

Earth Surf. Dynam. Discuss., referee comment RC2  
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## **Comment on esurf-2021-77**

Anonymous Referee #2

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Referee comment on "Entrainment and deposition of boulders in a gravel bed river" by  
Pascal Allemand et al., Earth Surf. Dynam. Discuss.,  
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Review of Entrainment and deposition of boulders in a gravel bed river  
by Allemand et al.

Summary. The authors report on a field study monitoring the population of boulders on a river bar through the use of repeat aerial imagery. Combining a hydrograph with repeat surveys identifying the presence and absence of boulders the authors are able to derive the effective residence time of the boulders and estimate a potential bed load flux.

### General Comments

Overall the paper appears technically sound and I have no major reservations with the work presented by the authors that would prevent it from being published. The methods are robust if perhaps still a touch manual to prevent them from being easily applied (as an example any sort of automated boulder detection algorithm might expedite the GIS work). The analysis of the data are fairly simple, and this is a major strength of the paper because it does not overinterpret the field data and connects well with laboratory derived results. The analysis, where perhaps oversimplified, is well qualified by the authors.

The theory and description of how one would quantify a bed load flux of boulders is interesting, however it is not clear to me that we should really place much trust in the final numbers and I wonder if this thrust of the paper may need to be downplayed a bit. I don't think it is wrong, but that the accuracy of the result places it more in the conceptual understanding than a number we should trust. Whereas the model development and application to the residence times of the boulders (especially figure 7) is clear and a very nice result and important contribution as the concept of time is often underquantified in tracer studies.

One drawback of the manuscript, is that the connection to previous literature on some of the topics is missing. It is not as if something is wrong per se, but that some topics felt

under explored and connections to the literature could be better explored/established. The boulder transport could certainly be framed within the active layer concept or within the work on partial transport (see the career of Peter Wilcock) but citations to those works are largely absent, alternatively I am sure the authors can inform or remark on the concepts of sorting or patchiness and how that might impact entrainment, but references to that literature are also absent. It would very much seem that the authors results resoundingly confirm the concepts of partial transport between floods which would be a strength in the discussion.

The paper would benefit from an english language editing service. There are 1 to 2 errors per page.

Additionally, my sincere apologies for the delay.

Specific Comments.

Ln. 29. Incomplete sentence after the ';'.

Ln. 39. Seismic misspelled.

Ln. 53. It looks like the wording of this sentence is a bit out of order. The tropical volcanic island aside should come at the end of the sentence.

Ln. 71. '...located within the...' Missing word.

Ln. 140. Here's a location where the references could reflect a broader geography (the idea of an immobile and active layer has been around for quite some time).

Ln. 145. It would be useful to me, to have the median grain size and standard deviation for the bar to be able to place the boulder sizes into context.

Ln. 241. Definition wise I do not think 'assimilate' is incorrect, but it is not the common english usage of assimilate. I would suggest 'approximate'.

Ln. 250. You also might consider a minimum flight length estimate based on the experiments of Lajeunesse et al. (2010), Phillips and Jerolmack (2014) (cited by the authors) found it to provide a reasonable lower bound for tracer transport in a similar tropical boulder stream. Use of the largest boulders may not provide a lower bound. The roughness of the bed is relative to the size of the mobile particle, a larger particle is mobilized less but may move farther when entrained due to a lower relative roughness.

Ln. 256-265. It is not clear to me that this paragraph is needed. It is fairly speculative and while it provides a number on the flux we can't constrain the error of the number or understand what to do with this number in context. That it is speculative is well qualified by the authors, it just may not be a needed paragraph.

Figures. The placement of the panel letters [ a), b), c) etc.] feels a bit unfinished. The styling of the figures is a bit all over the place, from font sizes to line widths. This isn't the biggest issue but it is noticeable and can distract from the message of the figures.

Figure 2b. Could you mark the points when field surveys were flown?

Figure 4. The vertical label in panel b is quite blurry.

Figure 5. Y Label missing a 'k' in Block.

Figure 6. I suggest that the ylabel be changed from duration to cumulative duration following the figure caption.  
Wording change suggestion - change 'The transport' to 'Transport is only possible for a few hours...'