Interactive comment on "Basement structure of the Hontomín CO$_2$ storage site (Spain) determined by integration of microgravity and 3D seismic data" *by* J. Andres et al.

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Dear authors,

I read your manuscript carefully given my own interest on the combined use of potential field and seismic data to overcome limitations with each of these methods. The manuscript is organized in a good manner and the findings are interesting. I particularly enjoyed the approach of forward calculating the sedimentary cover, constraints from the seismics, to be able to resolve structures in the basement. I have annotated the manuscript at several occasions and have a few comments that I invite the authors to address them in their revised version. In particular pay attention to the English and the inconsistency (citations, figure, Fig. and Figure etc.) in the text when resubmitting.

Follow SE guidelines to authors when preparing the revised manuscript.

Some of the major comments are listed here:

1. Lack of information about the accuracy of the gravity data. You mentioned micro-mGal and 0.5 cm elevation accuracy in geodetic surveying but this is too good to be justified based on my own practical experience although very little. Do you really have 0.5 cm elevation accuracy? How did you obtain this number? At best using DGPS systems in open field areas we obtain 1-3 cm accuracy, this then assumes a hard-flat ground surface? How about the location of the gravity-meter (what kind/brand was used)? How did you level this to have on average less than 0.5 cm difference from one station to another?

2. Explain how you found the Bouguer density correction in detail. Did you test other values? What was the error in this? What is the summed error of all the single corrections (including the terrain correction). Have a look at an in-discussion paper in SE by us, Malehmir et al. (2015 or 2016) about our way of presenting the summed errors. We came up with an almost one mGal and measuring at 10 m intervals. Of course the topography is different there.

3. Regional field: Why does this look like first-order polynomial while the observed complete Bouguer has two highs on the sides of the map? I would have guessed this should have been 2nd-order polynomial. Please explain.

4. In the 2D and 3D modeling, what did you assume for the background? What did you really model (BA: after removal of the regional)? Did you include topography? In the inversion then you should have obtained density contrasts not the absolute density. I kind of missed this.

5. Sensitivity for the basement offset. Did you check this to see how sensitive the gravity data is to the basement offsets? You did not mention in the 2D modeling results what contributes to the gravity highs. I assumed this was the basement! You fail to

say what were really inverted and how did you constrain the inversion model. Did you invert for the geometry or density? I kind missed the hard constraints here? Density bounds?

6. I agree the inversion method you used is reasonable for layer-based structures but perhaps you should refer to other ways of doing this. See for example a work by Hedin et al. (2014-Geological Society) and many others that use voxel type inversion.

7. Other minor comments: figure legends and decimal presentations of the basement is not professional. Please correct this and make them visible for the final presentations. Do not let Geosoft to dictate the legend and labels!

This needs a modest revision but I am unable to give this thus go for a major. I hope these help to improve the quality of your presentations and manuscript, and looking forward to your revised manuscript.

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Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/se-2016-13/se-2016-13-RC2-supplement.pdf

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Interactive comment on Solid Earth Discuss., doi:10.5194/se-2016-13, 2016.