

***Interactive comment on “Erosion after an extreme storm event in an arid fluvial system of the southern Atacama Desert: an assessment of magnitude, return time, and conditioning factors of erosion caused by debris flows” by G. Aguilar et al.***

**G. Aguilar et al.**

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Dear Teresa,

We kindly appreciate your suggestions and comments on the manuscript entitled «Erosion after an extreme storm event in an arid fluvial system of the southern Atacama Desert: an assessment of magnitude, return time, and conditioning factors of erosion caused by debris flows». By including them the manuscript presents a greater clarity

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and allows us to present a better and more useful contribution. I will now individually answer the main comments that you provided.

1) «The introduction lacks any statement of background information that would justify the authors' hypothesis that rock strength is a control on the rate of weathering or the generation of debris flows. Lacking that background, this reader was surprised to find that data are collected with a Schmidt Hammer, and that mean and IQR values of Schmidt Hammer data are considered to be potentially meaningful. Previous studies which make these assertions should be briefly described, including clarification of the rock types, climate zones, and topographic characteristics of the catchments from which the previous studies extracted their interpretations. Related to the lack of background information, the reader does not know whether to treat the result that there is no correlation of SH mean and IQR to the phenomenon of debris flow generation as a surprising result (because it contradicts a body of published knowledge), or instead as a demonstration that the hypothesis was negated here and may likely also be incorrect in other locations. »

[Reply] Measurement stations of Schmidt hammer were selected considering a statistic analysis of lithology, structural context, and geomorphology of the studied area. Details of this work are in the undergraduate thesis of Fredes (2016) (<http://repositorio.uchile.cl/handle/2250/140357>). In this analysis we take into account a background-review the geology 1:100.000 of Sernageomin (Salazar et al.2013) and geomorphological studies of two Ph.D. thesis of the Universite de Toulouse and Universidad Catolica del Norte (Aguilar, 2010; Cabré, 2019). We will show all the available data in the reviewed version of the manuscript. We will also cite more works that benefit from Schmidt hammer measurements to quantify resistance to rock weathering in catchments. Nevertheless, the validation of the Schmidt Hammer is far from being the focus of this paper.

2) «The authors refer in the Discussion, section 4.1, to the generation of debris flows in tributary catchments as “random.” I do not think that they have provided data which

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justify the statement that the phenomenon occurs randomly. In fact, it seems that their discovery that topographic features of the catchments are predictors of the spatial distribution of debris flows suggests that the phenomenon is not random. »

[Reply] We should have used "heterogeneous" rather than "random" to explain the different hydrological responses registered in relatively small catchments (<100km<sup>2</sup>) in this region of the Andes and therefore in neighboring tributary-junction alluvial fans. We will clarify this in the manuscript.

3) «In section 4.2, the concept of an "uncoupled" landscape is referred to. Nothing earlier in the paper provided an explanation of what the authors mean. »

[Reply] We refer to a landscape in a transient state with "uncoupled" surfaces, i.e. low degrees of connectivity within their catchments. We will clarify this passage.

4) «The caption to Figure 3 lacks vital information and guidance. At the least, it should be stated that left sides are "before" and right sides are "after". We also need to know whether the general color tone change is a physical evidence of erosion due to the March event, or if it merely indicates different sun illumination. »

[Reply] We will improve figure 3 to avoid confusion.

Best regards

German Aguilar

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