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Isterre,
November 23rd, 2020

Dr. S. McClusky
Topical Editor, Solid Earth
The Australian National University
Research School of Earth Sciences
Australia

Manuscript ID: se-2020-77

Dear Editor,

We are pleased to resubmit for publication the revised version of se-2020-77 "*Monitoring surface deformation of deep salt mining in Vauvert (France), combining InSAR and levelling data for multi-sources inversion*". We appreciated the suggestions and comments from this third reviewer and have revised the manuscript accordingly. We have addressed specific answers to the reviewer's comments. Changes to the last version of the manuscript are shown in red.

Again, we appreciate the time and effort that you and the reviewers have dedicated to providing valuable feedback on our manuscript. We are grateful to the reviewers for their insightful comments on our manuscript.

We hope this revised version is now suitable for publication in *Solid Earth* and we look forward to hearing from you.

Sincerely yours,

Séverine Furst
On behalf of the authors

Answer to reviewer 3

The authors express their appreciation to the third anonymous reviewer for his/her careful reading of our manuscript. We have changed the manuscript to include all your advice, changes are in red in the new version of the manuscript. Following, we offer a point-by-point replies to some comments the reviewer addressed regarding the revised manuscript.

6- Line 157-159: The “steady“ vertical velocity after 2003 seems, in figure 3b, more than 21mm/yr as assumed by the authors, especially after 2015. Any comment?

Indeed the ‘steady’ vertical velocity is about 26 mm/yr and not 21 mm/yr. We have changed it in the manuscript. Besides, we have added the mean velocity of vertical displacement in Figure 3b (red line) to better visualized it, and included a description in the caption.

8- Line 174: I don’t understand what means “optimized“ concerning the time and the perpendicular baseline for the choice of the master images. Could you be more precise?

Such optimization consists of minimizing temporal and spatial decorrelations by choosing a central image in time, and in space (distance between shots). As this optimization is very well known to the InSAR community, and has been documented for many years, we have not detailed this classic process further.

14- Line 308-309, “The incorporation of levelling data....from dual geometry InSAR“.
First: is it better to write “dual InSAR geometry“?
Second: It is not easy to estimate quantitatively the amplitude of the “refining“. Do you have an idea about? I expected to see a trace or a footprint of the levelling profile on the map of Fig. 7c. This absence, is it due to the kriging or to the good consistency of both measurements, or something else?

First: In this context, it seems to us more appropriate to use the term "dual geometry InSAR";
Second: Indeed, no footprint of levelling profiles can be seen on the combined velocity field due to the good consistency between InSAR and levelling data. However, the high accuracy of the levelling data compared with the 3D velocity field from InSAR allows us to refine the uncertainties associated with the combined set. Figure 7f gives an overview of this refinement by levelling, with a footprint of levelling profiles.

19- Line 458: Did the authors investigate the possibility of the presence of the classical trade-off between displacements on the dislocation planes and their depth, especially for the opening parameter?

We are aware of the trade-off between displacement on the dislocation planes and their depth, but for this study, we took advantage of the geological knowledge available to constrain the depth of our model. Indeed, the depth of the salt layers are well known. The parameter that may influence the result of our model would be the dip of the layers, for which we took a mean value. We varied the dip of the salt layer setting it to 25° and 35° (dip range given line 333). Considering these values of dip leads to a distribution of parameters whose amplitudes fit, within a scalar factor, the ones from the model presented in this paper, but with higher residuals.