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Short communication: Updated CRN Denudation datasets in OCTOPUS v2.3

We thank the reviewer for taking the time to thoroughly read and evaluate our manuscript. Several points raised in this review align with comments made by the other two reviewers. In such instances, we refer to our detailed responses provided in AC1, AC2, and AC3.

RC – Reviewer comment
AR – Author response

RC28	*I myself still find the usability a bit frustrating, but admittedly I haven't spent much time trying to learn the ins and outs.*
AR28	As noted in AR13, we extend an invitation to the reviewer to join the OCTOPUS GitHub repository and to channel any frustrations into constructive contributions to the OCTOPUS project, thereby helping to enhance the user experience.
RC29	*Line 17-43: The introduction describes a number of features of the OCTOPUS database that are not relevant to the current paper – (luminescence, charcoal, 10Be and 26Al exposure ages, pollen, etc.). This material should be shortened and the introduction centered on catchment CRN which is the focus of this paper.*
AR29	As highlighted in AR14, the introduction aims to provide a concise history of OCTOPUS releases. This places the current updates into context and appropriately acknowledges previous publications that discuss aspects of the database in detail, which are not addressed in this manuscript.
RC30	*Line 68: "limited return on investment"? I would not dismiss these studies from a database just based on the number of samples. Some may be in places with limited data coverage and thus quite valuable. I understand the resource limitations, but since these studies have already been identified I would recommend including on the OCTOPUS website a list of all identified studies, with an indication of their status (included, in process, not in process). This might streamline the possibility of a user to request addition of an important, but small study to the database?*
AR30	As discussed in detail in AR17, we do not automatically dismiss any study solely based on it including a small number of data points. However, we assign lower priority to studies with limited data points and insufficient information to facilitate the straightforward recalculation of denudation rates. We recognize the value of maintaining a public record of all identified studies and will explore ways to achieve this while ensuring that authors feel included.
RC31	*Line 110: A quick note about how atmospheric pressure is actually derived would be helpful (I think CAIRN is starting with elevation, mapping to atmospheric pressure using NCEP2 reanalysis, and then back-calculating and effective pressure from Stone 2000, right?)*
AR31	Good suggestion. We will add more information to the revised manuscript regarding how atmospheric pressure is calculated in CAIRN.

RC32	*Line 119: It's perhaps confusing to compare between "mean elevation" and the "effective atmospheric pressure", since the issue is not one of using elevation or pressure, but going through the process to calculate the "effective" pressure (or elevation).*
AR32	In the absence of being provided with effective pressure or effective elevation values for each basin, most users would probably default to using the mean basin elevation – which was always included in the OCTOPUS database – rather than going through the effort of using the included DEMs to calculate effective pressure / elevation values. Furthermore, the effective atmospheric pressure values included in the updated CRN Denudation datasets are approximations of the pixel-by-pixel calculations performed by CAIRN. Consequently, Figures 3(a) and 3(b) compare one approximation (effective pressure values) with another approximation (mean elevation) when calculating denudation rates, then evaluate both against CAIRN's more rigorous pixel-by-pixel approach. In our view it is important to show that while not perfect, effective pressure performs better than mean basin elevation. It is also important to illustrate at which point mean basin elevation ceases to be a suitable proxy for calculating basin-wide denudation rates.
RC33	*Line 129 and Figure 4: It seems unnecessary to discuss using outlet latitude, since the centroid latitude is already available and clearly the better approximation for production rates. And Figure 4 seems unnecessary as well.*
AR33	As we mention in AR20, we agree that centroid latitude is the better approximation and because it is easy to calculate, most people will chose this over outlet latitude. However, we disagree with the reviewer that Figure 4 is unnecessary. There may be instances where both mean elevation and sampling latitude are available (for example provided in the original publication) but it is not possible to delineate the actual drainage basin with confidence, and thus not possible to calculate centroid latitude. The latter could be due to insufficient information provided or issues with the DEM available (e.g., delineated basin does not match published basin). Figure 4 is useful in this regard as it shows that using centroid latitude vs. outlet latitude only becomes important when basin areas start exceeding 10^4-10^5 km^2, and so it may be possible to calculate reliable denudation rates using mean elevation and sampling latitude if certain basin relief and basin area criteria are met.
RC34	*Figure 3: The axis labels are hard to interpret without the caption – It would help readability to add some plain language to the labels ("Calculated erosion rate difference", "Erosion rate", etc.)*
AR34	See our response in AR24 regarding axis labels. We acknowledge that, without the figure caption, it is currently challenging to interpret the meaning of the axis labels in Fig. 3. We will explore the best approach to modifying the labels to enhance clarity.
RC35	*Line 150-167: There are so many issues with interpreting CRN data from currently glaciated basins (non-uniform erosion rates, time-varying erosion, storage/reworking in moraines, etc.) I would personally avoid doing this calculation at all and just flagging catchments that contain glaciers.*

AR35	The presence or absence of glaciers is less critical than the areal extent of the ice. Therefore, merely flagging basins that currently contain glaciers, without providing additional details, may not be particularly informative. Factors such as sediment storage and reworking in moraines are equally, if not more, relevant for basins that were glaciated in the past but are now ice-free. Therefore, the issue of moraines is more complicated and goes beyond present day ice coverage, and is one that we cannot easily address at the global scale. Fundamentally, however, the impact of glaciers on cosmogenic nuclide concentrations exported from a basin is one of dilution. Glaciers shield parts of the basin from cosmic rays and contribute material with depleted cosmogenic nuclide concentrations, thereby diluting the overall signal. The degree of this dilution depends on numerous factors and may be impossible to estimate with high confidence. However, it is possible to estimate a worst-case-scenario and this is what were are including in the updated datasets. We explicitly acknowledge the limitations of our calculations in the text and emphasize to readers that the primary purpose of this new data is to facilitate the evaluation of data quality, rather than to be used as definitive values.
RC36	*Line 180: what is the definition of "quartz-bearing"?*
AR36	See our responses in AR5 and AR25. We will add more information in the revised manuscript regarding GLiM lithology classes used to identify quartz-bearing rocks.
RC37	*Line 187-196: I agree that the topographic shielding corrections are going to be minimal for most catchments, but it is nonetheless quite awkward to be baking in an erroneous correction into every denudation rate. It can't be *that* hard to fix this? Or at least acknowledge that it needs to be fixed in the future?*
AR37	See our responses in AR6, AR11, AR12, and AR26. In AR11, we propose including, alongside the CAIRN-calculated denudation rates, those calculated using the Balco calculators both with and without topographic shielding corrections. In doing so, we are addressing this issue.