Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2019-21-RC1, 2019

Earth Surface Dynamics Discussions

Interactive comment on "Inferring the timing of abandonment of aggraded alluvial surfaces dated with cosmogenic nuclides" *by* Mitch K. D'Arcy et al.

Luca C Malatesta (Referee)

luca.malatesta@unil.ch

Received and published: 12 June 2019

review of D'Arcy et al. 2019 by Luca Malatesta

Dear Editor,

I have read the latest a manuscript by D'Arcy and colleagues with pleasure. They offer a new probabilistic approach to identify the likeliest age of abandonment of an alluvial surface based on series of exposure-dated samples at its surface. They build a power law that predicts the likeliest amount of time elapsed between the youngest surface age and the effective fluvial incision based on the distribution of surface ages

assuming their uniform distribution during the period of activity of said surface. It is a useful contribution that can be applied widely and is definitely worthy of publication in ESurf! In my opinion, the manuscript is ready for publication pending minor clarifying modifications. The article is very well written and easy to read. I would however encourage the authors to consider modifying their probabilistic approach and follow an explicit derivation of their probability power law without requiring the use of "artificial data" for empirical fitting.

Below I briefly describe an alternative approach for the probability law and I provide line by line comments on the text.

Probability The approach using synthetic data has the advantage of mimicking a field situation with n dated boulders out of a larger number. However, it seems to me that using an explicit approach would be much more advantageous. There is no need to graphically fit the powerlaw and deal with the associated error margins, the term "artificial data" can be avoided altogether, and the theoretical framework would be reinforced. Further it would become a more flexible platform, for example to introduce non-uniform distribution of surface ages. I have asked Quentin Berger, probabilist at Paris-Sorbonne, for some help as to how the explicit derivation can be made. I include a document that summarises his explanation hereby. The derivation would replace section 4.1 and provide a definitive and clean solution for this approach. I think it would improve the impact of the manuscript. That being said, it is not a necessary modification and the manuscript stands on its legs as is. It is for the authors to decide whether they want to follow an explicit approach or not.

Line by line

p. 2 L. 31. "These approaches risk circular or inaccurate interpretations." Can you elaborate or give a few examples of these risks?

p. 3 L. 13-15. I suggest to indicate that these ages are arbitrarily selected to produce the scenarios. The reader (or at least I) might think that they are lucky draws from

random rounds and that you are already talking about experiment results. It's a small detail but it would help focusing on the examples you are building.

p. 4 l. 4. "In this study, we use artificial data [...]" At this point it can be unclear whether you use artificial data on virtual surfaces or if you populate a real "geomorphic surface" with artificial data. I suggest to maybe include the purpose of the approach here already: e.g. "we use artificial data to simulate the characteristics of surveyed surfaces" (which you bring up only later at the end of the paragraph on l. 9-10.) This entire paragraph is actually paramount as it frames the use of "artificial data" for the first time. I suggest to carefully edit it such that the combination/coexistence of artificial data and field sites is clear. At this point in the text, Many readers will be asking themselves "ok i understand the problem and motivation but how is that useful for my field site?".

p.4 l. 27. Missing coma after "T"

p. 4 l. 27-28. I suggest to indicate the uniform distribution of the ages here already. The readers might be wondering about it.

p. 5 l. 13. tau = a_min - t_aban is an important relation, I'd suggest to give it a full equation line.

p. 7. The lines of equations lack punctuation.

p. 7 l. 6. "then tau = 12 kyr for P = 0.95." I'd suggest to paraphrase the end of the sentence in plain english for clarity.

p. 7 l. 11-15. the parameter k has a negative value. It should be mentioned here (important for what happens when n grows to infinite). Potentially even better âĂŤ and I believe in accordance with the convention for such parameters âĂŤ give k a positive value with an explicit negative sign in the equation.

p. 8 l. 21: section 4.3 is very good and will be very useful.

p. 8. l. 24: using the parameters values listed above I assume? It might be worth

specifying it.

p. 9 l. 11-17. this paragraph reads a little like conclusion material. I am not sure it is necessary.

p. 9 l. 23. "significantly" probably needs defining since you provide a quantity of "one order of magnitude" thereafter.

p. 9, l. 25. There is no figure 5d.

p. 12 l. 10 Without much context, I don't see why that would be a "conundrum".

p. 13 l. 2-4. I am not sure that this characterisation is fair to previous work, many authors showed the importance of timing abandonment and not mean ages. The stand-out "finding" of the present manuscript is to propose a simple and efficient method to get there using incomplete datasets. It's an important step.

Best wishes, Luca Malatesta

Please also note the supplement to this comment:
https://www.earth-surf-dynam-discuss.net/esurf-2019-21/esurf-2019-21-RC1-supplement.pdf

---

Interactive comment on Earth Surf. Dynam. Discuss., https://doi.org/10.5194/esurf-2019-21, 2019.