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Earth Surface Dynamics Discussions

Interactive comment on "Self-similar growth of a bimodal laboratory fan" *by* Pauline Delorme et al.

Anonymous Referee #3

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General comment:

I recommend this article for publishing if the comments are considered. The article is well-written and it is easy to read. The first two sections of the article are quite detailed, leading to sections that lack of substantial contributions to the general discussion by themselves, as they are too brief and without much analysis. Nevertheless, the article shows good results that are worthy to publish in spite the simple analysis with some flaws.

Major comments:

The analysis is focused only in some properties of the particles used and it misses other parameters that may give an important insight to the results, i.e. repose angles. Such properties of the materials could be included in the qualitative analysis, as Reitz and Jerolmack (2012) do.

It is mentioned that the exposure/hiding effects are negligible because of the density difference between the particles. This is only if the sample is well-graded. There is insufficient information provided in order to neglect, or not, such effects. Also, mobility is accounted separately, for each material, so it seems irrelevant if in the final experiments are mixed, since the mobility may be affected by the other material sizes, not only by density. Even if you are able to provide evidence that it is in fact negligible, a re-writing of the paragraph could be helpful.

There is a chapter called "Mass Balance". If you look at the equations, they are all in terms of volume. What about the packing conditions of the fan? And the packing conditions of the inlet? Why would those be the same? Is there a way to quantify the void between particles? I think that at least some assumptions should be made and explained.

I found interesting the geometrical self-similarity shown in the article, but a quite more complex self-similar behavior is there. Certainly, with the results something else could be done.

A similar pattern to the one you show when cutting the fan radially, has been obtained by other authors in a 'quasi-two-dimensional' cell, e.g. Makse et al. (1997). It could be interesting to say something about that. Makse et al. (1997) obtained stratification when the large particles' angle of repose was larger than the small one's. That is verified for Fig. 7, but what about the rest? Its quite interesting that the vertical cross section is not only segregated, but stratified. Could this be found in natural fans? If so, under which conditions? Since you performed experiments with silica volume concentrations ranging from 25% to 80%, maybe stratification depends of this parameter.

The above leads me to another comment. It seems that you only analyzed experiment 2. What about the rest?

In general for a roughly 10 pages article, 6 sections is too much I think. If some sections are merged or taken as subsections it would give more significance to each section.

As it is, seems that each section has nothing much to say, e.g. sections 4 and 5.

Minor comments:

p3.line1: It it confusing the way you say that large grains are in the upper part and small ones deposit near its toe, as figure 2 shows the opposite. The system inverses the gradation?

p3.line10: Routine seems something tedious, ordinary and repetitive, that has nothing special, therefore irrelevant. Another word could be better to start the chapter.

p4.line1: Again the density. If the density difference prevails over grain size, then how is explained that mobility has nothing to do with density? If so, which difference is more relevant? Could be there an equilibrium?

p4.line13: The number of channels is different from the number reported by Reitz and Jerolmack (2012). Is there a reason?

p4.line20: Silica proportion is introduced, is it of volume or weight? If such variable is introduced, maybe you could use a formula.

p4.line24: To put explicitly eye-average, indicates subjectivity as results may change by repeating the analysis. The error by this process is considered?

p5.line5: "The observations confirm the scaling, thus..." Instead.

p5.line24: 32% and 55% of the fan length, Which fan length? Is is the average of all the experiments? Of each experiment?

p5.line34: You say that the variability of sand-coal transition in the stratigraphy is because of channel avulsion. If you follow one of the major comments, then it is not because of that.

p6.line9: The interpretation in the context of self-similar growth should be in the self-similar growth section.

p8.line26: Why Chézy and that value? I understand that it is for simplicity, but still.

p8.line27: The reference is wrong, it should be (Chow, 1959).

p9.line20: Independently you consider the stratification analysis, you should say if deposits show stratification.

p9.line21: If you make reference to your sediments in terms of mobility it is tricky as it is true all the time and it could include both silica and coal particles. Too obvious.

p9.line30: It is not clear that it is possible to extend to a continuous size distribution. You did not say anything about the sample, where they well-graded?

p10.line2-3: The discussion about the most challenging problem is not fair enough. You lack of evidence or references to sustain that.

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