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Natural Hazards and Earth System Sciences
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Discussions

NHESSD
3, C1214–C1217, 2015

Interactive Comment

Interactive comment on "Railway deformation detected by DInSAR over active sinkholes in the Ebro Valley evaporite karst, Spain" *by* J. P. Galve et al.

Anonymous Referee #1

Received and published: 6 July 2015

General

Although the focus is on the local-scale problem linked to a sinkhole-related land subsidence, the results appear significant and could be of interest to NHESS audience. However, the readers unfamiliar with the study area (like me) may not fully appreciate the problem and the presented results, because of the insufficient background and contextual information. So, I suggest adding an overview geomorphological or geological map including also lithology and sinkhole distribution, as well as some more explanations in the text. Also the area covered by PS maps in figs 2 and 4 is so small that one misses the context. Please show larger areas in addition to the two small area zooms. I also suggest to complement the work by considering the temporal resolution of DInSAR-based results, which is related to satellite re-visit times. This is important when contemplating the use of DInSAR for monitoring and early warning purposes (you can find more information on this issue in References below). Finally, some aspects of the DInSAR data and derived results should be better explained (or relevant references provided) to make them understandable for the general NHESS audience, who may not be very familiar with radar interferometry. Below I indicate specific points that should be clarified and make some additional suggestions for paper improvement.

Specific issues

Section 1 – Introduction

SAR interferometry has been used to study sinkholes also outside of Spain (for example in Israel, USA). Perhaps it would be useful to cite some relevant examples. Line 57 why "respectively"?

Section 2 - SAR data & processing

Consider adding a table with ENVISAT and ALOS data characteristics, including spatial resolution, incidence angle, etc. In the text you mention full and medium resolution data, but do not clarify the actual resolution. Further, we learn the ALOS PS map had a 25x25m ground resolution, but the resolution of ENVISAT PS map is not given. Need to clarify what is meant by "Current Displacement rate values" and explain >2 mm/yr and >4 mm/yr velocity thresholds.

Section 3 - DInSAR results

The results shown in figs 2-4 are derived from ENVISAT and ALOS data, and you should explain the reasons for using different satellite images for the two sites, which are located very close (2km) to each other (Fig. 1). Limited spatial or temporal coverage, or? Please explain also the meaning of negative displacement rates.

Section 4 – Discussion

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Interactive Discussion

Discussion Paper

The discussion regarding the differences in density of radar targets obtained from ENVISAT and ALOS data is of interest but remains unconvincing (and even potentially misleading), because neither the actual numbers nor the actual significance of the density estimates are not provided. What areas were considered and how was PS density calculated? Please quantify and explain. Furthermore, the suggested explanation of the differences in ENVISAT and ALOS PS densities are weak, because some of the controlling factors are not considered.

The issue of radar target density (as well as that of quality and reliability of DInSAR and multi-temporal interferometry results) have been dealt with in detail in a recent review paper by Wasowski & Bovenga (2014a). In particular, in addition to the critical influence of the ground cover and land use, the number and distribution of radar targets depends also on the number of images used, the adopted processing parameters (and algorithm type), the selected coherence threshold, and on the spatial resolution of radar imagery. The recent remote sensing literature shows that in comparison to medium resolution imagery (e.g. ENVISAT), the use of high resolution data (e.g., COSMO-SkyMed and TerraSAR-X) can lead to more than 10-fold increases in radar target densities (e.g. Bovenga et al, 2012). Again, this aspect is discussed in detail by Wasowski & Bovenga (2014a,b), who also provide practical examples to show how high resolution radar data can lead to greater quantity (high target density) and quality information for the assessment of transportation infrastructure instability in landslide-prone environments.

Line 182-185 Unclear what you wanted to say

L207 higher critical baseline – you are probably referring to SBAS processing. This should be made clear.

Section 5 – Conclusions

Line 234 high resolution surface velocity maps from ENVISAT and ALOS data – potentially confusing, because the ENVISAT and ALOS data are generally considered as medium resolution and high resolution is “reserved” for TerraSAR-X and COSMO-

SkyMed data.

L248-249 but on demand high resolution radar satellite data are also expensive

L250 medium-high risk situation – not very informative

L254-256 future studies... - why future? There are already a number of examples published in scientific literature.

Figures

Fig 2b and 4a – explain dotted white line

Fig 4d – what does blue-grey color stand for?

References

Bovenga F., Wasowski J., Nitti D.O., Nutricato R., Chiaradia M.T. 2012. Using COSMO/SkyMed X-band and ENVISAT C-band SAR interferometry for landslides analysis. Remote Sensing of Environment, 119, 272–285. doi:10.1016/j.rse.2011.12.013

Wasowski J., Bovenga F. 2014a. Investigating landslides and unstable slopes with satellite Multi Temporal Interferometry: Current issues and future perspectives. Engineering Geology 174: 103–138. http://dx.doi.org/10.1016/j.enggeo.2014.03.003

Wasowski J., Bovenga F. 2014b. Remote Sensing of Landslide Motion with Emphasis on Satellite Multitemporal Interferometry Applications: An Overview. In T. Davies (Ed). Landslide Hazards, Risks and Disasters. p. 345-403. http://dx.doi.org/10.1016/B978-0-12-396452-6.00011-2 Copyright © 2015 Elsevier Inc.

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