



What's moving Vrancea?

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The Vrancea region in the South-East Carpathians of Romania is the last remainder of subduction-strike slip tectonics along the Alpine-Carpathian-Pannonian region. Here, a subducted slab is imaged by seismic tomography, coincident with up to magnitude 7.5 earthquakes in the depth range 70-180 km. Focal mechanisms show vertical extension in the slab, indicating that the slab is mechanically continuous and that break-off is not complete.

Regional GPS measurements were instituted in 1995 specifically to record the seismic and tectonic evidence of the ongoing slab detachment process. The current GPS network consists of more than 50 campaign points and six permanent GPS stations and is operated by ISES (Netherlands) in collaboration with SFB-461 (Germany), the National Institute for Earth Physics (Romania), and the University of Bucharest (Romania). Our most recent GPS solution shows horizontal velocities relative to stable Europe of less than 1.5 cm/year in variable directions.

We separately investigate post-seismic relaxation and slab-related processes as possible causes for the observed velocity field. To evaluate the potential contribution by post-seismic relaxation of the 1977 (Mw=7.5), 1986 (Mw=7.2) and 1990 (Mw=6.9) events we evaluate a three-dimensional finite element model with a slab geometry that is appropriate for the region. We consider a wide range of models with realistic rheologies to conclude that the current contribution of post-seismic relaxation to the observed horizontal velocity field is below the noise level of the data.

Contributions to the surface velocity field that we next investigate are based on various suggestions in the literature of (partial) detachment of the subducted lithosphere, and on lithosphere failure related to the finite width of the Vrancea slab (STEPs). Finite

element models are designed to test these suggestions. We show the fit of modeled and observed velocity fields.