Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SIT02-01 会場:211 時間:4 月 29 日 14:15-14:30

スラブ脱水，稍深発地震，島弧マグマ活動
Slab dehydration, intermediate-depth earthquakes, and arc magmatism: A review of seismological observations

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We review recent seismological observations beneath the Japanese Islands and show important roles of geofluids on seismogenesis at intermediate depths and arc magmatism.

Seismicity in the subducting crust of cold slabs is most active at depths of 70-90 km, where seismic velocity in the crust abruptly increases, suggesting that high pore pressures generated as a result of dehydration reactions in the crust facilitate intermediate-depth seismicity. In contrast, seismicity is almost absent in the subducting crust of warm slabs like Cascadia and Nankai. The aseismic crust may be explained by slow dehydration rates in warm slabs, which cannot increase pore pressures effectively.

Magmatism beneath the arc has been discussed in terms of the heterogeneities in seismic velocities together with geochemical and petrological constraints. We recently developed simple but useful method to estimate seismic attenuation structures and applied it to waveform data in NE Japan. Seismic attenuation provides additional insights into ongoing magmatic processes in subduction zones, because higher-temperature environments or the existence of fluids may have different effects on seismic attenuation from on seismic velocity. The obtained results show that a depth profile of Qp?1 in the back-arc mantle is explained by attenuation expected for a two-dimensional (2-D) thermal model. However, an inclined high-attenuation zone observed in the back-arc mantle wedge, which is interpreted as an upwelling flow, shows higher attenuation than that calculated from the 2-D thermal model. The higher seismic attenuation is probably caused by the concentration of partial melt in the upwelling flow. Our results further imply the breakdown of hydrous minerals in a hydrous layer above the Pacific plate at a depth of ˜120 km.
Keywords: dehydration, pore pressure, eclogitization, seismic attenuation