

Interactive comment on “Landscape analysis for multi-hazard prevention in Orco and Soana valleys, North-Western Italy” by L. Turconi et al.

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Comment of the Reviewer The manuscript seems to derive from a professional work done by the Authors (maybe some of them) to arrange a civil protection plan of the investigated area. They used aerial photo interpretation and field survey as well as an analysis of historical archives in order to delineate the major hazards affecting the area. Moreover a rainfall analysis of 82 years has been carried out to "evaluate the critical range of rainfall volume that lead to instability and trigger slope failure". A quite relevant data base has been compiled and some maps combining different layers have been produced.

Response:After the last huge flood disaster on October 2000 in the Orco and Soana

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valleys, several inhabitants claimed that some anthropogenic activities are responsible for landslides and flood events. Thus, public bodies (Regione, Comunità Montana, Comuni) asked to researchers of the CNR-IRPI Institute, due to their long-lasting experience in the studies on natural hazards and for warranties of impartiality, to give a scientific advice in order to arrange a civil protection plan for that area. The responsibility has been given by the CNR-IRPI to some of the authors of the present paper. While going to consult the historical records on the concerned area it was found that there was continuous lack of previous investigations and geomorphological studies on landscape instability since then. Persons in charge for research were thus involved in organizing and performing a bulk of activities, integrating the practical issues of the civil protection plan and to carry out detailed scientific work to make the plan a complete one. Methods and results, according to the authors, are enough illustrated in the work. Moreover, these sections have been revised to address all the hazards systematically.

Comment of the Reviewer The used methodology does not show any innovative approach and would be suitable for a degree or PhD thesis not for a scientific journal.

Response:In reality, the whole work has been completed engaging 10 persons for 1 year to go through the historical archives, hydrologic data analyses and GIS- mapping. Although some techniques used by the authors for fieldwork (e.g. geologic survey, geomorphological mapping, dendro-geomorphology by using the incremental probe or Pressler's auger, sediment analysis of grain size...), laboratory (e.g. aerial photo interpretation) tests are done by specialists, any further data processing and analysis has been done by the authors as well as the specialists using logical approach, which is innovative concerning the combination of data arising from different methods and sources. A lot of work done in the field for cross-control between paper reports and manuscripts dealing with descriptions of past gravity-driven rock masses and floods in a given locality and year, and field rectifications even for weak traces or signs of geomorphological records (terraces, sedimentological evidences...) as well as the age of old trees sampled for counting the growth rings. In most cases we found that

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data, reports and fieldwork analyses are matching for a past event in a given locality, or accordance in age between old documents and dendrochronological evidence. Recognition of some landforms and their changing nature (e.g. rockstream, partially buried or frozen debris flows deposits, unstable masses on slopes) have been detected from the archival information, which is more than any professional approach; whereas findings, discussions, experiments require scientific experience. In practice, the capability of solving intriguing geomorphological problems related to landslide or debris flow proneness, organizing bulk of data derived from different sources and distinguishing between the individual incidents is a matter of scientific reasoning than a professional routine.

Comment of the Reviewer There is an evident lack of information about rainfall analysis (no any numerical data have been reported, no information about the statistical model employed in such analysis), data base structure and specific outcomes.

Response: In reality, the so-called (maybe improperly) rainfall analysis has consisted a compilation of historical rainfall data (rainfall depth cumulated for three/four days, maximum 1-hr rainfall intensity) of the date of events of more or less serious landsliding and/or flooding has been occurred over in the study area. Thus, the objective is to detect (approximately) the threshold rainfall values simply by comparing rainfall vs expected events using both qualitative and quantitative techniques. In the text, the term has accordingly been changed from 'rainfall analysis' to 'rainfall values compilation'. Other hydrologic models, for flood prediction as well as debris flow magnitude have been cited in the text, according to the Reviewer's comment. Concerning data-base structure, if the Reviewer's remarks are related to the arrangement of data used in the draft of thematic maps (through data layers), a sentence has purposely added in the section 'Methodology'. Specific outcomes from the whole study are already illustrated in the section 'Results and discussion' and sentences or corrections have been incorporated for clarity and completeness.

Comment of the Reviewer Moreover there is some confusion in using a correct terminology (e.g., complex and composite landslide or process) and some terms are not

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properly explained or even obscure (e.g., gigantic landslide system, GSD).

Response: The 'complex landslide' means some landslides of several origins and kinematics and accordingly cited in the text. The term 'composite' has been removed from the whole text, according to the Reviewer's remarks and it is replaced by the term 'manifold'. The acronym 'GSD' has been rewritten, as 'Gravitational Slope Deformation'.

Comment of the Reviewer The section of the manuscript dealing with different type of hazards is quite poor and not exhaustive (few lines for each type of hazards).

Response: Being the focus of the study to illustrate the work done in order to 'discover' the status, under several points of view, of a valley system very poorly known from the points of preventing hazard conditions, geo-morphological conditions and recurrent (although evenly-distributed in space and time) slope instability and streamflow processes, as well as in order to describe how the knowledge derived from the research was transferred to purposely-drafted tables for a civil protection plan, the Authors do not find it essential to develop further detail in reporting the numerous 'case studies' or descriptions of processes known.

Comment of the Reviewer Some statements like "debris flows are most frequent during exceptional rainfall events" (lines 18 page 22-27); "our research finds that events of a given magnitude and process recur periodically in the same localities...." (line 13 page 22-35) and others, are quite banal and predictable and prove that the activity illustrated in the manuscript is merely a service for some local authorities which outcomes are generally internal reports.

Response: The statement 'debris flows.events' has been deleted from the text. Regarding the statement 'our research.', we have added '...may recur periodically. . .' just keeping in mind that the concept of 'periodicity' in such events is not so much 'banal' and 'predictable' as that an extreme event (the largest never occurred in the historical timetable) may happen even at millennial scale, as the authors have experienced in the Alps. About the 3rd point, we fully disagree with the statement that

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some outcomes, like illustrated in the present work, have merely a value of internal reports. The IRPI Institute has published several articles and books dealing with some concerns of the present study: a pair of these (e-books) are listed in bibliography.

Comment of the Reviewer The structure of the manuscript would need a better arrangement too: some chapters (i.e. chapter 2) are too long reporting useless information (for the scope of the paper); some other are too short (see above)

Response:Chapter 2 has been shortened just to explain geo-structures and morphology as intimately linked to preparatory agents for slope instability and stream activity. About 'shorteness', if it is referred to process descriptions (types of hazard), the reasons have already been referred above.

Comment of the Reviewer The references seem not up to date being most of them more than 10 years old.

Response:Some sentences are forcedly required as 'benchmarks' in literature, since no other useful references for the present work have been found; few recent references have, however, been reported and added in reference (e.g. Gamper, 2008; Turconi et al., 2014).

Please also note the supplement to this comment:

<http://www.nat-hazards-earth-syst-sci-discuss.net/3/C820/2015/nhessd-3-C820-2015-supplement.pdf>

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