

The authors have been addressing the concerns raised by the reviewers and me in a very detailed way into their response letter. Anyways, the modifications into the manuscript are not reflecting their efforts to explain to us their methods and results. In order to give to the future readers, the same details and fully understand the work presented, I suggest to integrate the material shown in the authors response into the main text. Moreover, for facilitating the authors I am listing here in details the modifications that might improve effectively the understanding of this work.

### **Move supplementary text to the main text:**

Move the data selection details (now in the supplementary material) into the main text; and reorganize as follows:

*“For each deployment, all earthquakes with  $MW > 5$  and epicentral distance  $> 120^\circ$  were selected. The selection of the minimum magnitude to be considered was taken as a balance between the signal quality of the earthquakes and the number of available sources for each deployment. The XX (this\_you\_have\_to\_state) gathered events were checked by computing the power-spectral density to confirm the existence of useful energy within the selected frequency band. This process gave the final selected 81 sources. For the first deployment a total of 44 earthquakes ..... Nishitsuji et al., 2016). The use of low magnitude events, between  $MW 5.1-5.4$ , is restricted to the first acquisition where the deployment time was the shorter and therefore, we were forced to include lower magnitude events in the processing scheme. These events represent the 35 % of the total events used to produce the central part of the image.”*

### **Figures:**

Figure 1. While reading the paper I was often confused by the naming of the zones and of the sectors of the profile. In order to avoid further confusion I suggest to mark in this figure the Zone I, II and III which are discussed in the Discussion section, and to label the deployments as referred in the text (from north to South, 3<sup>rd</sup>, 1<sup>st</sup>, and 2<sup>nd</sup> deployment)

Figure S1 can stay as supplementary.

The figure showing the central segment of the profile compared with the same done with  $M>6$  must be added to the supplementary material together with the related text.

Figure S2 must replace Figure 4. And the relative text plus the text concerning the multiple suppression must be included in the manuscript. The sentence “if we assume a depth in the range of 1-2 km depth and standard..” must be corrected to “if we assume a depth in the range of 1-2 km ~~depth~~ and standard..”

Figure 5 should be remade by:

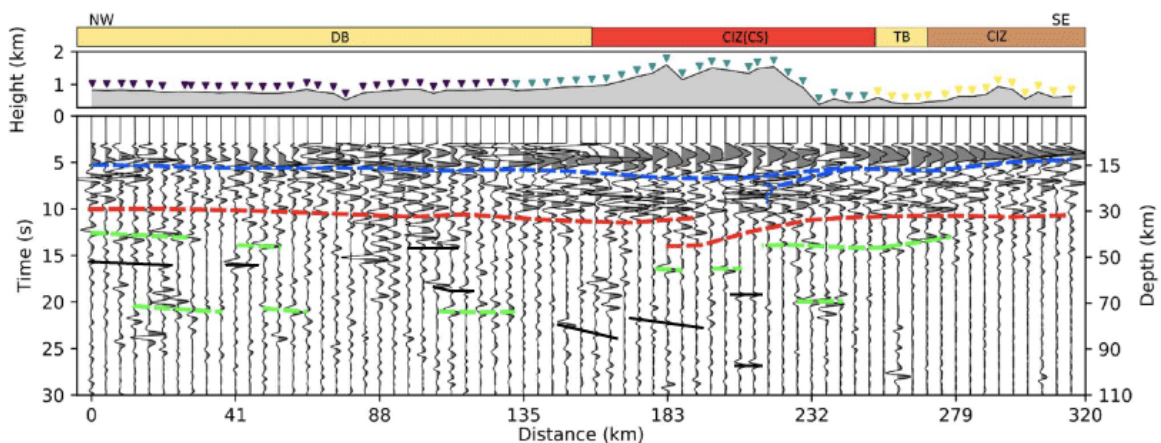
- 1) merging together the actual Figure 4 and Figure 5;
- 2) the interpreted lines in the profile should be redrawn trying to be more conservative, and following these suggestions:
  - a) mark differently the features which are newly defined by this study and the features “taken” from other studies (for example the newly defined features might be highlighted with a bold line and the features already present in previous studies might be marked by think

lines)

b) as the authors state in their letter *“We also state that we base our model with previous knowledge of the area and surrounding areas, and therefore, none of the proposed features is completely new, or to some instance random.”*, the features which appeared in previous works should be singularly distinguished in this new figure 5, and a legend should be added referring to such previous works. I mean that each line drawn on top of the profile, if corresponding to an interface already present in previous works, should be marked as such, and a legend should be added, with the coloured lines referring to the previous works. It would also be useful to show if a depth difference between interfaces defined by previous works and interfaces defined in this work exists.

c) mark differently which features are stable and which are speculative (for example the whole segment 1 (I mean the northernmost segment) and the mantle features could be drawn with dotted lines).

In particular, concerning the mantle features, most of them should not even be marked. There is no reason to mark the feature at 100-130 km distance and ~73km depth, and not marking the feature at 88-100 km distance at about 40 km depth, or all other similar-features that I have marked as an example in the following figure.



The more consistent mantle features can be marked in this figure, which are the one at 13-14 s between 230 and 280 km, and at 13-14 s between 0 and 30 km. These must be anyways marked with dotted lines or with faint colours, due to the fact that (as the author states) *“the lack of control on possible artefacts within the upper mantle should be noted and these results should be taken carefully”*.

d) increase the vertical scale of the profile, for discerning better the features (and specify in the caption the amount of vertical exaggeration).

e) using a round spacing for the annotations in the horizontal axis is generally a good practice and I encourage the authors to change the annotations in this figure and in figure 4 (for example using a 50 km spacing for the annotated distance).

Figure 1. Variscan granites in the legend, and granitoids in the caption. Authors must be consistent in the terminology.

Figure 6. to incorporate the geometry of Variscan detachment in figure 6 or in a new figure.

**Modifications to the text,** Line numbers are referring to the “author\_response” version of the text.

In the main text, at line 556, add: “The different approaches used in order to eliminate the influence of the delta pulse are illustrated in the Supplementary material (Figure S3 and text).”

At line 570 the author states: *“We have applied a time-to-depth conversion to display the estimated depth at which we obtain reflectors. The conversion is applied to the time axis to the left and is displayed on the right axis of Figure 4”.*

Since the time to depth conversion is non-linear it does not make sense to have on the same vertical axis both time and depth, even though the authors state that *“the velocity model is not too certain, thus the depth serves only as a reference”.*

The vertical axis should be in time only for the new figure 4, and the vertical axis in Figure 5 should be in Depth only, and labelled as “Approx. depth (km)” instead of just “Depth (km).”

Line 613-620 the description of how the Moho has been defined is not very accurate. *“The Moho is shallower and more difficult to define in the northern sector where it appears slightly above 10 s.”* The Moho is instead marked exactly at 10 s

*“It seems rather flat until it starts deepening to the SE, at 120 km distance to the N of the Central System.”* The red line drawn in figure 5 is shallower at about 100 km distance and is shallower at 180 km distance too. *“Below the Central System a clear step is found, differentiating the crust-mantle boundary in two parts. From the north, the gentle deepening continues until 180 km distance, just below the northern edge of the Central System. At this point, the deepest Moho position is found below the highest elevation of the mountain range, where two traces show high-amplitude reflectivity at 12 s TWT. The Moho shallows again southwards until 230 km distance, where it becomes almost flat again, featuring depths of 10 s TWT until the end of the profile”* This wording is also confusing. I suggest to substitute with something like the following:

*“Following the abrupt end of the crustal reflectivity from the north, we observe a slight fluctuation around 10 s TWT until 180 km distance along profile. Below the Central System a clear step is found, and we might speculate on a possible Moho doubling. At this point, below the highest elevation of the mountain range, the highest reflectivity is extending down to 12s TWT, possibly marking the presence of a deep Moho. Then it shallows southwards until 230 km distance, where it becomes almost flat again, featuring depths of 10 s TWT until the end of the profile”*

Delete lines 623-629 from “A reflection” until “of 230 km.” and substitute with:

*“A reflector can be followed up below the Tajo Basin and Toledo Mountains 14 to 13 s TWT. Another possible reflector at 19-20 s TWT is doubtfully visible under the Duero Basin and at a distance of 230 km.”*

Delete lines 643-645 from *“Finally..”*

Line 634-635 *“provides key insights to understand the internal structure and tectonic evolution of the Central System and the surrounding sedimentary basins.”* Substitute with *“confirms previous observations on the internal structure of the Central System.”*

Line 665-666: *“This area is crosscut by some 170 km along profile”* this sentence does not make sense.

Discussion-Upper crust section:

Are the Zones I II and III coinciding with the three segments of the profile? If so, this has to be stated clearly, moreover the zones I II and III should be marked in Figure 5. it is difficult to identify clearly zones I, II and II in the reflectivity profile, It will be interesting to indicate the location of zones boundaries.

Line 688-690 : *“Also ... System”* the sentence is not clear and must be rephrased

Line 711: *“during its tectonic evolution”* it is not clear to what *“its”* is referring.

Line 711: *“If this boundary were”* → *“If this boundary was”*

Line 723: delete *“in that zone”*

Line 735: *“The most prominent feature in the profile is the crust-mantle boundary (Fig. 5).”* This is not true, in particular for the Northern part of the profile, where there is no clear abrupt end of the high reflectivity. This sentence has to be deleted

Line 746: *“Moho branches is found”* → *“Moho branches is interpreted”*

Line 764: delete *“anyway”*

The word *“artifact”* should be replaced with *“artefact”* within the text. I apologize since this comes from my previous misspelling.