We would like to thank the anonymous reviewer for the constructive comments on our manuscript. In the following, we will answer to the referee's comments and suggestions.

In general, the manuscript reads well. However, I believe that the results are over-interpreted, and there is significant potential for further improvement. In the current shape of the results, I have a hard time to associate the interpretation with the observed results in Figure 4.

First thanks for the feedback. We agree with the reviewer, there is definitely potential for further improvement, and therefore we tried to keep the interpretation to a minimum. We know that the amount of data is fairly limited and relatively sparse. The later limits the lateral resolution, which is not comparable to conventional deep wide-angle seismic reflection images. However, with this in mind, we are convinced that the few events imaged by the technique need to be relevant enough as they pop out from the data by the relatively simple processing that we have carried out. In other words, the events are there and, they, probably need to be caused by some impedance contrast (changes in Vp and density). Therefore, considering the existing knowledge of the Iberian Massif to the South and to the North of the target zone we came up with a simple model with nothing extraordinary.

For instance, the upper-lower boundary interpreted in the section is a feature seen in the Iberseis and Alcudia datasets. The proposed models constitute the northward extension of this profiles and, we think need to be consistent with the reported findings. As a result, we interpreted this feature in our model. Note that a good candidate reflection (that is, the seismic event) appears in the image at similar depth. Furthermore, similar features have been observed in other Alpine orogens (e.g. Pyrenees, Alps), and also, within the Iberian Massif, in the Cantabrian Mountains, whose origin is similar to that of the CS (Alpine reactivation of a Variscan setting).

Regarding the crust-mantle boundary, we propose an alternative model where the crust below the Tajo Basin under-thrusts that of the Central System, contrarily to what has been proposed to date, where the Moho presents a slight bulking as a consequence of lithospheric bulking as proposed by de Vicente et al. (2007, 2018). The deepening of the Moho below the Central System required by the model is a feature that has already been proposed by gravity modelling and Receiver Functions data.

Finally, we have revisited the discussion and added a few more lines and references in line 395,

These features correlate well with the results of a magnetotelluric profile carried out in the same area (Pous, et al., 2012). In their image, a zone of lower resistivity is found around the Tietar fault, which affects not only the upper crust, but extends into the lower crust, and connects even with the Moho. This low resistivity is associated with a set of faults cutting the upper crust and which could be extended to cut the whole crust although they do not need to be necessarily connected. Furthermore, preliminary results from ambient seismic noise data (Andrés et al., 2018), picture the same scenario for the crust-mantle boundary, as do new wide-angle seismic data acquired within the CIMDEF experiment, where the mid-crust discontinuity and cortical structures are clearly visible.

We thank the reviewer for the feedback, however more detailed comments would have been appreciated.

-Figure 4: The reflectivity traces can be further boosted by applying an AGC type operator. I strongly suggest that authors try this for several windows of choice.

We avoid the application of AGC as we base our interpretation in changes in the reflectivity pattern (frequency and amplitude) and applying an AGC operator would destroy amplitudes, and therefore, the signal character. Conventional automatic gain control (AGC) is applied to seismic data to bring up weak signals. Gain must be used with care, since it destroys the signal character. The resulting image has a very strong dependence on the width of the time window used and, therefore, makes strong reflections indistinguishable from weak reflections (Yilmaz 2001).

Additionally, we believed that for a sound interpretation we needed to keep the amplitude information with depth. True amplitude images are required to be certain that a reflection is due to a contrast in the physical properties (sharp change in elastic parameters).

Authors openly discuss strategies about eliminating the side lobes of the AC traces. However, in the end, they opted to use a surgical mute. It would be great if they can share their results with both of the techniques in figures.

Images of the other strategies to eliminate the side lobes have been added in the supplementary material, along with a brief explanation of each strategy.

Three different approaches were used in order to eliminate the influence of the delta pulse at time t=0 (Fig. S3).

First deconvolution of the wavelet for each station was tested. For each station the wavelet dominating the trace around t=0 s is extracted and used for deconvolution. The construction of the wavelet used the full autocorrelation stack (i.e., positive and negative times). The time window of the wavelet was selected by visual inspection and it was selected to be 5s. This approach did not yield good results as it suppressed most of the reflectivity throughout the profile.

The second approach is based on the subtraction of the average delta pulse. To construct the wavelet, all the stations are stacked together. The selection of the time-window to extract the wavelet followed the same procedure as in the deconvolution approach. Then the wavelet is subtracted from each station stack. This approach seems to produce similar results as the deconvolution, except it preserves more reflectivity earlier than 5 s. Still, most of the coherent reflectivity was suppressed.

The selected technique to eliminate the delta pulse was muting. We selected the time window to be muted as in the other two procedures, but to keep it as possible. A window of 3 s was selected, even though the wavelet is probably slightly longer at the southern stations compared to the northern ones. This procedure preserved the reflectivity of the profile and was selected for that reason.

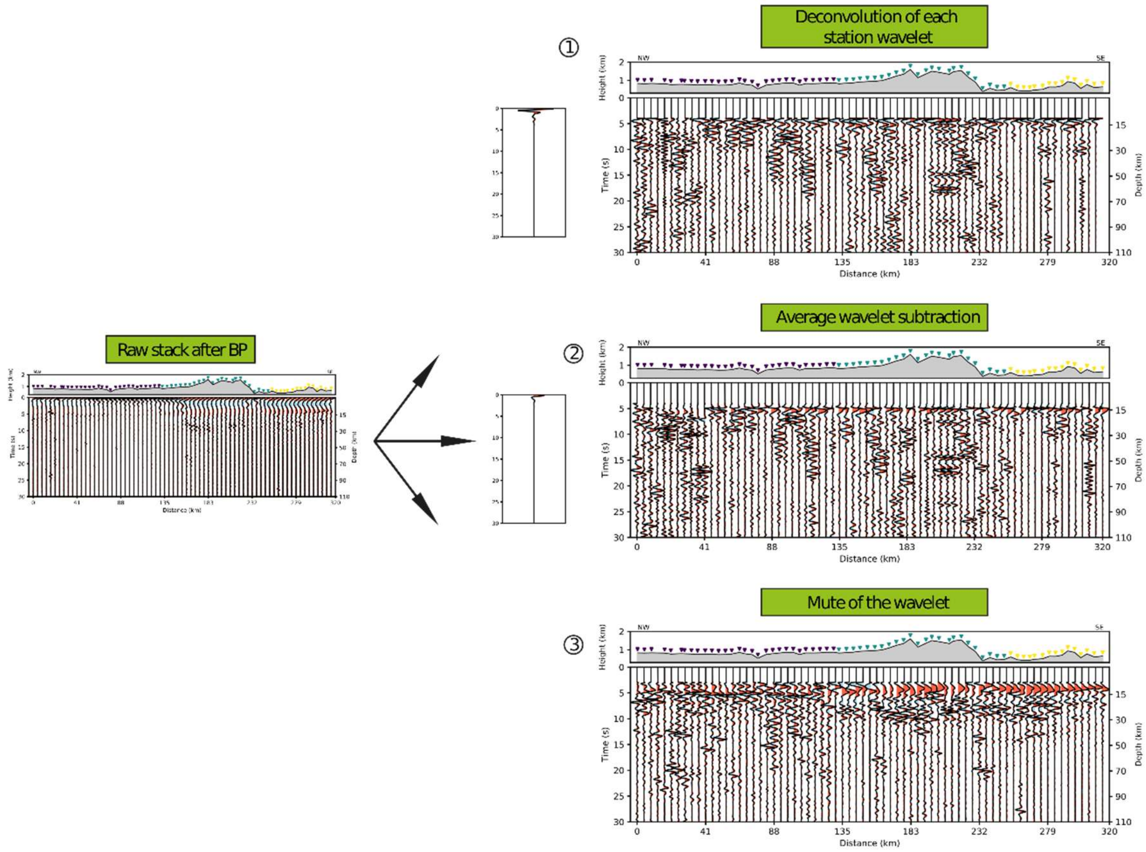

Figure S3. Approaches to eliminate the influence of the delta pulse at t=0. 1) deconvolution for each station of the wavelet, 2) subtraction of the average wavelet of all the station, 3) muting of the wavelet.

New references added:

Andrés, J., Draganov, D., Ayarza, P., Schimmel, M., Palomeras, I., Ruiz, M., Carbonell, R. Imaging the lithospheric structure of the Central Iberian Zone. EGU General Assembly, Vienna, Austria, 7-12 April 2019, EGU2019-7690, 2019.

Pous, J., Muñoz-Martín, A., Olaiz, A. J., Seillé, H., & de Vicente, G. (2012). Análisis de la estructura alpina de la corteza del centro de la Península Ibérica: Una sección Magneto-Telúrica a través del Sistema Central (Sierra de Gredos). Geo-Temas, 13, 4–8.

References

Yilmaz, O.: Seismic data analysis, Society of Exploration Geophysicists: processing, inversion and interpretation of seismic data, Society of Exploration Geophysicists, https://doi.org/10.1190/1.9781560801580, 2001.