Solid Earth Discuss., 6, C1284–C1287, 2014
www.solid-earth-discuss.net/6/C1284/2014/

Solid Earth
Discussions
Open Access

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.

Anonymous Referee #2

Received and published: 18 November 2014

General comments:

The paper '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. describes an aftershock sequence at the north-western portion of the Hellenic subduction zone below and around the island of Cephalonia that occurred in early 2014. The authors use seismic recordings from the local permanent stations of the Greek network and from local stations deployed after the first mainshock.

To a large extent the paper reflects a well-done technical study on the challenges and

difficulties in determining precise hypocenters with sparse seismic networks using one-dimensional velocity models in a truly three-dimensional and laterally heterogeneous crustal structure. Unfortunately, the authors fail to point on the fact that even the enormous effort did not result in a hypocenter catalogue with sufficient precision to address state-of-the-art seismological objectives allowing to derive an improved understanding on the ongoing seismotectonic processes related to the 'mainshocks'. Also, the study does not go beyond determining hypocenters and leaks on further important aspects such as e.g. faulting mechanisms. A very large portion of the text (section 3+4, more than six pages) is dealing with describing the three different velocity models and how they affect the hypocenter determination. This can be substantially shortened and should not be a main focus in a peer-review scientific paper. The precision of the hypocenters provided in this study is basically an important boundary condition but finally simply a tool to study the spatial distribution of the local seismicity below and near Cephalonia with regard to the seismotectonic implications. The further step analyzing their findings is not presented. Throughout the text (and even in the title) the authors describe their tool as 'high-precision relocation' which is certainly exaggerated considering that there are well-established relative hypocenter location techniques (hypoDD) allowing to derive a much finer internal resolution of a seismic cloud as a pre-requisite for in-depth analysis. Finally, the paper does not include a summarizing and concluding section where the results are adequately interpreted and the results are not discussed in a broader framework leaving the paper as a study of regional relevance only.

Specific comments:

1. p.2701, l.14-24: The dominating process is certainly the ongoing subduction while e.g. the Cephalonia Transform Fault Zone (currently described as the 'major seismotectonic structure' controlling the regional seismicity) is a secondary effect (structure) as a result of the subduction. The subduction is the driving force.

2. p.2703, l. 5-10: There is relevant additional study (Sodoudi et al., JGR, 2006) not refered to in the text, proposing a crustal thickness of $\sim$20 km around the plate

boundary. It is worth to mention the non-uniqueness of the proposed crustal thickness in this region.

3. p.2704, l.3-6: While the region of interest is certainly at the western border of the Greek seismic network leaving a large azimuthal gap it might be useful to include stations from Italy further to the Northwest to reduce the azimuthal gap.

4. p. 2704, l. 24-26: The comparison between the 'roughly estimated magnitude of Md=5.0' and 'reports from local people' is not reliable enough to be mentioned as scientific rationale in a peer-reviewed seismological paper. This part should be skipped.

5. p.2705, l.4 (and several times later in the text and also in the title): The term 'relocate' is widely used to describe the process of relative relocation of hypocenters involving waveform cross-correlation (e.g. hypoDD) while in this context it is misleading since here actually absolute hypocenter determination is meant.

6. p. 2710, l. 20-25: The space-time evolution shows that there is no space-time evolution. It is not adequate to describe the hypocenter catalogue as 'high-precision relocated' for many reasons. Is the width (NW-SE) of the seismic cloud an artefact of the hypocenter precision or is it real? If it is real how can it be explained tectonically since these are aftershocks of a larger earthquake that activated a planar fault plane?

Technical corrections:

7. p. 2700, l.8: Replace 'locations were' by 'the hypocentral location precision was'.

8. p.2701, l.15-16: The Cephalonia Transform Fault Zone is not indicated (labelled) in Figure 1.

9. p. 2702, l. 5: Replace 'suffer' by 'suffers'.

10. p. 2702, l.15: Replace 'at the geometrical edge of' by 'outside'.

11. p.2702, l. 19: Skip 'microseismicity'.

12. Figure 4: There is not much information in this figure. No details are provided on what the relation between Vp and Vs is (e.g. is there a constant Vp/Vs, does it vary laterally or with depth)?

13. Figure 6: This figure is way too trivial to be considered as a stand-alone figure. Its content can be described in one sentence in the text.

14. Figure 7: What should the reader conclude from looking at the different epicentral distributions that look (almost) fully equal in first-order approximation and with the resolution provided. More or less the same is the case for Figures 8 and 9.

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