

## ***Interactive comment on “Structural analysis of S-wave seismics around an urban sinkhole; evidence of enhanced subsidence in a strike-slip fault zone” by Sonja H. Wadas et al.***

### **Anonymous Referee #1**

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#### 1. General comments

When dealing with sinkholes, the fundamental questions are: 1. At which depth the cavity formed?

2. Why the cavity formed?

3. Is it an isolated phenomenon or is it widespread?

4. How much time was needed for the cavity to reach the ground surface? And consequently when did the cavity formed?

5. Is the process at the origin of the cavity persists? Or is there another cavity below

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the one studied?

So far, this paper provides a convincing answer to the first three questions.

Based on the rich datasets (boreholes, gravimetric, seismic profiles etc.), the authors could at least discuss on the fourth question.

Regarding the fifth question - which is quite important for the validity of the comprehensive model developed in this paper. . . and for the safety of the inhabitants - it is unclear from the seismic profiles and boreholes if the answer is positive or negative.

Indeed, based on the submitted text and the elements explaining the formation of the cavity (tectonic blocks, convergence of unsaturated underground water, etc.), it seems that the process leading to the cavity formation will not stop because all the elements necessary for the cavity formation are still present after the (first?) sinkhole reached the surface.

It would be interesting to discuss this point in the dedicated section based on the seismic profile and also the gravimetric data.

Finally, if this sinkhole is an isolated case, would it be possible that the cavity had an anthropogenic origin (e.g. over pumping, mining activities in the surroundings)?

Globally, this paper is very well written. It is a model of geological and geophysical rigor. Technically it can be published after minor revision.

#### 2. Specific comments

In my opinion, the section related to the geological evolution should be simplified in order to keep only the information strictly necessary for the explanations given to the five questions above mentioned.

For example, the author could draw a simplified cross section with the different lithologic layers and could underline the specific horizon where the cavity was most probably created.

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The tectonic setting is an important parameter and a dedicated figure showing the different stages would help in the understanding.

The figure dedicated to the underground water circulation is fundamental for the overall understanding and should be improved / redrawn in order to:

- support the sentence in the text related to the confluence zone (page 15, line 8) "The sinkhole of Schmalkalden is located at the meeting point of three groundwater catchment areas";
- explain the different symbol used (rather than in the text only), and also the elevations;
- Improve the relationship with the tectonic setting (tectonic blocks).

The discussion section is rated long and should be summarized in order to highlight the key elements such as the water circulation, the micro-gravimetric results, etc. I suggest drawing a table to list the contributions, the results, and the facts to take into account in the explanatory model.

### 3. Technical corrections

Page 1, line 17: Closson, D. & Karaki -> Closson, D. & Abou Karaki, N.

Page 6, line 7: istallation -> installation

Page 15, line 31: Closson, D. & Karaki, N.A. -> Closson, D. & Abou Karaki, N.

Page 19: Closson, D. & Karaki, N.A. -> Closson, D. & Abou Karaki, N.

Nice work, congratulation!

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