Solid Earth Discuss., 6, C760–C765, 2014
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Solid Earth
Discussions



# *Interactive comment on* "Upper mantle structure around the Trans-European Suture Zone obtained by teleseismic tomography" *by* I. Janutyte et al.

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We thank Dr. U. Achauer for the constructive comments and present our reply below.

1) For the EEC Artemieva is using all available data resulting from the wide angle reflection and refraction studies by Vinnik & Ryaboy (1981); Garetskii et al. (1990); Grad & Tripolsky (1995); Kostyuchenko et al. (1999); EUROBRIDGE Working Group & EUROBRIDGE'95 (2001); Grad et al. (2002); and Thybo et al. (2003), and the results of P and S wave tomography by Matzel & Grand (2004). Obviously this data is sparse compared to the entire area, and the spatial resolution is questionable, but there was no other data to use.

2) We used both the USGS and the ISC bulletins to make a list of relevant earthquakes

(EQs), but only the location information from the ISC bulletin was used in our study to compile the dataset, because its result is more precise.

3) The sampling frequency was 20 Hz, 50 Hz or 100 Hz depending on type of the data-loggers. Before the picking procedure we defined the criteria of different quality factors (from 1 to 3), and the presented error boundaries seem to be reasonable. However, the picking error for the most of the top quality picks was usually smaller than <0.2 sec, because of good quality of the data and high signal-to-noise ratio.

4) Fig.4 shows the absolute magnitude of the TT and indicates clear change in the trend (from larger to the west to smaller to the east) of the values of TT residuals, however, we agree that the figure does not carry more precise information. We may consider removing it from the manuscript, if advised.

5) We will add the reference Weiland et al (1995) for the TELINV code.

6) Several values of smoothing have been tested, with limited influence on the final results. The value 50 km was selected as a default value corresponding to the spacing between the nodes of the model grid.

7) In our study we performed inversions with both damping values 80 and 120. The results with damping value of 80 shows the higher velocity variations of smaller scale compared to the results obtained using damping value of 120. As we aim to resolve regional (larger) scale variations, we decided to show results with damping value of 120.

8) The crustal model by Majdanski (2012) was compiled using all available information from the deep seismic sounding (DSS) profiles carried out around the area, and the model was used to estimate the crustal TT corrections for the stations covered by this model. As for other territories, there are not so many DSS profiles in Lithuania (see Fig. 1 in this response from Grad et al. paper), thus, we took a constant value from one of the profiles (EUROBRIDGE‘95). In Germany there are more profiles, but not so many

"outlying" stations, thus, we used a constant value as well (from the CELEBRATION profile). Moreover, the model by Grad et al. (2009) (see Fig. 2 in this response from Grad et al. paper) does not contradict to our results for the Moho depth for the easternmost (Lithuania) and the westernmost (Germany) territories of the study area, which are assigned to 32 km and 50 km, respectively, thus, we think that the compiled set of the crustal TT corrections using model by Majdanski (2012) and the DSS results is reasonable and close to optimal. All available refraction profiles have been used to generate this set of crustal corrections, while the model by Grad et al. (2009) is a map of the Moho depth not the "full" crustal model. Talking about the similarity among the presented results without and with different sets of crustal TT corrections (Fig. 7 in paper), one may find general trend of "blue" area in the east and "reddish-bluish" area to the west. The artificial effects from the EUCRUST07 model is obvious while the other set provides more detailed and fine result which is more similar to the result obtained without crustal corrections, however, the amplitudes of the velocity perturbations are somehow different. This result is quite consistent to what we might expect taking into account the previous studies.

9) We agree that checkerboard test alone does not provide full resolution capabilities of the inversion. Thus, to evaluate the resolution we plot the diagonal elements of the resolution matrix as well. Both means enable to define the resolution fairly well. Moreover, we perform a synthetic "geological" test which shows that the dataset (ant the station configuration as well) in general is able to resolve such structures.

10) In Fig 9 we present diagonal elements of the resolution matrix. The Referee is right, we indeed observe considerable vertical smearing in our results which we indicate in Chapters 6 and 7.

11) We agree with the Referee that reasoning may be not correct, and we may consider to change the order in the text: first to indicate the value of observed anomalies and then to present the explanation to what we observe. The anisotropy studies indicate quite high anisotropy in parts of the study area. We are not sure about its effect on the



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velocity contrast, but we assume that the effect (even relatively high) should not exceed 0.5 % of the observed velocity perturbations.

12) In our study we use the "flat-Earth“ transformation.

13) Fig. 4: we may consider removing it from the paper. Fig. 8: different size of the checkerboard boxes were not applied.

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Interactive comment on Solid Earth Discuss., 6, 1723, 2014.



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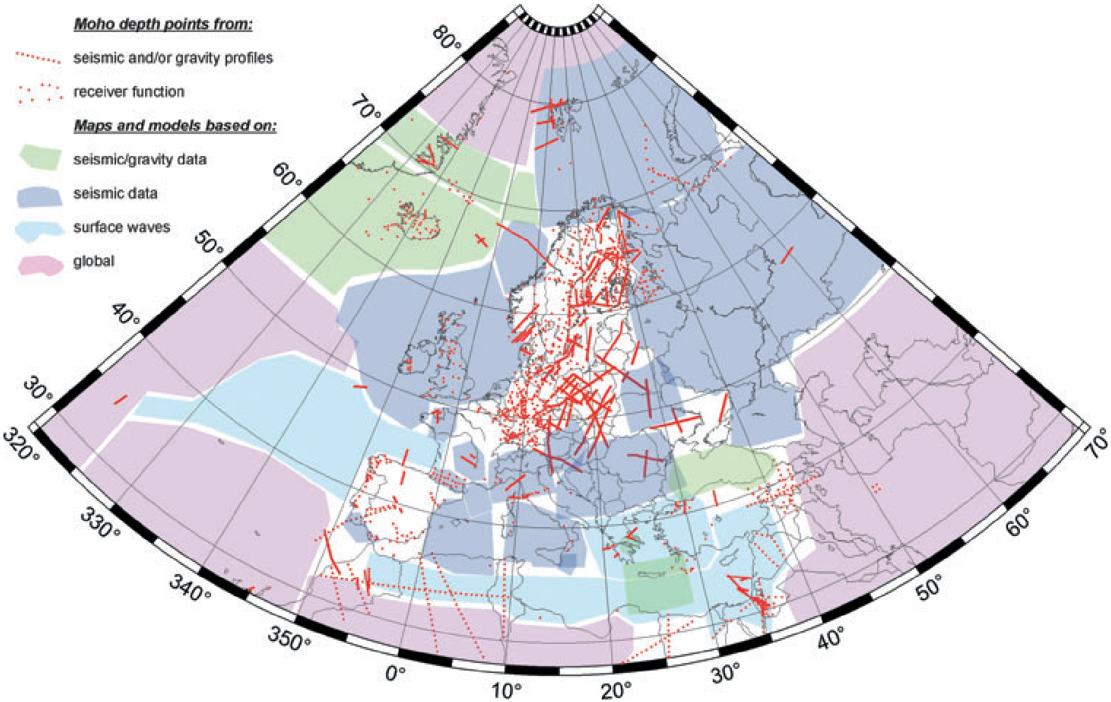


**Fig. 1.** After Grad et al. (2009). Locations of DSS profiles.



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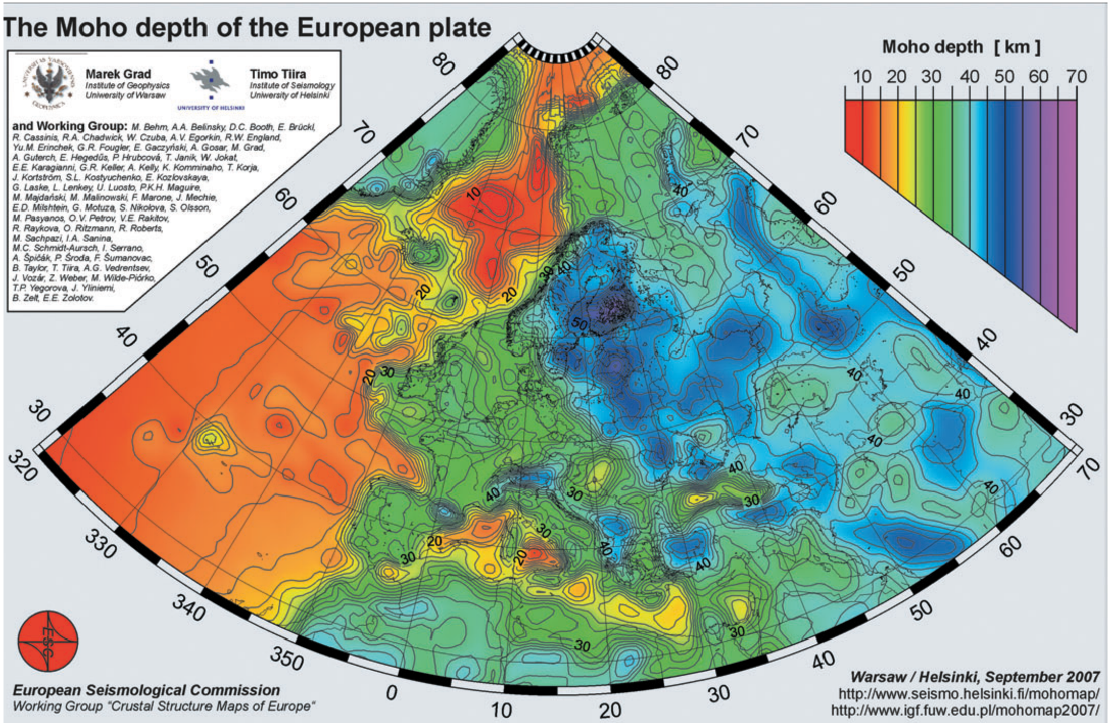


**Fig. 2.** After Grad et al. (2009). The Moho depth map of the European Plate.



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