Earth **Surface**
Dynamics
Discussions

Interactive comment on "Extracting information on the spatial variability in erosion rate stored in detrital cooling age distributions in river sands" *by* Jean Braun et al.

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I first would like to apologize to the authors for the very long time it has taken to process their paper. As associate editors our job is to find reviewers and try to get their reviews in due time. In this case, it has taken an unacceptable time before the decision had to be made to take over the review from an uber-uber-late reviewer.

I find the manuscript basically acceptable as is. It is of fundamental interest and potentially of broad applicability. I am far from understanding the math details underlying the approach presented, but I trust the authors and future users of the method to deal with this if needed.

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Discussion paper

I have a few comments/questions that the authors are free to consider.

"The first piece of information comes from the ages themselves: catchments or sub-catchments where the proportion of grains with young ages dominates are likely to experience rapid exhumation today or in the recent past; whereas catchments or sub-catchments where the proportion of grains with old ages dominates are more likely to have experienced rapid erosion in a more distant past."

=> Why would "a catchment with old ages" be interpreted as representing an area of rapid erosion in the past. I thought old ages meant slow erosion. Are you only saying that pulses of rapid erosion can't be resolved by thermochronometric method when ages are old? Hence only catchment with young ages would be able to decipher rapid erosion. Isn't there some bias here?

"For this, ages can be regarded as passive markers (or colors) that inform us on the proportion in which the mixing takes place today, which is directly proportional to the present-day erosion rate."

=> what is the relation that determines a direct proportionality link between the "mixing of passive markers in a river" and "present-day erosion rate". Is this obvious or are there any references to back this up?

"we have devised a simple method that, unlike many others such as that of Brewer et al. (2006), is only dependent on the raw, binned age data." I guess I understand that here you're bypassing the need to model individual age data into cooling rates through assumptions of geothermal gradients etc. . . If that's correct I must say that for a non-specialist it would be great to have a bit more material here on the assumptions that are made and not made. Also, are the ages really "raw" or do they come with uncertainty/standard error on them? And if yes, what are the uncertainties/SE on "raw" ages.

In the abstract it is said "We show that detrital age distributions contain dual information

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about present-day erosion rate" but in the text it is more an assumption than a demonstration. And I also failed to see how the results obtained are confronted with existing constraints on erosion rates in this area.

4. Uncertainty estimates. Since the distribution are not normal, does it makes sense to use the standard deviation around the mode? Also, wouldn't it be possible to perform a standard error propagation that would include the standard errors on ages?

Conclusion: thanks to the authors for submitting their work to eSurf and apologies again for the slow process.

Interactive comment on Earth Surf. Dynam. Discuss., https://doi.org/10.5194/esurf-2017-42, 2017.