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# Three-dimensional instantaneous dynamics modeling of present-day Aegean subduction

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The Aegean region (Eastern Mediterranean) has known continuous subduction for at least 100 My (van Hinsbergen et al. 2005), rendering it an ideal candidate for the study of the interaction between crustal tectonics, plate motion, subduction and mantle flow. To better understand this coupling of the tectonic evolution of the crust and the underlying mantle dynamics, we have developed 3D numerical models of the instantaneous dynamics of the present-day Aegean subduction system.

We use the finite element code ASPECT (Kronbichler et al. 2012) and have developed plugins to this code to create complex, realistic model set-ups. The initial and boundary conditions of the instantaneous models are derived from geological and geophysical data. For example, the geometry of the subducting slab is inferred from seismic tomography and the plate boundary configuration is based on tectonics and GPS motions. Moreover, the models incorporate the major crustal weak zones of the overriding plate and crust and lithosphere thickness variations. The mantle initial temperature conditions can include variations to an adiabatic profile from conversion of seismic velocity anomalies. Mantle flow through the model boundaries is either left free through open boundary conditions (Chertova et al. 2012), or is prescribed, as are the bounding plate velocities.

We first test the effect of different tomographic models and conversion methods on model predictions of the regional flow field through the initial temperature conditions. Subsequent models combine representative initial conditions with constructed variations in subduction morphology, slab segmentation, fault zone geometry and boundary conditions, for which a wide range of hypotheses can be found in the literature. By comparing the resulting model predictions of velocity, stress and strain- and rotation rates to the widely available observations, such as focal mechanisms, GPS velocities and seismic anisotropy, we aim at determining the controls of mantle dynamics on present-day tectonic deformation in the Aegean region. This enables us to characterize the general sensitivity of surface observables to plate motions, mantle flow and slab dynamics and, thus, to quantify the coupling of crust and mantle dynamics.

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