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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Source model of 18 September 2004 Huntoon Valley earthquake estimated from InSAR" *by* W. J. Lee et al.

E. Trasatti (Referee)

elisa.trasatti@ingv.it

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This manuscript deals with the problem of mapping the surface deformations due to an earthquake and source modeling of the obtained geodetic data.

In particular, authors study the 18 September Huntoon Valley earthquake, analyzing InSAR data and performing a data optimization to retrieve the seismic source characteristics.

The manuscript, in the present form, appears to be a very basic exercise, associated to speculative conclusions, that leave me with many concerns. From a point of view, it presents new results about the coseismic displacements of the studied earthquake and a first source estimation. However, the study lacks of many important topics/comments

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commonly associated to data analysis and modeling, leading to hypothetical interpretations.

My suggestion is: the manuscript is unsuitable to be published in NHESS in the present form. If the authors clarify the following main concerns, changing the draft consequently, showing the interferometric/modeling results without any further interpretation (if unsupported by data and analysis, and in the present form this is the case), so that the study may be considered for publication as short communication or technical note.

Main concerns

1 – Two earthquakes? Bell et al. (2008) documented a M 5.4 (18 Sept. 2004), M 5.6 (18 Sept. 2004) and a M 5.0 (20 Sept. 2004) earthquakes at Adobe Hills (Fig 3 of the technical report). I checked in the global-CMT and Neic-USGS catalogues, finding in both catalogues two earthquakes of the same magnitude in 18 Sept 2004, 5.4 at 23:02 GMT and 5.4 at 23:43 GMT, therefore at a very close distance. Even if we neglect the M 5.0 indicated by Bell et al. (2008), why authors avoid to clarify this important point? They indicate the 23:02 earthquake only. It is obvious that InSAR cannot discern between the coseismic deformation due to the first or second earthquake since they happened in the same day with a time lapse of 40 minutes. The manuscript should be re-organized to take into account this important feature, since the deformation observed is cumulative, and the subsequent fault inversion will be related to both earthquakes.

2 – InSAR data. The temporal baselines, especially for the ascending component, are very large. Authors don't show single interferograms, and don't discuss many aspects of the interferometric results. What about the coherence of interferograms with 1000 days of Btemp? Is the deformation distributed in the same way in all the interferograms? And there is a conceptual problem: how can be averaged different images with such different temporal baselines? They contain post-seismic deformation also. Furthermore, as indicated in Section 3.3, during 2004-2006 there was a seismic rate

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increment. My suggestion is to show the InSAR images (not only the average), discuss coherence/results, clarifying which images are averaged.

3 – InSAR data for modeling. The images used in the modeling are downsampled? What is the associated error?

4 – Conclusions. I believe the discussion about the importance of InSAR for determining source parameters are beyond the scope of the manuscript since this cannot be demonstrated by a basic finite fault with uniform slip inversion. In addition to the fact that the InSAR is pertinent to (at least) two earthquakes of comparable magnitude, while the seismic catalogues distinguish between them. I suggest the main scope of the manuscript should be the study the Huntoon valley earthquake giving new insights from InSAR and fault modeling.

5 – Model information missing. The fault should be reported in one of the figures. Data error is missing. Goodness of fit not discussed quantitatively (RMS or % of residuals within errors).

6 – P 4292 line 23. Better say “Agree within errors”. Parameters uncertainty should be reported (InSAR and from seismic catalogues, usually available).

7 – Section 3.3. There is no “suspect” (line 18) but certainty that InSAR images contain cumulative cosesimic deformations of the three (or two) earthquakes of similar magnitude. See arguments of points 1 and 2. This section should be re-organized accordingly.

Minor points

1 – P 4288 both “SAR” may be removed at line 3.

2 – P 4288 line 6 “obvious” to be removed.

3 – P 4288 lines 11-12 “images. . .tracks” may be removed.

4 – P 4288 lines 17-19 last phrase is unsupported by rigorous analysis, should be

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removed. Geodetic inversions by single fault with uniform slip is very basic and the estimated depth is often shallower than from seismic inversions since the deformation data is relative to the free surface. Before going to this conclusion, a quantitative analysis of fault parameters estimation from geodetic and/or seismic analysis should be performed, and this is beyond the purpose of the present manuscript, I guess. Accordingly, also the discussion/conclusions should be modified.

5 – P 4289 lines 5-6 “and. . .strong” to be removed.

6 – P 4289 line 17 InSAR acronym defined few lines above.

7 – P 4289 line 26 “without further modeling” what does it mean?

8 – P 4291 line 5 “u” is a vector or a matrix? Because u_asc and u_dsc seem to be two vectors. What is “r”?

9 – P 4292 line 7. “reasonably well” is unsupported by quantitative data, e.g. RMS or percentual of residuals between data error.

10 – P 4292 from line 19. Institute acronyms should be defined in the text before first citation of Table 1 or in the table caption.

11 – P 4293 lines 9-10. Conclusion should be reviewed taking into account the uncertainties of the retrieved source parameters.

12 – P4295 line 19. “Last access” necessary?

13 – P4296 Table 1. Please use same number of significant digit. Refer to text for acronyms definition, or insert acronyms here. All the longitudes must have same sign (negative).

14 – P4299 Table 4. Negative longitude. Errors missing!

15 – P4300 Fig 1. Mw + 5.5 may become Mw 5.5.

16 – P4301 Fig 2. Mm instead of rad should be better.

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 4287, 2013.