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Contrasting origin and PT-paths of serpentinites in subduction channel melanges: insight from numerical modeling

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To study the influence of variation in lithological structures of incoming plate on origins of coexisting serpentinite blocks composing subduction channel mélange we use coupled petrological-termomechanical 2D model of subduction. To simulate realistic conditions in subduction zone we have implemented fluid release from the slab, hydration and partial melting of mantle wedge and also spontaneous slab bending to the code. Two types of incoming plate were tested: (1) crust composed of homogenous layers of basalt gabbro and serpentinite (classic slab composition); (2) fragmented basaltic and gabbroic crust sank in serpentinite matrix (represents subduction of fossil slow-spreading ridge). Results from numerical simulations indicate strong influence of incoming plate geometry on serpentinization processes in subduction channel. In the first case (strong, homogenous layers in the crust) the only source for serpentinite appearing in subduction channel mélange is depleted overriding plate, as gabbroic and basaltic layers prevent slab serpentinite from penetration in to subduction channel and the fluid release is restricted due to limited water amount in the slab. In the second investigated case (fragmented incoming plate) serpentinited blocks in the subduction channel mélange have three different origins: (1) serpentinites derived from the top of subducting plate, (2) serpentinites produced by hydration of overriding plate lithosphere during subduction and (3) serpentinized rocks of quenched thermal-chemical mantle wedge plumes.

According to our experiments PT histories (and presumably geochemical signatures)

of these different types of serpentinites are significantly different which can be possibly distinguished in natural serpentinite mélanges.