velocity and Poisson's ratio structures can provide important constraints on the

interpretation of the obtained tomographic images. For this reason, in this work we have attempted to determine Vp, Vs and Poisson's ratio structures beneath the Japan Islands by applying the tomographic method of Zhao et al. (1992) to 80,364 P-wave and 27,340 S-wave arrival times from 3717 local

earthquakes recorded by the Japan University Seismic Network. A grid net with a spacing of about 33 km in the horizontal directions and 10-30 km in depth was set up in the study area. New and reliable information on the 3-D crustal and upper mantle structure under Japan has been obtained, which have important implications for the active volcanism and seismotectonics in this region.

Significant variations amounting to 6% for the velocity and 10% for Poisson's ratio are revealed in the crust and the uppermost mantle beneath Japan Islands. In the lower crust and the uppermost mantle, prominent low-velocity and high Poisson's ratio zones are visible beneath active arc volcanoes, which may represent magma-related partial melting bodies and may result from the

dehydration reactions of the subducting Pacific and Philippine Sea slabs and the convective circulations of the mantle wedge. Intermediate-depth and deep earthquakes occur within the high-velocity subducting slabs. Large crustal earthquakes are found to locate around the low-velocity zones in the crust and the uppermost mantle, which may represent weak sections of the seismogenic crust. The crustal weakening may be caused by active volcanoes, arc magma and fluids.