Revisions (S. Mudd, associate editor)

Dear Simon Mudd,

Thank you for your review of our manuscript. Here is how we took into account your comments. We have uploaded a revised version of the text with marked changes in blue, and a clean version without marked changes.

Sincerely yours,

Carole Petit.

Minor edits (English language) have been corrected directly in the text

Page 3: "real" erosion rate: we have replaced this word by "simulated"

Page 5: the units of a and b have no physical meaning but their values have been determined for C_s in $kg.m^{-3}$ and Q_w in $m^3.s^{-1}$. Quoting Syvitski et al., "the rating coefficient has variable units and depends on the value of the rating exponent b: $[M/L^3][T/L^3]^b$". This is now explained in the text.

Page 7: the value of *m/n* has been taken from previous studies (like in Saillard et al., 2014) so we infer from it m=0.5 and n=1 as is often done. Now indicated in the text.

Page 7 and 8: About sediment flux and deposition: From the detachment-limited law (Eq. 2), sediment entrainment rates are obtained on every node in the landscape from upstream to downstream regions and local sediment flux moving out of a cell equals the flux of sediment flowing in plus the local erosion rate. Because we use a detachment-limited approach, no restriction is applied to the sediment concentration a given river is able to carry, and rivers with limited transport capacity are not considered in this study. As rivers flow across the landscape, sediment deposition might occur under three circumstances: (1) either when the channel slope falls below a given threshold (alluvial plain deposition, see Table 3), (2) when the rivers reach their baselevel or (3) when entering a depression (endorheic basins). In these cases, available sediment fluxes carried by rivers are used to compute the volume of sediments to deposit. If transported sediment fluxes, when deposited, are insufficient to fill the depression or to reach the prescribed channel slope threshold, all sediments would be deposited and the outgoing river sediment concentration would be null. If, on the other hand, the available sediment flux exceeds the required deposition volume, the excess flux will be carried out to the downstream nodes. We briefly recall this in the revised version of the paper.

Page 9: The flux of sediments coming from glacial erosion during glaciations is very low because glacial erosion is simulated by local processes (diffusion) and river discharge is set to zero beneath glaciers. As stated in the text, this probably underestimates the role of reworked glacial sediments in the observed ^{10}Be signal. Still, it allows us to take into account surface denudation by glaciers during glaciation periods, that leads to lower-than-average ^{10}Be concentration in glaciated areas.

Page 11: about the comparison with Mariotti's study and ours: we do not apply a constant erosion rate to every pixel, as they do (no particular erosive process is considered when computing denudation rates from the average ^{10}Be concentration in river sands). Instead, we apply a constant precipitation rate and simulate hillslope creep, water discharge and subsequent river incision (and ^{10}Be production, transport and deposition). Therefore, some pixels erode faster than others depending on their location (river channel, hillslopes, altitude). This explains why our simulated ^{10}Be concentration is slightly different from theirs.

Page 13: the production rate is also slightly different because the topography is smoother and the map of quartz-bearing rocks is a bit simpler than the one used in Mariotti et al., 2019 (due to the surface grid mesh). If, for instance, we have quartz-bearing rocks in lower altitude areas than in Mariotti et al., we will find a lower average production rate in the given catchment.

Page 20: about sediment storage: it is true that the initial topography contains low topographic gradient areas where sediment storage can occur, and which can be progressively dissected later on. However, this occurs at the very early stages (2-3 time steps, i.e. 2 to 3 ka) of the model, while the "patch" of ^{10}Be-rich sediments which is observed on model M9 in the Var delta and upper submarine canyon starts to develop much later (after 30-40 ka), so we believe it is not due to initial conditions. In the reference model, the final ^{10}Be concentration (-30 to 0 ka in "real" time) in marine sediments is not larger than in the other models (it is even a bit lower than in some models). The difference between this model and, for instance, models M13, M14 and M15 is that the earliest stages of model M9 (-100 to -30 ka) are characterized by a lower ^{10}Be concentration in submarine sediments. It is not easy to determine precisely what is the relative contribution of the different sources to the final ^{10}Be concentration of sedimentary deposits. However, from what we could infer from the reference model, up to -50 ka there is little contribution of submarine sediments to the deep ^{10}Be record. After that time, sediments from the upper var canyon start to become reworked and contribute to ^{10}Be enrichment in the sediments of the deep basin.