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Geochemical interaction between subducting slab and mantle wedge:Insight from observation and numerical modelling

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Understanding the subduction factory and geochemical interactions between subducting slab and the overlying non homogeneously depleted mantle wedge requires better knowledge of passways of slab-derived fluids and melts and their interactions with the melt source in the mantle wedge.

Our approach of understanding subduction-related processes consists in coupled geochemical-petrological-thermomechanical numerical geodynamic modelling of subduction zones. With this method we can simulate and visualize the evolution of various fields such as temperature, pressure, melt production etc. Furthermore we extend this tool for 2D and 3D modelling of the evolution of various geochemical signatures in subduction zones.

Implementation of geochemical signatures in numerical models is based on marker-in-cell method and allows capturing influences of various key processes such as mechanical mixing of crustal and mantle rocks, fluid release, transport and consuming and melt generation and extraction. Concerning the isotopic signatures, we focus at the first stage on a limited number of elements: Pb, Hf, Sr and Nd. These incompatible elements are transported by hydrated fluids and/or melts through the mantle wedge and therefore they are good tracers for presenting the interaction between mantle wedge and slab. The chosen incompatible elements are also well explored and a large data set is available from literature. At this stage we focus on intra-oceanic subduction and numerical modelling predictions are compared to natural geochemical data from various modern and fossil subduction zones (Aleutian, Marianas, New Britain, Kermadec arcs, Kohistan, Vanuatu).