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Interactive comment on "Long-term erosion of the Nepal Himalayas by bedrock landsliding: the role of monsoons, earthquakes and giant landslides" *by* Odin Marc et al.

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We thank the referee for its detailed comments.

We only address here its two main comments.

1/On the evacuation timescales for landsliding:

» The transport dynamics is indeed a difficult issue, that remain an important challenge for the community. We now added a paragraph to detail explicitly transport issues:

" A general caveat is that these rates represent mobilization of bedrock into sediment deposited on lower portions of the hillslope and in channels. In contrast, erosion

rates derived from sediment budget and 10Be refer to the materials transported by the rivers. Small landslides (As<=10ˆ4) have small volumes and likely deposit relatively fine grained materials (mostly from shallow, weathered soil and regolith) that should be remobilized and transported by rivers within one to a few monsoons. Thus to the extent that ~50% and 90% of our RE catalogue had their largest or second largest landslides size at about 10ˆ4 m^2, we likely have short term sediment export on the same order than landslide rates. On millenial timescales, evacuation of sediments must depends on river transport capacity and remobilization of debris on hillslopes, likely linked to hydro-climatic forcings (Pratt-Sitaula et al., 2004, Cook et al., 2018). Recent modelling study suggest that fast (10-100 yr) evacuation of most of any large landslide deposit should be achievable due to river morphology self-adjustment (Croissant et al., 2017). However, the variable state of export of giant deposits (>80% preserved for Latamrang and Dhumpu (5 kyr) deposits, but ~25% for the Braga (pre LGM) deposit, Weidinger, 2006), as well as evidence of substantial sediment storage in the high range (Pratt-Sitaula et al., 2004, Blothe and Korup, 2013, Stolle et al., 2018) suggest complex evacuation dynamics. As a result, landslide erosion rates may be similar to or significantly larger than 10Be depending whether landslide evacuation over the last ~1kyr was efficient or not. Nevertheless, the estimated total modern storage in the central Himalayas is ~100 km3 within an area of >105 km2 (Blothe and Korup, 2013), equivalent to a mean cover of 1m, or about 500 yr of landslide erosion, while fission track indicate that >1 mm/yr of erosion have been sustained for 10 Myr or more, clearly indicating that on million year time scales landslide deposit are effectively transported and storage is extremely minor."

2/ On the homogenity of various environmental factors.

» We agree with the referee that the area is not necessarily homogeneous, however, our results in terms of size distribution or amount of landslides are very similar, suggesting, that as far as landslides are concerned the different zones are similar. Nevertheless we rephrase the methods to : "This area encompasses several lithological units, a climatic gradient (with enhanced precipitation south of the high peaks, and a rain shadow behind), localized glaciated areas and a likely uplift gradient (Fig S1 or 1). However, the overall result of these heterogeneities on landsliding is unclear and we start by assuming subparts of our study area (e.g., RE tiles, region of coseismic landsliding) have asimilar behaviour and can be compared applying only an areal normalization, and will discuss the validity and caveats of this assumption at the end."

We also added a geological map and climatic map to Figure 1. It is important to note we do not state that these parameters are not varying, only that their net effects on landslide dynamics is not varying much. This does not say that these geographical variations may not matter for other processes, such as soil formation, underground water storage, river flow. . .

All other details comment are answered in our final reply.

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