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Earth Surface Dynamics Discussions

Interactive comment on "Denudation systematics inferred from in situ cosmogenic ^{10}Be concentrations in fine (50–100 µm) and medium (100–250 µm) sediments of the Var River basin, southern French Alps" *by* Apolline Mariotti et al.

Anonymous Referee #1

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In their paper "Denudation systematics inferred from in situ cosmogenic 10Be concentrations in fine (50-100 um) and medium (100-250um) sediments in the Var River basin, southern French Alps", Mariotti and colleuages demonstrate that fine grained sediments produce similar denudation rates to more traditional sediment sizes in a mountain catchment. The study is well designed for the goal of this work, and the manuscript is well written and presented. The data are convincing; however, they might be over interpreted in a couple places. Overall, this is a good contribution.

As the authors point out, the ability to measure in-situ produced cosmogenic nuclides

in fine grained sediment would dramatically increase our ability to undertake paleo-denudation studies in lacustrine and marine sediments. This work is certainly taking steps in that direction. However, one of the key conclusions, that this work demonstrates the ability to use 10Be in fine grained off shore sediments, is unfortunately not supported. There are two main reasons for this. First, the analysed catchment is quite small compared to those that will be contributing most of the fine-grained sediment. Second, the most distal samples in this study are still taken from the channel. As such, they have not undergone long-shore transport, mixing, bioturbation, density flows, etc. that characterise many offshore environments. I would recommend that the authors rephrase this slightly. Their work does demonstrate that fine-grained quartz can be used over short transport distances and in a fairly complex geomorphic setting. This is significant, even without an offshore connection. The authors do a good job of reviewing Alpine denudation studies and placing their work in this context. I appreciated the quick overview offered by figure 4.

It is interesting that the 10Be results are similar to the modern sediment flux despite the different timescales and spatial averaging. I am somewhat surprised that the limestones would be eroding at an equivalent rate (especially since they would be undergoing relatively more chemical weathering than the quartz bearing regions). Are there any sediment flux data for subcatchments that are predominantly quartz? That might help pull this apart more convincingly. The lack of an interannual signal, despite significant torrents, is also a bit surprising given previous examples of this (i.e. Kober et al., 2005, etc.).

I would have liked to have seen a more developed discussion of grain size dependence of cosmogenic nuclide data. The authors do note that some have reported trends and some not and provide a few examples of drivers. Since this is a fairly short manuscript, there is space to expand this to discuss when we might expect a grain size dependence and why (i.e. Lukens et al., 2019, etc.). This could be incorporated into a broader summary of the development of the method presented here.

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