Distribution of slab-fluids around the edge of the Philippine Sea Plate in Central to Northeast Japan

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Marginal parts and edges of a plate and subducting slab may play important roles in geodynanmics, because those are the places where the plate interacts with other plates or with the mantle: Thermal, geochemical and mechanical interactions are expected. The Philippine Sea slab (PHS slab) that subducts beneath the Japan arcs has such an edge. To examine the relationship between the arc magmatism and the slab edge in the transition zone from Northeast Japan to Central Japan, we have investigated isotopic systematics of the volcanic rocks in the area, including both the data from literature and the new data for five isotopic ratios of Sr, Nd and Pb. The new data include major element compositions of 22 samples from the back-arc area where a few petrological data were available and five isotopic ratios for the selected 6 samples from Pleistocene to early Quaternary epoch. As a result, a detailed spatial variation of the isotopic ratios can be discussed for Northeast to Central Japan. On the basis of the spatial variation of the isotopic ratios and the estimated amount of slab-derived fluid, we found (1) the amount of fluid derived from the two subducting slabs (i.e., the Pacific slab and the Philippine Sea slab) decreases from a significantly high value (~5 wt.% fluid added to the source mantle) to the north away from the seismically determined edge of the PHS slab, (2) the proportion of the PHS component in the total slab-derived fluid also decays northward, and (3) the PHS component spreads to the north beyond the edge of PHS slab. These observations strongly suggest that the aseismic Philippine Sea slab exists beneath the southernmost Northeast Japan to deliver the PHS component to the arc magmatism. In addition, the double subduction of the two slabs generate enhanced suction force at the corner region near the edge of PHS slab, which may account for the fluid focusing as described (1) above.

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