

Interactive comment on “The December 2012 Mayo River debris flow triggered by Super Typhoon Bopha in Mindanao, Philippines: Lessons learned and questions raised” by K. S. Rodolfo et al.

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These are our final author comments on behalf of all co-authors (final response phase), all of which were already published on the NHESS page [<http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-102/#discussion>]:

1. Responses to Referee #1

i. From K S. Rodolfo, published on 04 June 2016: We are grateful for the review by Referee #1, and accept many of its comments and suggestions. However, we believe Referee #1 interprets the NHESS definition of a research paper, and of “substantial and

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original scientific results" too narrowly. The judgment that our report "is not a scientific research paper" dismisses the effort expended in gathering remotely-sensed data to use for evaluating debris flow in the field, the fieldwork itself, and the scholarship that went into examining the literature in search for clues regarding what Typhoon Bopha and the Andap tragedy might signify for the future.

As its name implies, the journal Natural Hazards and Earth System Sciences serves a very diverse audience of professionals concerned with natural hazards, and is the ideal home for this holistic examination of the Mayo debris flow, a major disaster triggered by the world's worst storm of 2012. Such catastrophes inextricably involve both natural and human components of the Earth system, and we evaluate it holistically as such. The NHESS website states: "Papers submitted to NHESS can address different techniques and approaches including theory, modelling, experiments, case studies, and instrumentations... Contributions dealing with multidisciplinary aspects of natural hazards and their consequences are welcome."

We document the world's seventh largest debris flow of record with all the meteorological, geological and historical reasons that made the Andap tragedy possible. (Typhoon Bopha deserves greater attention in its own right, because no Super Typhoon had ever formed and made landfall so close to the Equator.) We discovered that the literature concerned with future tropical-cyclone activity may not apply to low-latitude areas like Mindanao. Finding a major gap in our understanding is important too, for otherwise how can it be remediated?

One of our themes is how interacting geologic processes affect the development of communities. We illustrate how the lack of knowledge about fundamental principles of geomorphology, geologic history, and mass wasting can profoundly contribute to disasters. The NHESS website includes within the scope of the journal "the analysis of the impact of climatic and environmental changes on natural hazards and their consequences", which is exactly what the last part of our paper tries to do. Uncomfortable with our holistic approach, Reviewer #1 proposes to eliminate or greatly reducing



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several important parts of the manuscript:

A. Lines 5-25 on page 4, which describes the debris flow phenomenon. We believe it is necessary because one cause of the tragedy was precisely that many land use planners, not only those who established New Bataan and Andap, are still unacquainted with debris flows. Are not such decision makers a target audience for NHESS? Other readers not well grounded in geology might also find this useful.

B. Lines 19-22 on page 7, which explain how we estimated the velocity of the debris flow that hit Andap. Omitting this, however, would have us simply assert to the uninformed the velocity, without giving our basis for arriving at it.

C. Section 5 [Geomorphologic setting and history of New Bataan and the Mayo debris flow]. It is rare that the entire history of a community from its establishment to its devastation is available, and that events and decisions made along the way contributed to the disaster can be described, as these 27 lines do.

D. The review characterizes Section 7, The role of Philippine population growth, as “interesting, but not so useful to the discussion in a scientific paper”. That unabated growth motivated the establishment of New Bataan and Andap, and continues to exacerbate the hazards in a country where safe areas to develop are already virtually nonexistent.

E. Virtually our entire Section 8, our exhaustive evaluation of what the climatologic literature might tell us about future typhoon impacts on Mindanao. We cannot simply substitute it for the assertion by Chang and Chiang (2011) that typhoon activity will increase in Taiwan. See for example the comprehensive review by Knutson and his nine coauthors (2010), which is much more equivocal. This is especially true for Mindanao and other low-latitude areas, which, even though they have large populations, are given short shrift by most meteorological and climatologic analyses.

F. Finally, Reviewer #1 suggests that we excise Section 8.6, Other climate-related haz-

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ards in the Philippines and Mindanao. We think these six lines are necessary to inform the readership that Mindanao is susceptible to other hazards related to climate change. First specific comment: We will modify lines 25-27 on page 1 to state that published definitions also refer to debris flows as a variety of landslide, and will cite the sources provided by the reviewer.

Second specific comment: We will prepare a figure that shows the high-resolution imagery that we used to map out the debris flow deposit.

A very well taken suggestion is that we provide internet links for the amateur video footage of the debris flow we mention on page 7, line 16, which we will do.

Reviewer #1's TECHNICAL CORRECTIONS are also very welcome, and the manuscript will be modified accordingly, with many thanks.

ii. From R. N. Eco, published 08 June 2016: I think the reviewer's definition of new scientific results as only new results or methods is too constricting. The theme of the paper is the interaction between geologic processes and how it affects the development of communities/society. Our research showed that knowledge, or lack thereof, of fundamental geologic principles such as geomorphology, geologic history, and mass wasting have profound effects on the occurrence of disasters. The NHESS website lists the following as one of the scope of the journal: "- the analysis of the impact of climatic and environmental changes on natural hazards and their consequences" I think our paper does this exactly.

Regarding the specific comments: Second comment: We will prepare a figure that shows high resolution imagery that we used to map out the debris flow deposit.

On the technical corrections: We'll make the necessary corrections to the manuscript.

Response to Referee #2 from K. S. Rodolfo, published 13 June 2016: We thank Referee #2 for very useful comments. The manuscript is being amended to incorporate the comment and references about the definitions of landslides and debris flows, which

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was also mentioned by Referee #1. We are also incorporating the second point that developing countries are also experiencing more frequent hazards owing to urbanization of unsafe areas, along with its references.

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