Geophysical Research Abstracts
Vol. 20, EGU2018-12786, 2018
EGU General Assembly 2018

Factors controlling back-arc extension or overriding plate shortening – a numerical modeling study of ocean-continent subduction systems

Sebastian G. Wolf and Ritske S. Huismans
University of Bergen, Earth Sciences, Bergen, Norway

The crustal structures of overriding plates in subduction settings around the world can vary between a wide range of deformation styles, ranging from extensional structures and back arc opening as in the Tonga or Hellenic subduction zone to large, plateau-like orogens such as the central Andes. Both end member types have been intensively studied over the last decades and a range of hypotheses has been proposed to explain their characteristics. Here we model ocean-continent collision using high resolution, upper mantle scale plane-strain thermo-mechanical models, which also account for phase changes of rocks that enter the eclogite stability field and the phase transition at the 660 km mantle discontinuity. We consider varying plate velocities and back-arc lithospheric strength as the main variables affecting the strain regime of the overriding plate in subduction zones and conducted a sensibility study with those parameters. With our small set of variables we can reproduce both overriding plate extension and shortening and show the dynamics behind those processes. More specifically, we find that the back arc lithospheric strength plays a pivotal role in determining whether and when the overriding plate will deform, and the combination of the absolute subduction and overriding plate velocity determines the type of strain regime in the overriding plate. To verify and discuss our modeling results, we also present a comparison of the models with natural subduction systems.