



Mantle forcing of Earth surface evolution in Europe and the Mediterranean: From Past to Present (TOPO-4D)

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TOPO-4D is one of the TOPO-EUROPE EUROCORES programs. At the meeting a brief overview will be presented of results obtained in the first 2 years of TOPO-4D.

The scientific rational of TOPO-4D is as follows. Surface deformation, in particular topography evolution, results from a complex coupled dynamic system in which mantle processes interact with surface processes. The impact of mantle processes on surface deformation is perhaps conceptually well understood but largely lacks thorough quantification. As a result, it is in many cases impossible to discriminate between mantle-induced and surface-induced contributions to surface deformation. Any progress in understanding present-day topography and topography evolution, and progress in making correct interpretations of valuable surface observables requires quantification of real-Earth mantle dynamics and of the surface response. The European-Mediterranean region is a well-studied natural laboratory for which this progress can now be made and this is what our Collaborative Research Program TOPO-4D aims at.

Our application to Europe comprises (1) modelling of the instantaneous dynamic state of the crust-mantle system (Present) linking P- and S-wave tomography models to stress-, strain-rate, and the mantle flow field, (2) the link between the European plate and underlying mantle through time (e.g. past 100 Myr; Past), evolution of dynamic topography resulting from global convection currents, and detailed modelling of surface evolution resulting from Mediterranean subduction systems and their impacts on surface change of the plate interior (Past to Present). We aim to understand interactions between mantle currents and slabs and to isolate topographic effects of these interactions for major plate-tectonic processes (such as subduction, collision, slab retreat and detachment, intraplate uplift) involved into the geodynamic development of Europe in the past and at present.