

Interactive comment on “Seismic LAB or LID? The Baltic Shield case” by M. Grad et al.

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In the title of the article authors put a question “seismic LAB or LID?” and further in conclusions they answer it: “LID beneath the Baltic Shield!”. While reading the paper one may have doubts if authors had enough data for such a definite answer. In my opinion they had not. It does not mean there wasn’t more data available. The authors used temporal selection (10 earthquakes from years 2008-2011). This choice of events, although guaranteed by good records, is absolutely insufficient for defining the structure of upper mantle for such a vast area as Baltic Shield. My concerns are raised especially by a quantity of data. The authors wrote that they had chosen 10 earthquakes and after quantitative analysis, they had erased “poor quality and noisy seismograms” from the sections. They did not mention what was the total number of the analysed records. However sections shown on figures consisted of around 350 analysed records. I realize that it would be difficult to present all the data but this

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amount seems to me precariously small. Lack of seismic data from seismic projects such as FENNOROLA, EUGENO-S, the TOR in the analysis resulted in a significant reduction in the reliability of the final conclusions. Taking into account as far as possible all existing data from a much longer period of time (particularly the use of data from experiments with controlled sources) would allow more accurate determination of the nature of the upper mantle, and I am convinced it would forbid from drawing final conclusions as explicit. Therefore, I believe that if the authors intended to answer the question posed in the title, they should have taken into account data from the projects listed above, make a quantitative analysis and only after this answer the question. That is why I think the article should be rewritten with added discussions on the currently existing views on the structure of the lithosphere presented by other authors, eg. Guggisberg, Hauser, Stangl and others. Both sections and models presented by above mentioned scientists are fundamentally different from the results and ideas delivered by the authors of the paper. More specific remarks: The authors are convinced - on the basis of nine - branches on traveltimes of non-existence of the LAB. Having a very diverse data(both in terms of area, as well as in the scope of registration) does not allow for clear identification of the structure of the upper mantle for such a large area. Excluding the event 10 (registrations to 300 km) for a number of branches on traveltimes, registrations start with more than 500 km (events 2, 3, 7, 9) and even above 1300 km (event 8). This configuration of data limits the statement about distribution of velocity directly beneath Moho. For distances above 1000 km seismic rays carry on information for tens of kilometers below the Moho. Although the authors used the map of Moho (Grad et al. 2011), for the first data on traveltimes they extrapolated wave Pn. This is not always justified. The authors believe that the wave Pn recorded for the distance of 2000 km (Fig. 4b, in the text this is only mentioned) but when it comes to the analysis of individual traveltimes, they separate by themselves the waves in the first impulses on Pn and P waves. Likewise the final provisions of each branch of the traveltimes - many of them end up well before 2000 km (event 1 - 1500km, event 4 -1800km, event 6 - 1600km), which does not allow for precise determination of depth

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and thickness of the potential LAB. Adding to analysis data from FENNOROLA, is of fundamental importance because, for example event 4 is located exactly in the region of SP-I and SP-H and event 5 directly in the region of SP-B. Seismic sections from these shot points are of a rather good quality, from ca 10 km to the distance of well over 1500 km. Presented by Hauser and Stangl (1995) sections of SP-D to North (and not only) have a completely different character in the wave pattern from the section presented by the authors. To this results, it is necessary to respond, in both quantitative and qualitative analysis. Data from other projects, which are omitted by the authors, are data from EUGENO-S (SP-10), which prove interpretations of Hauser, Stangl, Guggisberg. It would be necessary to use also data from BABEL and TOR projects, which would enable wider view on the issue raised in the article. Weakness of data collected: 1. Considerable distances between the events (see Fig. 2) effects in lack of links of the various branches of traveltimes. It would be worth to see a map with marked locations from which the authors had information on the structure of the upper mantle. The final drawing on Fig. 14a is too general. In literature exist several more detailed maps showing thickness of the lithosphere. 2. Uneven distribution is not conducive to a two-dimensional modeling of wave field although it does not preclude it. 3. Other weakness is a significant distance between the experimental points on individual branches (eg on Fig. 12 - between the distances from the event 3 from about 280 km to 550 km, authors have only one experimental point (red dot).) 4. On the presented map the regions of the lithosphere (Fig. 14 a) "navy blue dot" zone was defined on the basis of three stations and three data (Fig. 13). If so, then . . .?! If I misread, I'm sorry but I ask for some explanations. 5. Velocity of reduction in Fig. 8 is rather not 8 km/s, is it? 6. The composition of drawings with sections is inconsistent. Individual sections are presented with additional figures, causing quite much a confusion. In some cases, additional figures are: map, in other synthetic seismograms, in one case the sections P and S, yet another map and histogram, and only one model.

However I am very much interested in results, I expect to see this paper in new version. My suggestion is to take into consideration all the remarks and then send it for

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publishing. Moreover the answer to the question “LAB or LID? - LID beneath the Baltic Shield!” I would treat with more modesty.

Interactive comment on Solid Earth Discuss., 5, 699, 2013.

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