Geophysical Research Abstracts
Vol. 19, EGU2017-18044, 2017
EGU General Assembly 2017

Crust-mantle decoupling in the Alps, Carpathians, Dinarides and Hellenides - the next targets of AlpArray?

Mark R. Handy (1), Eduard Kissling (2), Wim Spakman (3), Kamil Ustaszewski (4), Eline Le Breton (5), and Joerg Giese (6)

(1) Freie Univ. Berlin, Dept. Earth Sciences, Berlin, Germany (mark.handy@fu-berlin.de), (2) ETH-Zürich, Institut f. Geophysik, Zürich, Switzerland (kissling@tomo.ig.erdw.ethz.ch), (3) Vening Meinesz School of Geodynamics, Inst. Earth Sciences, Utrecht (wims@geo.uu.nl), (4) Inst. Geol. Sci., Friedrich-Schiller Univ. Jena (kamil.u@uni-jena.de), (5) Freie Univ. Berlin, Dept. Earth Sciences, Berlin, Germany (eline.lebreton@fu-berlin.de), (6) Freie Univ. Berlin, Dept. Earth Sciences, Berlin, Germany (joerg.giese@fu-berlin.de)

The junctions of the Alps, Carpathians, Dinarides and Hellenides have disparate subsurface and surface structures that indicate decoupling of the crust and lithospheric mantle during Adria-Europe convergence. The complexity of subsurface structures at these orogenic junctions make them inviting targets for the next generation of integrated seismological-structural studies.

Travel-time and receiver-function tomography at the Alps-Carpathians junction suggest that the NE-dipping "Lippitsch" positive anomaly beneath the Eastern Alps may connect eastward to a subvertical positive anomaly reaching down to the Mantle Transition Zone beneath the Pannonian Basin. The length of this slab-like anomaly exceeds known Neogene shortening in the overlying crust which is masked by Miocene Pannonian upper-plate extension. This suggests that either Neogene N-S shortening in the eastern Alps, western Carpathians and northern Dinarides has been underestimated and/or that this anomaly is an amalgam of subduction of both European and Adriatic lithospheres; these may have melded during a Miocene switch in subduction polarity beneath the eastern Alps. Neogene crustal deformation north of the Periadriatic Fault in the Tauern Window (Austria) involved north-directed crustal wedging and eastward orogenic escape, whereas south of this fault deformation involved large ($\leq 130°$) clockwise block rotations, S-directed thrusting and overturned Eocene Dinaric thrusts (Medvenica mountains, northern Croatia).

Most global P-wave tomographic models indicate no Adriatic slab anomaly in the northern Dinarides and only a short ($\leq$ 150 km long) NE-dipping anomaly in the southern Dinarides. The short length probably reflects the obliquity of Neogene Adria-Europe convergence, whereas the lack of an anomaly may be due to thermal erosion during asthenospheric flow since late Paleogene slab delamination or breakoff.

At the Dinarides-Hellenides junction, the NE-dipping Adriatic slab has retreated SW-ward since this breakoff event, as indicated in cross sections by offset between the slab anomaly and the Sava suture. This junction is marked by orogen-parallel and –normal extension, and clockwise block rotation localized along a normal fault oriented transverse to the orogen (Shkoder-Peja Normal Fault, SPNF). Faulting has been active since mid-Miocene time according to clastics in the hangingwall of the SPNF, earthquake focal mechanisms and GPS motion vectors. The junction has been interpreted as a hinge zone at the NW end of the Hellenic arc that links arc-parallel extension to Adriatic subduction during radial expansion of the SW-retreating Hellenides.