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Dear Prof. Simon Mudd,

We are thankful that our effort in addressing the reviewers' comments was appreciated and we thank you for the additional suggestions that you raised. Therefore, please find below each of your comments (*blue italic font*) followed by our discussion/reply (black regular font). All orthographic corrections and minor changes in the text were fully considered and are not repeated below.

General comment:

Comment 1: I am happy with the responses to reviewers, and think this paper is nearing readiness for publication. However, I have some remaining concerns that will require one more round of revision. You will see my comments in the pdf, but it boils down to a clearer explanation of why the most upstream DB sample, which is argued to drive continuing high denudation rates downstream, has a lower denudation rate than the downstream samples. There could also be more clarity on the mixing calculations and what they explain. I also had a few minor editorial comments. I look forward to the revised manuscript.

We thank the editor for the insightful comment and for the text corrections suggested throughout the manuscript, which were all implemented. We have also updated and checked the reference list.

As we now explain in lines 237-242 of the revised text, the lower denudation rate of sample DB01 compared to the downstream DB samples (DB02, 12, 10, 06), despite the similar ^{10}Be concentrations, is probably due to an overcorrection of ^{10}Be production/denudation rates of catchment DB01, due to its high elevation and steep topography: *"Because of its generally higher elevation and steeper topography, catchment DB01 shows the maximum production rate corrections for topographic, snow shielding and LIA-glacier cover (Table S2) and consequently yield lower output denudation rate compared to the other sampling locations downstream along* *the main DB river (DB02, 12, 10; Fig. 2), despite similar ^{10}Be concentrations (Fig. 3). This suggested overcorrection of the ^{10}Be production rate for the DB01 catchment is reflected by the large difference between uncorrected and corrected denudation rates (1.45 and 0.68 mm/yr, respectively, Table 1).”*

We have also better clarified how the mixing calculations were conducted in lines 245-258 of the revised text (see reply to comment 5).

Detailed comments:

Comment 2, line 187: Are you just referring to total denudation when you mention physical erosion and chemical weathering? If so, say that. Because it doesn't seem that these two denudation mechanisms will be separated in the paper.

Following this suggestion, we modified lines 186-188 of the revised text by removing the distinction between physical erosion and chemical weathering: *“Percentage of bare-rock area was estimated from the extent of class 30 (“bare bedrock”) of the 100-m resolution CORINE Land Cover Inventory (2018), to consider if catchment areas with null to low soil/vegetation cover have higher denudation rates”.*

Comment 3, line 227: I would add a short note here that based on Figure 2 and the table the erosion rates calculated from these three basins are very similar to the tributaries into which these sub-tributaries drain.

We followed this suggestion and partly modified the caption of Figure 3 (lines 228-229): *“Samples DB03, 14 and 18 are omitted since they do not directly connect to the main DR river, but note that their ^{10}Be concentrations are similar to those of the tributaries into which they drain (DB04 and DB13, respectively; Fig. 2 and Table 1).”.*

Comment 4, line 235: Why is this not captured by DB01, which seems to get most of the Mont Blanc Massif?

As specified in lines 249-251 of the revised text, in the mixing model we considered sample DB02 rather than DB01 as representative of the contribution from the Mont Blanc Massif, since DB02 has the lowest ^{10}Be concentration, allowing therefore to maximize the potential contributions of the tributaries along the DB river: *“We based our model on sample DB02 (lowest ^{10}Be concentration) which provides a more conservative estimate of the contribution of* *the Mont Blanc Massif to the ^{10}Be signal measured along the DB river (i.e. the potential contributions of the tributaries are maximized).”*

The reason why DB01 has slightly higher ^{10}Be concentration than DB02 is instead explained in lines 234-236 of the revised text: *“A possible explanation for such a dilution may arise from shielded materials supplied by the incision of a bedrock gorge located between samples DB01 and DB02 sampling sites (and upstream of the tributary junction with catchment DB19).”*.

<u>Comment 5, line 237:</u> Okay, I have a "nesting" erosion rate model (in CAIRN) where you 1) Get the erosion rate of a nested basin 2) then iterate on the erosion rate of the remaining basin in order to 3) arrive at the correct concentration at the outlet of the larger basin. I think this is also what you are doing but it isn't really clear from the text. Can this be clarified?

We acknowledge models which calculate erosion rates of nested basins (e.g. CAIRN), and refer to this in the revised text. However, in our study we applied a simpler first order approach, based on the mass-balance between the normalized ^{10}Be concentrations of the Mont Blanc catchment (DB02) and the tributaries. This was better specified in lines 245-258 of the revised text: *“To quantify at first-order the relative contribution of the Mont Blanc Massif to the ^{10}Be signal measured along the DB river, we followed the approach reported in Delunel et al. (2014), where relative contributions of different sediment sources can be estimated based on their respective ^{10}Be concentrations. Although other approaches can be used, which consider nested catchments for quantification of sub-catchments denudation rates (Mudd et al., 2016), we adopted a first-order approach in this study based only on relative contributions in ^{10}Be concentrations between different (sub-)catchments. We based our model on sample DB02 (lowest ^{10}Be concentration) which provides a more conservative estimate of the contribution of the Mont Blanc Massif to the ^{10}Be signal measured along the DB river (i.e. the potential contributions of the tributaries are maximized). River-sediment ^{10}Be concentrations from tributaries and along the DB river have been first normalised to the SLHL ^{10}Be production rate (i.e. 4.18±0.26 at g^{-1} yr^{-1}), implying that variations in normalised ^{10}Be concentrations represent the variability in denudation rates only. We then estimated the respective river sediment contributions of the Mont Blanc Massif and different tributaries through the mixing model of Delunel et al. (2014; $C = xA + yB$, $x + y = 1$) considering (A) the normalised ^{10}Be concentration for river materials exported from the Mont Blanc catchment (upstream catchment DB02), (B) the averaged normalised ^{10}Be concentration from the upstream tributaries contributing to each* *sampling points along the main DB river and (C) the normalised ^{10}Be concentration at the sampling points along the main DB river (DB12, 10, 06).”*.

<u>Comment 6, line 246</u>: I struggle to understand this. DB01 has a lower basin-wide denudation rate than DB02 according to figure 2. Meaning that the somewhere between DB01 and DB02 there must be something eroding faster than catchment DB01. But the tributary DB19 is eroding more slowly. So there must be a low concentration supply from somewhere else. I do not understand how you get a dilution of ^{10}Be at DB02 if almost all of it comes from DB01. What am I missing?

As specified above (see reply to comments 1 and 4), the lower denudation rate of sample DB01 compared to DB02, despite the similar ^{10}Be concentrations, is probably due to an overcorrection of ^{10}Be production/denudation rates of catchment DB01, because of its high elevation and steep topography, leading to the maximum corrections for topographic and snow shielding and LIA-glacier cover (lines 237-242). The ^{10}Be dilution at DB02 is instead related to input of low-^{10}Be concentration material between DB01 and DB02, potentially deriving from a gorge located just downstream sample DB01 and therefore not captured in the DB01 ^{10}Be concentration (lines 234-236).

<u>Comment 7, line 320:</u> I think it would be useful to include geodetic uplift in this plot. The piedmont has the lowest denudation rates. Presumably it also has the softest rocks. But figure 4 suggests that the geodetic uplift is not the cause of low denudation rates. Seeing this in figure 7 would be useful.

We have followed this suggestion and added an extra panel (D) in Figure 7, showing the distribution of the mean geodetic uplift rates in the different litho-tectonic domains. We also added few sentences in the revised text describing the absence of correlation between uplift and denudation rates of the different litho-tectonic units.

Lines 326-329: *“We also evaluated the distribution of the mean geodetic uplift rates in the different litho-tectonic domains (Fig. 7D). The highest uplift rates are observed for the Briançonnais basement and cover and for the External Massif (median of 1.0-1.2 mm/yr), while the other litho-tectonic units have uplift rates with median of 0.8-0.9 mm/yr.”*.

Lines 468-474: *“No correlation appears instead between the mean geodetic uplift and the denudation rates of the different litho-tectonic units, with the highest uplift rates observed both for the fast eroding External Massif and the slow eroding Briançonnais units (Fig. 7D). This* *further excludes the role of geodetic uplift in controlling denudation rate variability within the DB catchment (Fig. 4D), while further supporting the dominant influence of bedrock resistance. However, the long-term (late-Miocene) high uplift rates in the Mont Blanc Massif compared to the rest of the DB catchment (Malusà et al., 2005) could be one of the causes of the high denudation rate of the Mont Blanc Massif, by sustaining high-elevations and in turn promoting efficient geomorphic processes."*

Comment 8, line 385: Okay, why is the denudation rate higher downstream then, after the DB catchment has mixed with more slowly eroding tributaries?

As specified above (see reply to comments 1 and 6), the higher denudation rate of sample DB02 compared to DB01, despite the similar ^{10}Be concentrations and the mixing with high-^{10}Be concentration sediments from DB19, is probably due to an overcorrection of ^{10}Be production/denudation rates of catchment DB01 (lines 237-242).

Comment 9, line 399: The denudation rates vary from ~0.7 to 0.9 mm/yr: are you arguing this is noise and these can be considered a constant rate? State this clearly if that is what you are asserting.

This was corrected in lines 412-413 of the revised text: *"from the Mont Blanc Massif, only slightly increasing along the DB course (from 1.1 to 1.5 x104 at/g, Fig. 3),"*.