

Interactive comment on “A semi-automatic procedure to support the detection of rapid-moving landslides using spaceborne SAR imagery” by Giuseppe Esposito et al.

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General comments:

This research is very interested, and I think it represents a valuable contribution to the current state-of-the-art of landslide mapping and detection during post-emergency phases, especially in case of persistent clouds. The Authors apply a change-detection method, classically used in optical remote sensing, to radar images. The rational and methods are well described and presented. I agree with other comments about the title: it is somehow inexact. The main contribution of the research is the detection of earthquake-triggered landslides (event inventory mapping) rather than rapid moving

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landslides detection before occurrence. Therefore, I agree to revise it. The manuscript is supported by a robust biblio-graphic background. The scientific sound is appropriate and supported by a good statistical analysis, which makes the results very interesting and noteworthy. The overall quality of the manuscript is very good, with an appropriate number of figures. The English language is good. I have just a few comments as reported in the attached pdf file.

Author response: We are grateful to the Reviewer for the appreciated comments and suggestions aimed at improving our manuscript. We agree with the previous comment. As highlighted in the attached pdf file, both the title and other issues identified by the Reviewer throughout the manuscript have been revised accordingly.

Specific comments

Please provide more information about the used images (ex. Image characteristics, geometry of acquisition).

Author response: Information on the dataset has been provided both into the sections 2.1 and 3. Further specifications have been inserted in section 3, as highlighted below:

“Considering that the majority of the slopes in the study area are exposed towards West, to limit geometrical distortions in the single images and in the change detection estimation, we preferred to use IW-SLC products acquired in ascending mode, with a VV-VH polarization. Each IW product is collected with a swath characterized by a width of 250 km, subdivided in turn to three sub-swaths containing one image per polarization consisting of a series of bursts which are processed as independent SLC images.”

A new version of Figure 2, including the spatial extent of the used Sentinel-1 SAR images, has been also prepared, as shown in the attached pdf file.

Please provide more information about georeferencing problems of radar images and associated characteristics that play a role in analysis (i.e. layover, shadow and foreshortening).

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Author response: More information about this point are provided both in the Introduction and Discussion sections, as highlighted below:

Introduction: “geometric distortions, such as layover and shadowing due to the side-looking acquisition geometry of SAR sensors, that can affect the quality of the images over mountainous areas, where landslides are likely to occur.”

Discussion: “Another improvement may consist in the use of images acquired in both ascending and descending geometries. The use of ascending images was only related to focus this first step of the work on the implementation of the entire processing chain, that we tried to simplify as much as possible. In fact, there is no doubt that combining images acquired in ascending and descending geometries can improve the quality of results, representing a non-trivial advancement of the procedure that was out of the aim of this first implementation. The a priori choice of using ascending products was based on the findings that most of the slopes in the study area are exposed towards West, with the aim of limiting the inclusion of geometrical distortions in the change detection products.”

Along the text, it is not clear which processing step is done manually, semi-automatically and in a fully automatic way. Please specify better.

Author response: Considering this comment, we probably have improperly termed the proposed procedure as “semi-automatic”. In fact, the operations described in the flowchart run in an automatic way but they need a one-time calibration phase to define both values of the parameters required for the segmentation and some statistics. Therefore, we preferred to delete “semi-automatic” from the title and within the revised version of the manuscript. Moreover, it is worth noting that information on how we automatized the described procedure is provided in the paragraph 2.5, that we have renamed as follows: “Automatic implementation of the processing chain”.

Please also note the supplement to this comment:

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<https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2020-55/nhess-2020-55-AC2-supplement.pdf>

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