GEODYNAMIC CONSTRAINTS ON MANTLE FLOW PATTERNS BENEATH THE ALPS

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The geodynamics of the Alps remains matter of debate and over the last decades many of the geophysical studies have highlighted the potential structure of the Alps at depth (from tomography, seismic anisotopry etc), with more data to come from the AlpArray project. Yet, interpreting this data in a dynamic manner is non-straightforward and requires 3D geodynamics models. Moreover, different tomographic models have come up with different solutions and it is unclear which of those fit the data best.

Here we employ 3D geodynamic models of the upper mantle and crust of the Alps and surrounding regions to study several scenarios of the present-day configuration of slabs and lithosphere at depth to understand whether differences in slab polarity or geometry cause differences in the mantle flow patterns.

Our model setup consists of two plates, Adria and Europe, both composed of an upper crust, lower crust and lithospheric mantle. The interface geometries are taken from the Eu-crust07 model. Below the lithosphere, three end-members configurations of the slab have been tested: (1) one slab attached, (2) one slab partly detached below the western Alps and (3) two slabs with opposite vergence. The densities of the different layers have been constrained by a gravity inversion method. The three slab geometry lead to distinct mantle and surface velocity patterns as well as in different crustal stress fields. We will show a detailed comparison of the various end-member models, and highlight in which areas the differences are largest and future which would thus be ideal target areas for future seismological studies.