

Interactive comment on “Shear wave reflection seismics yields subsurface dissolution and subsrosion patterns: application to the Ghor Al-Haditha sinkhole site, Dead Sea, Jordan” by Ulrich Polom et al.

P. Kruiver (Referee)

pauline.kruiver@deltares.nl

Received and published: 10 June 2018

This paper describes a good example of using S-wave reflection seismics in a setting where classical P-wave reflection would not have resulted in high resolution images. The review criteria are assessed below. After that, suggestions for improvement of the paper are listed.

The review criteria are assessed as follows:

1. Does the paper address relevant scientific questions within the scope of SE? An-

C1

swer: yes

2. Does the paper present novel concepts, ideas, tools, or data? Answer: yes, application of S-wave reflection seismics in difficult setting to image

3. Are substantial conclusions reached? Answer: yes

4. Are the scientific methods and assumptions valid and clearly outlined? Answer: partly, see comments below.

5. Are the results sufficient to support the interpretations and conclusions? Answer: yes

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Partly, see comments below.

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Answer: yes

8. Does the title clearly reflect the contents of the paper? Answer: yes

9. Does the abstract provide a concise and complete summary? Answer: yes

10. Is the overall presentation well structured and clear? Answer: yes

11. Is the language fluent and precise? Answer: yes

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? If present: yes

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Partly, see comments below

14. Are the number and quality of references appropriate? Answer: yes

15. Is the amount and quality of supplementary material appropriate? Not applicable,

C2

no supplementary material.

Suggested improvements for the paper: Section 2.2:

1. Line 183: typo 'experimentss'

Section 3:

2. The target depth for imaging is not stated. Please explain why the chosen setup is suitable for the target depth.

Section 4:

3. The readability of the paper would be improved if a table with processing steps and results of those steps were provided.

4. There is Love wave energy present in the seismic data. Have you considered inverting these data (MASW) in order to obtain Vs information about the first tens of meters? In the overview of section 2.2 several MASW studies are reported. In the discussion it is stated that Bodet et al. (2010) reported strong lateral Vs heterogeneity. Yet you use only one mean Vs profile to convert the reflection data from time to depth domain. Knowledge about the amount of variability of Vs in the top tens of meters will inform the reader about the reliability of the reported depths.

5. Line 326: "to derive final depth sections by using mean 1D velocity-time function". How was that derived? The explanation follows much later (lines 347-349). It is clearer when this section is moved up and a couple of more lines are spent on the explanation. It is too short now.

Section 5:

6. Figures 7 – 10: In the text there is reference to certain positions along the lines, but the horizontal distance is not clear in the figures. There seem to be numbers like 200 250 300 in the figure, but rather hidden in the portion above the depth sections and fonts too small. Please add a clear horizontal distance axis in each figure.

C3

7. Figure 9: boreholes BH1 and BH2 are too far away (420 m) from the line. I would not show them in figure 9, no added value. To show them in figure 8 and 10 (~ 200 m away) is already on the limit of preferred. 420 m is really too far off.

8. Blank line needed after line 442. Move the next line about Figure 11 to below Fig 11 to be in the same paragraph as the sentence starting on line 455.

Section 6:

9. Line 505 states that the internal structures such as topsets, foresets and indications of bottom sets are present in the seismic depth sections. It helps the non-geologists reading this geophysical paper if these are indicated in the bottom parts of figures 7-10. And it helps the geologist to recognize these in the geophysical data.

10. Line 548: use of only one 1D Vs profile. Please elaborate on why you think this would be a valid approximation even if Bodet et al. (2010) reported strong lateral Vs heterogeneity. Or support this by MASW results for the observed Love waves in your data.

11. Missing in the discussion section: From your results, would it be possible to indicate areas where future sinkholes might develop? If not, what would be needed to be able to do so in the future?

12. You postulate a new combined process model (lines 689-702). What data would you need in order to further support this model? The formation of subsurface channels and loss of cations might be monitored by a combination of time-lapse ERT, IP and SP. The arid environment might pose challenges for these techniques.

Kind regards, dr. P.P. Kruiver

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2018-22>, 2018.

C4