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Discussions

Interactive comment on "Empirical atmospheric thresholds for debris flows and flash floods in the Southern French Alps" *by* T. Turkington et al.

J.L. Wood (Referee)

j.l.wood@exeter.ac.uk

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GENERAL COMMENTS

This paper effectively communicates a methodology by which to determine robust thresholds for flash floods and debris flows from regional atmospheric conditions from ECMWF ERA-Interim reanalysis data. The paper compares the results with rain gauge derived thresholds, and demonstrates that atmospheric reanalysis data is an important asset, potentially replacing rainfall measurements in empirical exceedence thresholds for debris flows and flash floods. I believe that the paper addresses relevant scientific and technical questions within the scope of NHESS whilst presenting novel methods for deriving these thresholds, and I would recommend publication.

The title clearly reflects the contents of the paper, and the abstract provides a concise, complete and unambiguous summary of the work done and the results obtained; both are pertinent and easy to understand to a wide and diverse audience.

The author gives credit to previous and related work, and clearly indicates the relevance of these to this paper. The author is also able to highlight the short-comings of other studies (e.g. p.5, lines 1-6) and address these through this new methodology.

The size, quality and readability of each figure are adequate to the type and quantity of data presented. References are clear, of appropriate quality, and are accessible. Mathematical formulae, symbols, abbreviations and units are correctly defined and used. The scientific methods and assumptions, to my knowledge, are valid and outlined clearly; however the authors may wish to consider framing the statistical and mathematical elements of the paper (e.g. the SI, section 3.2) within the context of this work as opposed to from a purely mathematical basis.

Section 3.1 provides a good description of the data used and the reasons for this; although as a reviewer I am unfamiliar with this data and so am unable to comment on its suitability. Section 4 gives a clear outline of the findings, applicability and issues. Section 5 provides a clear, well written and concise summary of the paper, findings and applicability.

Overall, the presentation is well structured, clear and easy to understand and the technical language precise and understandable by fellow scientists, with further comments available for these in the following sections of this review.

SPECIFIC/TECHNICAL COMMENTS

I think that section 3.2 and 3.3 would benefit from a little editing for clarity, i.e. with the use of the SI in relation to the meteorological variables, and with regards to the application of Bayes theorem. At first reading it is not entirely clear how these were applied to the datasets used in the paper. I think that the authors should be more prescriptive of how these were applied to the datasets used in this paper.

In agreement with the other reviewer a concern is the limited number of available events from which this analysis was conducted. I feel that the paper would benefit from a comment on the limitations that the small sample size imposes.

MINOR CORRECTIONS/SUGGESTIONS

As the paper deals with scales at which thresholds are derived through the application of models (p.3, lines 19-25) and I feel that this could be appropriately mentioned in the abstract for context, e.g.: The method is tested in the Ubaye Valley in the southern French Alps (548 km2), which is known to have localized convection triggered debris flows and flash floods.

P.10, line 13 - (large scale atmosphere) was defined on P.6, line 3, but first appeared earlier on P.5, line 19.

P.11, line 23 - Each day in the calibration period 1989–2004 is assigned a label as an event day (a day where one or more flash events were recorded), and non-event days (where no flash event was recorded).

P.15, lines 10-13 - needs consistency: The earliest local convective event reported in a year occurred on the 1 June (number 5 in Table 3) and the latest on the 23 November (number 13 in Table 3). The synoptic events occurred over a wider range of months, between March (number 9 in Table 3) and November (number 1 in Table 3). OR The earliest local convective event reported in a year occurred on the 1 June and the latest on the 23 November (numbers 5 and 13 in Table 3). The synoptic events occurred over a wider range of months, between March and November (numbers 9 and 1 in Table 3).

P.15, line 15 - (Fig. 5, middle and bottom) for consistency?

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 757, 2014.