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Tomographic Vp and Vs images in the area of the Southeast Carpathians in Romania

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P and S first arrivals from 183 seismic local events and from two seismic refraction experiments have been re-analysed in order to provide new insights into the post-collisional processes of descending slab in the area of the southeast Carpathians in Romania. Geological and geophysical studies of this area are driven by the existence of intense earthquake activity in a remarkably confined volume, restricted to a surface area of about 30 by 80 km (Wenzel et al., 1998).

The data-sets are part of three multi-disciplinary projects: the CALIXTO (Carpathian Arc Lithosphere X Tomography, EOS, 1998), VRANCEA99 (Hauser et al., 2000) and VRANCEA 2001 (Landes et al., 2004) carried out respectively from May to November 1999 and between August and September 2001.

Information from a previous high-resolution teleseismic tomography (Martin and Ritter, 2005) allow us to build the starting models. The models cover a volume of 230 x 230 x 230 km^3 and contain both shallow small-scale heterogeneities and large-scale structures down to the asthenospheric level. Hence, we obtain our final distribution of Vp and Vs in four main steps. 1) The a priori models are used for the localization of the seismic events with the NonLinLoc location program (Lomax et al., 2000). The used Grid-Search algorithm performs successively finer, systematic, grid searches centred on the previous minimum misfit hypocenter, in order to obtain each time a misfit function, an optimal hypocenter and an estimate of the associated PDF. The location is centred on the maximum PDF node. 2) The shallower velocity structures, down to 10 km of depth are modelled with the refraction data. 3) The localized events are considered as fixed source points and the inversion of seismic traveltimes is performed with the methodology proposed by Tondi and de Franco (2005). The mathematical formu-

lation of this travel time inversion algorithm enables us to control the proliferation of caustics and arrivals during the iterations, which is a common problem when using ray-tracing techniques with realistic heterogeneous models. 4) Eventually, the events are relocated with the updated 3-D velocity model and the whole process is repeated until the discrepancies between two subsequent localizations is sufficiently small. The synthetic tests show the resolution power of the data-set and the limits of a seismic travel times inversion, when dealing with an uneven distribution of sources.