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Slab dehydration and melt generation in subduction zones

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Volcanic and seismic activities in subduction zones are the result of complex interaction of geophysical and geochemical processes. I have investigated the hydration and dehydration and the generation and transportation of melt in subducting slab and adjacent mantle wedge using a numerical model. The model includes hydration and dehydration of the slab and mantle wedge, melting and solidification of mantle peridotites, permeable flow of melt and aqueous fluids, and temperature-dependent solid flow of mantle peridotites with water- and melt-induced weakening. In addition to these processes, I will discuss in particular the effect of fractional melting on melt distribution and composition. The model shows the following features. 1) Lherzolite flows into mantle wedge from back-arc side and harzburgite subducts with slab after segregation of melt under the arc. 2) Melt composition and melt fraction vary spatially and are controlled by the degree of mantle depletion and the amount of water supplied by slab dehydration. I will also discuss the effects of water content of the subducting oceanic crust and mantle on the melt distribution.

Keywords: subduction zones, slab dehydration, fractional melting