

Contribution of slab-fluid in arc magmas beneath adjacent Japan arcs

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Water is the most important material in magmatism at the convergent margins for its unique functions, e.g., decreasing mantle viscosity and melting temperature. Identifying the amount of water and its variation is the key to quantifying processes in the mantle wedge and provides a better understanding of volatile recycling processes. Here we show the distribution of 'slab-fluid' which dehydrates from the subducting slab and metasomatizes the overlying mantle wedge in the adjacent Japan arcs. We find that the amount of slab-fluid added to mantle wedge has a spatial variation with reference to the depth of the Wadati-Benioff zone, and the proportion of subducted materials in the Pacific plate which contribute to generate a slab-fluid is different in each arc. The contribution of sediment involved in the slab-fluid is dominant in Northeast Japan Arc compared to Izu-Bonin and Central Japan Arcs. This could be attributed to fractures well-developed along the surface of subducting Pacific slab, which may trap and transport sediments smoothly into the deeper mantle. Tectonic and mechanical structure of subducting plate may control the proportion of sediment in slab-fluid. These results suggest that dehydration of the subducting materials is controlled not only by the thermal conditions of mantle wedge and slab but also by the tectonic and mechanical features of the subducting slab.