Slab factory – ocean formation and subduction in the Western Alps

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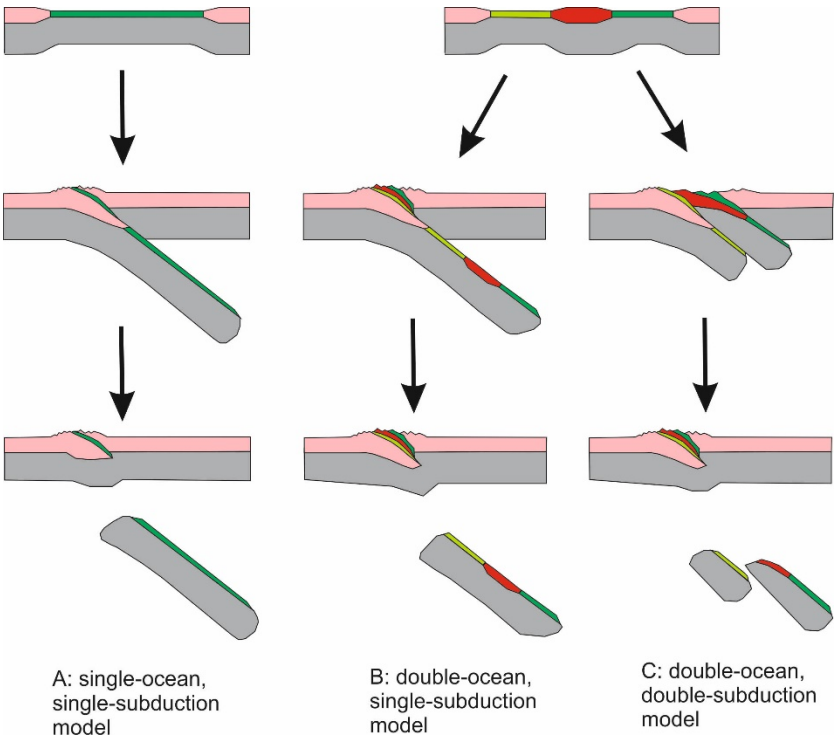
The deep structure of the Alps has been modified by subducted slabs of lithosphere which are imaged by seismic methods in the framework of AlpArray. During subduction, slivers of oceanic crust (ophiolites) were sheared off from oceanic slabs and became part of the collisional stack of thrust sheets exposed at the Earth's surface. These carry important information about the history of ocean formation, subduction, and collision. We study ophiolites and fragments of continental margins in the arc of the Western Alps using a combination of structural geology, U-Pb zircon dating of metagabbros (to determine the age of oceanic spreading) and Lu-Hf garnet dating of eclogites and blueschists (to determine the age of subduction). Using these new data together with the large amount of already existing data, the kinematics of ocean-basin opening and subduction are reconstructed and predictions are made for the nature of subducted slabs in order to support the interpretation of lithospheric structures recorded by AlpArray and serve as input for models of the tectonic evolution. These results will be particularly important for understanding the southern end of the Western Alps and transition into the Apennines and Ligurian Sea, the subject of AF-B (LOBSTER). In collaboration with the AF-B projects, we will reconstruct the kinematic evolution of the Alps-Apennines transition.

The project deals with Research Themes 1 (Reorganizations of the lithosphere) and 3 (Deformation of crust and mantle).



Schematic sketches of different paleogeographic situations (upper panel), subduction geometries (middle panel), and resulting slab geometries after slab break-off (lower panel). The sketches do not depict specific stages in the tectonic evolution of the Alps, but rather show in a general way how lithospheric slabs are related to basin paleogeography and subduction geometry. Model (A) results in one oceanic slab, model (B) in one mixed oceanic-continental slab, and model (C) in two slabs, one oceanic and one mixed oceanic-continental. Grey - mantle lithosphere; dark green and light green - oceanic crust; pink - continental crust of major continents; red - continental crust of a microcontinent.