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Interactive comment on "High-precision relocation of seismic sequences above a dipping Moho: the case of the January–February 2014 seismic sequence in Cephalonia Isl. (Greece)" *by* V. K. Karastathis et al.

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Review on the paper by Karastathis et al "High precision relocation of seismic sequences. . ." General impression on the paper:

The topic of the paper is important and it appears to be suitable for presenting in Solid Earth. Indeed, the problem of mislocations of sources due to inadequate velocity model may lead to erroneous interpretation of seismological survey results. The text is clear and fairly well written.

At the same time, I recommend some corrections which may improve the paper. First of all, in my opinion, in the paper there are too many figures. For example, presenting the results for five different velocity models makes their comparison very complicated. It would be easier and clearer if the authors compared only the best 1d and 2d models, and the other 1d models were just mentioned with brief description of the major parameters in a table, for example. I think the authors should clearly separate in the paper the parts related to synthetic modeling and analysis of observed data. I believe that most of the recommendations can be easily implemented without performing new calculations.

Specific comments along the paper:

The first sentence of the abstract does not sound to me. How geometry of a network is associated with boundaries of convergent plates?

P2702 l.7-10: I think two factors, such as misidentification of phases and picking errors, should be separated.

P2704 l.13-14: It sounds paradoxical that weaker events with smaller number of recorded picks are better located than strong ones, and I find this statement not correct. It is obvious that if the number of stations is same, the location accuracy should be better with a stronger event which has clearer picks. Probably it should be said here that better aftershock locations is due to deployment of additional stations at short distances.

P2705: Description of the active source experiments is unclear. There are many terms and abbreviations which are probably clear to specialists dealing with the experiment, but remains Chinese for a broader audience. What are “bearing N62E”, “M/V Bin Hair 511”, “36-airgun tuned array”, “36-fold seismic profile”? I encourage describing these experiments using more simple terms.

Do these previous active source experiments provide the S velocity distribution?

SED

6, C1154–C1158, 2014

P2706. L4-6: It is unclear whether this is an active or passive experiment.

P2707: Description of the synthetic experiment. It is unclear where the profile in figure 4 is located. Please show it on the map. I do not understand why the contour lines of time differences in figure 5 have so complicated shape. I would expect that in the case of 2-D velocity model versus the 1-D model, the time difference patterns should be close to the elliptical shape without corner-shaped structure, as observed in NE of the plots. Why in this experiment, the crust in W part is thicker, whilst apparently it corresponds to the sea area?

Is the Moho interface in this model represented by sharp transition or by a gradient layer?

I do not almost see any significant difference between plots in figure 5. I would expect much stronger differences for events at different depths.

In my opinion, the description of synthetic modeling should be placed into a separate section to distinguish it from the analysis of observed data.

P2708 – Data description: Total number of events corresponding to the mentioned phases should be indicated here.

Station corrections: were they computed by VELEST of estimated from a priori information?

P2709 – Presenting errors: What is the definition of the source location error? Is it the distance from the unknown true location, or it is just a measure of remaining time residuals? I guess the former is more valid in this case. I think that it is incorrect to call these values errors, because for most readers it means that the true source coordinates should be located within the error ellipse. However if you consider two velocity models you may obtain two source locations at a distance larger than errors of each event. The true source cannot be located simultaneously within both ellipses. I think, it should be stated here that one velocity model provides smaller rms of residuals

SED

6, C1154–C1158, 2014

that another one; therefore it is considered as better one.

For the same part of the text: what is the mean difference between source locations in different velocity models. It is not easy to see the difference between source locations in maps in Figure 7. In my opinion, it would be much more informative to present just one map showing the differences between locations in the best 1D model and the 2D model presented by dots for events in one velocity model and line connecting with the solution in another model.

I think that the conclusion, which summarizes the main achievements of the study, is necessary at the end of the paper.

Figure 1. I think here it would be useful to present the bathymetry (instead of Figure 2) which may give an idea about the transition from the oceanic to continental crust for the study area and surroundings. For the transform fault, the direction of the displacement should be shown.

Figure 2, caption: Correct “26 January”. For the GFZ, the name is too long for the caption.

Figure 3: Are the S-velocity distributions available for all studies? In my opinion, these graphs can be shown in one plot.

Figure 4: Show the location of the profile in one of the maps. Do you use the same 2D model for synthetic and real data?

Figures 6 and 7. I think all these figures can be combined in one plot showing the deviation of the main shocks and differences between locations of smaller events in two models (best 1D and 2D) indicated by vectors.

Histograms in Figures 8 and 9 seem to me not informative because I do not understand what the error of source location is, regarding the fact that the true source locations are unknown. Instead, I would recommend presenting a table with standard deviations of residuals.

SED

6, C1154–C1158, 2014

Figure 11. Indicate the time ranges in each of the plots

Figure 12. I find coloring in vertical section non informative. I propose using different colors for different time periods. In map, yellow and red dots of events are not well seen in the yellow-red topography background.

Figure 13 seems to me not necessary: it relates to another story and appears to be confusing to me.

Figure 14. I don't understand the logics of this figure. A and C relate to the same time period, but different sections; b is another section and another period. Wouldn't it be better to present in Figure 12 two or three different cross sections with indications of different time periods by different colors?

Interactive comment on Solid Earth Discuss., 6, 2699, 2014.