

Line 3: "A model could help...": awkward sentence. I suggest something like "to address this, a model can be designed to explore the statistical properties of CN concentrations in sediment grains."

Line 59: Why hillslope erosion is not simulated by a diffusion equation? Equation 3 should look like:

$$\epsilon_h = \nabla \cdot (\kappa \nabla h)$$

I don't understand how drainage divides get eroded with equations 2 and 3 since basically erosion is null when the slope is null. Am I missing something?

Line 75: You use MFD to distribute the incoming water flux from the donor node to the receiver nodes, but then you only use the "steepest-descent slope" when you compute the erosion potential of the donor node. Somehow it means that the water that is given to the other nodes does not contribute to erosion. Why not computing the erosion potential of a donor node as the sum of the contribution of each receiver node proportionally to their slope?

Line 81: "Sediments that leave the cell are spread downstream". Do you mean "distributed to downstream cells"?

Line 88: Composed instead of comprised

Line 89: "They are localized by the cell number where they are located": not clear to me. Do you mean they have an index corresponding to the cell number where they were initially sown?

Line 98: "For a grain on a cell, it is detached if the eroded layer on that **time step** is **thicker** than or equal".

Line 110: Sediment deposition volume instead of flux; I would keep the term "flux" for something that is moving.

Line 197 and 206: "Outgoing water flux" instead of "leaving water flux"

Line 202: "Erode the bedrock but multiply the eroded volume by (1-sediment volume/potential erosion of sediment)" Awkward sentence. Could you rephrase it please? If the volume to be eroded is greater than the volume of sediment available, the bedrock is eroded by the remaining quantity. Is it correct?

Line 214: what do you mean by "draw the next cell"?

Lines 215-216: Shouldn't this be in a while loop (with lines 213-214)?

Line 223: Do you mean user-determined output times?

Line 299: How do you define the "residence" time? This term is not clear to me. I would say that the "residence time" of sediments is the time spent in a given system (river network for instance) whatever they are exposed to cosmic rays or not. On the other hand, the exposure time should be the duration during which the sediments are exposed, even partially, to cosmic rays whatever the system they reside in. Could you please be more specific on what you call the residence time?

Line 301: Figure 3A instead of 3B

Line 322: Having seen this, I think it would be interesting to see the effect of a variable Quartz source distribution (i.e., more abundant in the upstream or downstream parts of the catchment for instance) on the resulting <sup>10</sup>Be-derived erosion rate. Maybe add this topic in the Discussion section also?

Line 362: You do not discuss the amplitude. It seems that the amplitude is largely underestimated for the short period oscillations. Why is it so?