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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Landslide dynamics and coupling revealed by L-band InSAR in central Georgia" *by* E. Nikolaeva et al.

Anonymous Referee #2

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General comments: Authors show an important work towards landslide research, including landslide classification, investigation, monitoring, mechanism analysis, trigger factors discussion and GIS management. On the other hand, in a single paper, authors should focus on one or two main parts, not all aspects. Actually, lacking of in-situ measurements, most analysis cannot be undertaken. So, several conclusions are not convincible. Several sections in this paper are irrelevant to the topic, please condense them. I point out my suggestions in paper sequence as follows. This paper and test involved should be enhanced.

Specific comments and technical corrections: P5, L1, a mistake of 10-mm yr- . Here authors show the temporal deformation scale, while the spatial deformation different in magnitude and direction is another main problem to be considered. P5, L6, "common

InSAR"ãĂĂshould be replaced by "traditional 2 pass differential InSAR". At the end of the first paragraph in section 3.1, authors should give some brief explanations of the functions of four data involved and then give detailed description as follows. P7, L 25, exactly to say, it is better to use "pixel posting or spacing" rather than "resolution". The accuracy of GDEM and SRTM DEM (1 arc sec?) should be discussed and the propagation of DEMãĂĂerror to deformation are beneficial to the differential interferograms analysis. What's the landslide type in this research? rotational, translational or complex one? In my view, the inverse models are different for different landslide type, so do the volume estimation. Authors should focus on the one and give more detailed description. Please give all parameters of SAR interferometric pairs, accordingly, the InSAR deformation errors can be analyzed. Moreover, the precision or accuracy of InSAR results is missed. If the temporal evolution of landslide is expected, the best way is to use SBAS method, especially for the later trigger factor analysis. Regarding the arrangement and explanation of Fig. 4, it confuses me, such as Fig. 4(1,2,3) is refer to A, B, C or (1), (2) and (3), so do Fig. 4(1-3). And in the Figure 4, please re-arrange the sub-figure sequence in chronological order as the daily deformation rate is considered, and give the time duration for each figure after perpendicular baseline. I also find some figures have not been discussed in the whole text. Besides, the InSAR quality is low for some monitoring duration, such as the images shown in D and H. Please give more discussion of InSAR results before inversion of the landslide geometry. In the main text, please correct the figure label of Fig. 5 and Fig. 6 with capital, not low cases, make sure the consistence with the corresponding figures. P15, L21, temporal baseline is 92 days, not 90 days. As far as landslide volume is concerned, please clarify the type of landslide, is it the deformed landslide or geomorphologic landslide, as the surface areas are significantly different as mentioned in the text. In section 4.3, refer to Okada dislocation inversion, firstly, the three interferograms are not well consistent with each other, regardless the thermal noise. So the errors of deformation should be analyzed and tried to mitigate in advance, such as DEM error, artifacts or phase unwrapping errors. Secondly, as for a specific landslide, the mostly changeable

parameter is dip slip dislocation component, especially for the temporally non-linear landslide, whilst the changes of any other parameters can be neglected. Therefore, in technical mean, you'd better fix some parameters in order to achieve good inversion results. Currently, the inversion results are not convinced, and the errors will propagate to volume estimation. More importantly, the inversion of depth and dip angle and geometry and the validation are key to landslide mechanism research and landslide hazard mitigation and prevention. Some errors exist in Table 1, such as the 2nd column of 46 and 92 days and in title, (Fig. 8A-C). Again, as for the extrinsic factors of landslide movement discussion, the prerequisite is the reliable InSAR time-series deformation results and even dense resolution in time domain. P16,L11, 0.3km and 1 km should be transposed.

Fig. 9 is confusing, please give more detailed explanations in caption and in main text. It's hard to analyze temporal correlation between surface deformation and precipitation within four different areas. Precipitation data should be collected from metrological station (real data), not the simulated model (ECHAM5).You'd better change the scheme. As a result, no obvious correlation between deformation and precipitation can be found. Actually the lagging between deformation and precipitation should be carefully considered. (see e.g. Hilley et al., 2004, Science; Chaoying Zhao et al., 2012, Remote Sensing of Environment)

P18, L27, make sure the MI = 3.8 and in Line 25 Mw = 6.0 are correct. And in this paragraph, please indicate two earthquakes in Fig. 9.

The discussion of mining factor to landslide is too qualitative to be convinced. More investigation data should be imposed.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 4925, 2013.