

Interactive comment on “Brief Communication: A new testing field for debris flow warning systems and algorithms” by M. Arattano et al.

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We have followed all the minor suggestions of the referee regarding the single text changes required. In the following we only address the major comments of the referee.

The referee asks and comments:

1. The description of the algorithms and the sensors needs more details.

Answer: We have added greater details in the text (see the following).

2. The paper has a great number of self-citations. Although I acknowledge the contribution of the authors in this field I strongly encourage the authors to reduce this number and to add external references.

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Answer: We agree with the reviewer and so we have eliminated three self-citations and added three external references in their place (Di Capua and Peppoloni, 2014; Koschuch et al., 2015; Moser et al., 2002).

3. The abstract is not sufficiently informative. From here it is not clear what kind of “installation” you realized; is it an informative installation? Is it an EWS? What parameters does it measure? What kind of information is delivered by the didactic video? In the last sentence of the abstract it seems like this video was only possible after that a debris flow occurred.

Answer: the abstract has been completely re-written, specifying that this new installation offers an example of integration between technical and informative needs. However the abstract requirements for brief communications impede to enter into many details. The parameters that the EWS measures (mainly the SNR) are specified IN THE TEXT. The same for the kind of information delivered by the didactic video. Actually the didactic video was only possible after that a debris flow occurred, so the information provided is correct.

New abstract:

A permanent field installation for the systematic test of debris flow warning systems and algorithms has been equipped on the Eastern Italian Alps. The installation was designed to produce also didactic videos and host informative visits. The populace education is essential and should be envisaged in planning any research on hazard mitigation interventions. This new installation responds to this requirement and offers an example of integration between technical and informative needs. The occurrence of a debris flow in 2014 allowed to test a warning system and to record an informative video on its performances. This paper will provide a description of the installation and an account of the first technical and informative results obtained.

4. Page 1718 line 15: there are many examples of landslide EWS, please cite a few.

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Answer: we have added a pair of references to some examples of landslide EWS.

5. Page 1718 line 19: advance EWSs can also perform predictions based just on displacement data (see for example Rose & Hungr, 2007; Intrieri et al. 2012) without considering hydro-meteorological conditions, unless you only refer to debris flow EWSs, in which case please be more precise. Otherwise, if you want to be more general about EWSs, remove the reference to debris flows from line 21.

Answer: we have clearly specified that we only refer to debris flow EWSs and we cite a paper that only refers to these type of phenomena (Hungr et al., 1987).

6. Page 1719 line 8: what are these specific devices that permit to detect the arrival in advance? How much in advance? Why do you not consider EWSs with such devices as advance EWSs?

Answer: we have added in the text at pag. 1719 an indication of the type of sensors that permit to detect the debris flow arrival in advance and also an indication of the amount of advance. When ground vibration sensors are employed, in fact, they may be able to detect some tens of seconds in advance the arrival of the debris flow (Abancó et al., 2014; Koschuch et al., 2015; Schimmel and Hübl, 2015). However, tens of seconds are still too small an amount of time to consider these as advance EWSs. Moreover, these latter are conventionally considered as systems that monitor the hydro-meteorological conditions that might lead to debris flow initiation (Hungr et al., 1987).

7. Page 1720 paragraph 2: you often make reference to algorithms but your description is always very generic. Please explain more in detail how these algorithms work.

Answer: there are actually still very few examples of algorithms for debris flow detection and warning in literature to provide a good number of examples. However we have introduced a reference to the algorithms proposed by (Badoux et al., 2008) and also by (Abancó et al., 2014), giving an explanation of their working principle and referring to the authors for more details. The warning algorithms we are referring to, require that

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a certain signal intensity threshold is exceeded to spread the alarm, for example, and they need a check of the correct choice of this threshold (Badoux et al., 2008).

8. Page 1720 line 26-27: websites are better cited in the reference list together with the date of the last access, while in the main text you can just write Siapmicros, 2015 or Sedalp, 2015.

Answer: we thank the reviewer for the suggestion that we have accepted correcting the paper accordingly.

9. Page 1721 line 27: please add some reference of studies dealing with the importance of involving public education.

Answer: the reference Di Capua and Peppoloni (2014) has been added that deals with the importance of involving public education.

10. Page 1723 line 1: how this algorithm is different from what described in Arattano et al., 2014?

Answer: an explanation has been added to introduce the reference of Arattano et al., 2014.

11. Page 1723 line 16-17: please explain what caused the false alarms.

Answer: the false alarms was produced, in one case, by the passage of a vehicle along the left bank of the torrent and in the other by a distant source of vibration that caused simultaneous recordings at the three sensors. We have added this information in the text.

12. Figure 1: it is not clear what a stage sensor is. Furthermore flashing light (named in the text) should be added in the figure.

Answer: the flashing light has been added. We prefer to leave "stage sensor" because it explain clearly the purpose of the sensor: measuring the stage (level) in the torrent.

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13. Figure 2 caption: Please describe in the caption what we see in fig. 3b and c (the description furnished is very generic).

Answer: Figure 2 has been modified and improved and it has been better described in the caption what we see in fig. 3b and c.

References

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Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/3/C860/2015/nhessd-3-C860-2015-supplement.pdf>

Interactive comment on *Nat. Hazards Earth Syst. Sci. Discuss.*, 3, 1717, 2015.

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