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Interactive comment on "Monitoring surface deformation of deep salt mining in Vauvert (France), combining InSAR and levelling data for multi-sources inversion" *by* Séverine Liora Furst et al.

Anonymous Referee #1

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This paper is interesting, and certainly worth publishing. In the past, only vertical displacements were measured above brine caverns fields. Satellites provide much more information, opening the way for a more comprehensive analysis of subsidence data.

It is suggested to add (at the end of the paper) a vertical cross sections along a selected profile (similar to Figure 3) in which both horizontal and vertical displacements are represented A few changes are suggested below.

L.30 : Âń the difference between geostatic pressure and brine (or hydrocarbon) at cavern depth produces . . ." ("density" is not precise enough)

L.32: "The instantaneous (i.e. elastic)"

L.33: "creeping toward salt caverns" (in Europe, well = borehole)

L.34: No, when cavern pressure is kept constant and smaller than geostatic, the stress distribution reaches a steady-state distribution which is not geostatic. "until the cavern volume vanishes"

L.35: "These deferred [or delayed]. . ."

L.36: "to mitigate" rather than "prevent"

L.40: explain "SAR" and "GNSS" for the lay reader

L.48: this sentence is unclear. To my knowledge, this model (SALT_SUBSID) takes into account the difference between geostatic pressure and cavern (fluid) pressure, which is not assumed to be zero. Old versions of Van Sambeek's software were used to predict subsidence above salt mines, in which the pressure is zero.

L.57: "the degrees"

L.122: "from deep caverns"

L.125: "are being vented from time to time"

L.126: "9.5 MPa", "0.2 MPa" etc (SI units)

L.131: Âń until lithostatic Âż: no, brine pressure is released before lithostatic (geostatic) pressure is reached.

p.10, l-2: "and, mostly, . . ."?

L.221 "nearly identical"

L.288: "both horizontal . . ."

L.300: “axi-symmetrical” is more accurate than “spherical”.

L.301-307: this technique (dislocation planes) is not commonly used in the salt cavern industry; it seems to provide good results.

L. 315 “vented” rather than “drained”

L.320. In the reviewer’s opinion, the mathematical functions should be provided in the paper (in an Appendix?)

L.324: explain which parameters are concerned.

L.381: “the best fit against . . .”

L.405: “constraint”

L.436: “a maximum subsidence rate of . . .” (a “collapse” is a more abrupt displacement)

L.437: these sentences are confusing. Salt extraction does not generate subsidence per se. Creep closure (volume loss) does. A relation exists between extraction rate and subsidence rate; however, creep closure rate must be taken into account, and a large part of the effect of salt extraction is deferred.

L.448: This issue is difficult (see above). In fact, there are two aspects here: (1) is the subsidence a deferred (not instantaneous) effect of salt extraction? (it is) (2) is the stress distribution similar to the linear elastic distribution at some distance from the caverns? (maybe).

L. 465: “French”

L.467: “calibrate a rheological law . . .”

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