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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Debris flows in the Eastern Italian Alps: seasonality and atmospheric circulation patterns" *by* E. I. Nikolopoulos et al.

Anonymous Referee #2

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The manuscript deals with an interesting issue concerning rainfall thresholds triggering debris flows, which the Authors have focused on the effects related to seasonality and atmospheric circulation patterns. Therefore, the research has been oriented to analyze spatial and temporal variabilities of rainfall thresholds, reconstructed by an empirical approach at a regional scale, taking into account different seasonal and climatic conditions. The study area is the Trentino-Alto Adige region (Eastern Italian Alps) for which the Authors have reconstructed, in the period 2000-2009, a consistent dataset of debris flows occurrences (821 events) and gathered hourly rainfall data from a regional rain gauge network (205 stations). The paper is generally well structured and written and only few conceptual improvements can be accomplished to increase its completeness. These possible advances are described following through general and specific

comments.

GENERAL COMMENTS

The manuscript describes accurate analyses regarding the influences of seasonal effects and atmospheric circulation patterns on characteristics of rainfall events that triggered debris flows in the studied period. Nevertheless, additional evaluations and descriptions about two aspects, whose explanation would improve the manuscript, could be carried out:

a) Effect of orography on rainfall patterns. This aspect appears to this reviewer not trivial due the very high mountainous morphology and wide altitudinal range of the Trentino-Alto Adige region. Therefore, Authors could discuss more about the relationship between orography and spatial distribution of rainfall patterns triggering debris flows.

b) Extension of the climatological analyses. Besides the Hess and Brezowsky Grosswetterlagen (GWL) classification system, Authors could describe the mean annual rainfall patterns of the region in terms of monthly cumulative values and mean intensity. This analysis would improve the comprehension of the seasonal effects on rainfall events triggering debris flow and explain the ratio between debris flow occurrences and rainfall events (Tab. 2) also by this point of view. Also for this type of analysis, a zonal differentiation appears to be possible due the extension and variable physiographic setting of the Trentino - Alto Adige region.

SPECIFIC COMMENTS

1) Lines 115-116: further descriptions about the altitudinal distribution of rainfall stations and locations of debris flows would improve the comprehension about the representativeness of rainfall records and the inherent uncertainties.

2) Line 124: probably the extension of references about the Hess and Brezowsky Grosswetterlangen (GWL) could give to the reader a more comprehensive view of the

scientific literature about this topic (e.g. references cited in James, 2007).

3) Line 150: “rain” before “gauge” perhaps is better.

4) Lines 164-166: the Fig. 3 shows a distribution of DF rainfall events, with higher accumulation and intensity values, which appears in accordance with the shape of the principal mountainous ridges (Fig. 1). A description of the effect of the orography with rainfall event triggering debris flows could increase the understanding about factors controlling rainfall thresholds.

5) Lines 177-178: this finding could be better understood with a descriptive analysis of the mean pluviometric regime of the area. For instance, with an additional figure showing the mean annual monthly cumulative and intensity values of rainfall as well as a related description.

6) Lines 194-195: the same as the preceding point 5.

7) Lines 203-206: the same as the preceding point 4.

8) Line 246: in this case, also a correlation with orography would complete the analysis.

9) Lines 255-258: the relationship could be found also with orographic conditions.

10) Lines 309-311: the same as the preceding point 4.

11) Line 339: the following paper should be cited and discussed

Vessia, G., Parise, M., Brunetti, M.T., Peruccacci, S., Rossi, M., Vennari, C., Guzzetti, F., 2014. Automated reconstruction of rainfall events responsible for shallow landslides. Natural Hazards Earth System Sciences, 14, 2399-2408.

12) Lines 390-392: this reference seems incomplete.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 2, 7197, 2014.