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Earth Surface
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Discussions

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Interactive comment on "Entrainment and suspension of sand and gravel" *by* Jan de Leeuw et al.

Anonymous Referee #2

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This paper presents the development of new equations for transport by suspension. The author fit the Rouse number and Entrainment parameter with a large data set, and ultimately they derive a general equation for concentration. The results seem to be very promising; nonetheless the model was calibrated but not validated. The paper is well written but I think it could be improved for clarity, especially in introduction and discussion. I propose minor revision; the authors will have no difficulty in answering the various point presented below.

Comments I found the introduction a bit confused. Instead of presenting general considerations on suspension (why it is important, what do we know, what are the limitations, what are the differences between lowland and mountain rivers...), you go straight in a presentation of limitations of existing mechanistic approaches through a very ex-

haustive literature review (congratulation for the review) and new analysis. In addition the title is a bit confusing because when mentioning "sand and gravel" we expect more consideration for suspension of coarse sand and gravel, and this aspect is not really developed (in the introduction but also in the paper where the data sets comprises fine sands only) which, in my opinion, reduces the scope of the paper to situations where suspension can freely develop from fine bed sediments. Finally, it takes time to really understand the objectives of the paper. For clarity it might have been more efficient to really explain the context and objectives in introduction and describe the equations limitations in a next part called for instance "review of the existing theory".. ? This is a suggestion, I let the authors decide how to arrange the paper, but the must improve the message in introduction.

Line 80: If F_z is the upward flux of sediment it is not clear how F_z/w_s is dimensionless. Could you give the dimension each time you introduce a parameters?

Line 177: Eq.7 is not usual; maybe you can give a reference or explain how it was obtained?

Line 188: it is not straightforward: write the Shields stress with Eq11

Line 199: does hiding effects make sense for sands?

Lines 213-214: this sentence is not really clear but is essential for understanding the methodology. I understood that you fit P with the data and compare to variables? I suggest that you develop a bit more this methodological point to insist on the absence of spurious correlation in Figure 5.

Line 230: Because of the absence of data, the approach for gravels is purely conceptual. One can for instance question on the validity of Eq20 and 21 at high shear stress (was this aspect considered in the original paper)?

Line 278: it could be clearer to start this paragraph with : "Figure 8 plots..." and explain again the parameters tested. For instance what was the reference level used for E_{si} in

Figure 8?

Line 295-297: The way it is presented seems a bit arbitrary. Could you give a reference for that?

Lines 398-399: I suppose that the threshold is 0.015 in Eq. 26? Is there a figure where we can visualize this threshold effect?

Line 301: Equation 26 is made complex to limit its maximum to 0.33. In my opinion it's too bad to lose the equation aesthetics: you could keep a simplest form and just mention $Esi<=0.3$

Line 310: Why don't you give the definitive model (used for Fig 11)?

Line 316: This very short paragraph looks like more a discussion point (a perspective) than a real result.

Discussion: It could be worth discussing the model limitations (if any). For instance I have in mind the complex interactions that may exist with coarse gravel and cobles beds in Mountain Rivers.

Your model has been calibrated but not validated. A lot of data are available in the literature could they be used for validation? If not could you discuss what should (could) be done for a validation in future research.

Figure 14: This result is surprisingly good. How was measured Cai for the runs considered? And what do you obtained when comparing qb_meas and qb_cal?

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