Solid Earth
Discussions

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Interactive comment on "3D Seismic Traveltime Tomography Validation of a Detailed Subsurface Model: The case study of the Zancara River Basin (Cuenca, Spain)" *by* David Marti et al.

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General comments

The manuscript presents an analysis of very dense 3D seismic dataset to characterize the shallow subsurface. The authors suggest that use of a simple first-breaks travel-time tomography method can lead to high-resolution image of the studied area. I have already seen presented data and an initial interpretation at a conference presented by Ramon Carbonell. The data are indeed of high density and good quality, and supported with some boreholes information, so reflection imaging should be a natural interpretation technique. Unfortunately, authors do not discuss this possibility focusing on the

simplest possible technique, claiming that reflection imaging is not needed.

In the first part of the manuscript authors present clear description of traveltime inversion supported with the uncertainty analysis (checkerboards). In the second part they try to combine smooth velocity model from traveltime tomography with sparse borehole data. This is very difficult and questionable part, and would be much easier with reflection imaging.

The manuscript is well written, and easy to read and understand. In the second part it is also a bit long and unconvincing.

Specific comments

Use of the first breaks only. In the near-surface data the first breaks are difficult to pick, especially in the near field. What was the data quality for those short offsets? Fig.3 present only mid-offset arrivals. What data processing (filters, agc) has been applied to the data. What is presented in Fig.3, it is definitely not raw recordings

Line 170 – what do you mean by suitable did you mean "very smooth initial model"? Line 211: it is more like in the first 40 m, as shown in Fig.4, not 20-30

Figure 5 caption – there is no need to explain what is the checker-board test in the figure caption. It is described in the text. Also references to methodology in figure caption is unnecessary. Moreover, reference to Rawlinson et al. 20154 (should be 2014) is missing

Rawlinson, N. and Fichtner, A. and Sambridge, M. and Young, M.K. (2014) Seismic Tomography and the Assessment of Uncertainty. In: Advances in Geophysics. Advances in Geophysics, 55 . Elsevier, pp. 1-76. ISBN eBook ISBN: 9780128003718 Hardcover ISBN: 9780128002728

Figure 5 – a-e marks and all labels are tiny; values in colour scale are missing; what are those black dots in a and b? What parameters (velocity in anomaly) has been used for checkerboard test?

The checkerboard results shows that the first 25 m has not been resolved at all. I assume this is because of usual problem with picking the first breaks at very short offsets in the near field. In the article no short offset arrivals are presented. Could you comment on that?

4.1 Is this sub section necessary? There is no 4.2

Profile c-2i in figure 9 shows no correlation between tomographic velocity and extrapolated surface geology. The only consistency might be found with ray penetration. I would avoid writing "matching is very consistent" (in line 348)

Figure.1 b small inlet has tinny font, but there is space to change legend to two column text

Figure.2 a b c marks are not needed, as they are not mentioned anywhere

Figure.3 what processing has been applied to this data? No information in caption nor in text

Figure 9 half of markings are tiny

Minor editorial corrections

Line 86 – double dot (.)

Line 133 – unnecessary comma after .

Line 151 – missing space "releaseof"

Line 157 – of first breaks -> of the first breaks

Line 441 – taking into account this -> taking this into account

Line 451 - that does not exist any evidence of recent -> that there is no evidence of recent

Line 454 – models no not show -> models do not show

C3

Line 724 – m. -> m