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Natural Hazards and Earth System Sciences
Discussions

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

Anonymous Referee #2

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General comments: The paper analyses the area around a large collapse sinkhole that formed on 2010 in Schmalkaden, Germany, using several shear wave seismic reflection profiles and multiple boreholes, in order to unravel the factors that controlled the development of the subsidence phenomena. The sinkhole was related to the dissolution of Permian evaporites at a depth of 50-100 m, in an area where the Phanerozoic bedrock is affected by an inactive system of NW-SE strike slip faults. Authors infer from the profiles a dense network of steeply dipping dip-slip tectonic faults (normal and reverse). They conclude that faults contributed to increase permeability and controlled groundwater flow, favouring "subrosion" processes (dissolution and subsidence). On the one hand, this is not a relevant scientific finding. It is well known that faults may

favour sinkhole development by increasing permeability, guiding groundwater flow and reducing the mechanical strength of the rocks. On the other hand, it is not clear that the small-throw faults imaged in the seismic profiles are true tectonic faults; they are depicted with as continuous lines in the supra-evaporitic units and with dashed lines in the evaporites. They could correspond to gravitational collapse faults related interstratal dissolution of the evaporites and subsidence of the overlying formations. This process generates both normal and pseudoreverse faults; normal faults that over-steepen close the surface and tilted normal faults with the appearance of reverse faults. In fact, authors describe: (1) bowl-shaped structures (synformal structures) larger than 150 m wide and large "subrosion-induced depressions; (2) a system of steep normal fault next to the sinkhole that apparently dies out in the evaporites; (3) variations in the thickness of the evaporites attributable to dissolution. Authors indicate that "the complex 3-D structure of the faults is difficult to decipher with 2-D seismic lines"; "the high fault density and the complex fault geometry . . . did not allow to make a direct spatial correlation of the faults. . .only a high-resolution 3D shear-wave reflection seismic survey could deliver more or less unquestionable spatial correlations".

Specific comments: I strongly suggest the authors to avoid the term "subrosion", which is rarely used in the sinkhole literature. I recommend the use of dissolution and subsidence. The setting section should include information on: (1) the geomorphology of the area, including karst features (e.g. karst depressions, previous subsidence events); (2) the hydrogeological behaviour of the different units and their broader hydrogeological context. The geological map included in figure 1 is not readable (legend, use symbols in the map indicating units).

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