Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2017-63-RC1, 2017

Earth Surface Dynamics Discussions
Open Access
EGU

Interactive comment on "Geomorphic implications of gravity currents created by changing initial conditions" *by* Jessica Zordan et al.

O. Sequeiros (Referee)

oeseq@yahoo.com

Received and published: 28 December 2017

General comments 1) The word "Geomorphic" is very appealing. However it is only used once in the Title and once in the Abstract. It is never used in the text, much less defined. It seems that "geomorphic" is just a fancy word for sediment transport/erosional processes. If you insist in keeping it, then at least make sure you define it and use it in the body text. Don't just place it in the title for attention-catching purposes. 2) I understand that the slope in the channel (as opposed to the slope in the lock) is always zero in these experiments. If this is true, then a lot of the references, e.g. Britter and Linden (1908), could be off the mark or misleading. B&L did experiments with the slope of the channel being the same as in the lock. Your set up is completely different. There is a slope break in your experiments, and you should not try to back your results

Printer-friendly version

Discussion paper

up with previous experimental work that have a different set up. This does not invalidate your work or even your analysis, but you need to explain your work in a different way. This pervades many of your interpretations and discussions. 3) Discussion about the shape of the current, Equation 3.Why not just using H=h(t) to tell the body from the head? You might have some reasons, but they are not explained. It comes up as arbitrary the force the process based on H=ud(t)h(t) without further explanation. Figure 3 shows that H can sometimes not be a good parameter to tell head from body, e.g. the top plot corresponding to S0, where the first prominent minimum is not evident at all. 4) Explain better the process of filtering and Figure 2. It is not intuitive how the 8Hz threshold is chosen. In Figure 2, it appears that you are filtering above 8Hz, but the text (P2,L93) hints that you are filtering below it. 5) P5,L36-48. "Mean streamwise velocity is slightly higher for tests on horizontal bed. . ." This is also explained because there are lock-exchange tests, with a finite/fixed volume. In sustained density currents the opposite is true. You need to explain the context of your experiments and explain that lock-exchange flows a subset of something bigger. Otherwise statements like the above can be interpreted to be universal, which is not true. 6) P5,L61. "Under the assumption of flow gradually varied in the longitudinal direction". Do you mean "transient flow" instead of "gradually varied flow"? "Gradually varied" brings to mind something that changes in space, and not necessary in time. In fact a steady non-uniform flow is a gradually varied flow. But your flows are first and most transient, the spatial variation comes as a result of that. 7) P5,L71. "the flow boundary is assumed to be smooth" Why do you have to assume it? Can't you show with the Shields parameter (a function of the shear velocity) and the particle size show that you are in a hydraulically smooth region without assuming anything? See for example Chapter 2 of the Sedimentation Engineering (Manual 110) edited by Garcia (2008) 8) P5,L75-86. You mention that the fitting is done "from the lowest measured point until the maximum velocity vertical position"; this is questionable because the log profile most probably will not be valid near the position of the maximum velocity. I recommend that you show in an Appendix an example on how the fit is actually done. I have done this before and I am aware

that the fitting of the log profile to derive the shear velocity is extremely sensitive to z0 and to which points in the measured data you chose for the fit. 9) P5,L90. “Tests performed on an inclined bottom show...” Here the reader can be misled to believe that the bottom was inclined in the entire channel. See point 2 above. 10) P5,L95ss. Chikita et al. (1991) have an alternative method to account for the effects of the interface shear stress. It could be useful to compare with the approach you have followed. 11) P6,L36. “...and the head is fed by the rear steady current” But your flow is not steady at all, as in a sustained density current. Is inherently transient due to the small volumes released from the locks... 12) P9,L24-25. “The potential bottom erosion, i.e. the quantity Psib in Figure 11, show a tendency to decrease with increasing slope”. This is not intuitive at all... Back to my point 2, you are thinking in terms of “slope”, but what matters is “volume”. The slope of the lock is misleading in order to understand this behavior. You are describing phenomena that happen in the zero slope-channel, downstream from the lock. I would rather venture that because tests with steeper slope have smaller volume, their flows downstream the channel (at least where you measure shear stress) have smaller power/intensity and eventually lower shear stress. It is a about volume, not the slope of the lock. Please reconsider. 13) P10,L32-34. “The configurations S4-L4, corresponding to the steepest lock-slope and the shortest lock-length, respectively, exhibit the highest deviations between tests with lock-slopes with respect to correspondent tests on the horizontal bed” Same as last point. This makes sense because S4 tests should be seen as small volume tests, rather than anything else. Downstream the channel, away from the lock, the slope of the lock area is arguably a second order effect. 14) P10, L27-31. “Bottom erosion capacity generally results reduced by the presence of the extra gravitational forces most probably due to lower streamwise velocities which followed gravity currents dilution.” Reword this sentence. Difficult to follow in its current form. 15) P10, L38-40. “The present study analyses changing initial conditions which trigger gravity currents that are commonly observed in nature.” What conditions are commonly observed in nature?

Minor/format comments 1) Abstract: “The shape of the current is altered due to the

enhanced entrainment of ambient water and mainly the body of the current results affected." Reword this sentence. 2) Abstract, last sentence: What is "a base experience"? Reword. 3) Page , Line 27-28: Not sure what is the meaning of "in same cases" in the middle of the sentence. Reword. 4) P2, L3. It is "Niño and García", not "Ninto and Garcia". 5) Table 1. Caption. ΔT, T0, Ta do not appear in the Table. 6) P4,L9. Define R in Rˆ2. 7) P6,L36. What do you mean by "faster material"? Reword. 8) P7,L3 and elsewhere. T1, T2 are time parameters, while Lh, Lb are space parameters. For consistency define T1 as the time when the current reaches Lh, or something like that... 9) Figures 8, 9 and 10. Parameters L and Psi should have units.

References: Chikita, K., N. Yonemitsu, and M. Yoshida (1991), Dynamic sedimentation processes in a glacier-fed lake, Peyto Lake, Alberta, Canada, Jpn. J. Limnol., 52(1), 27–43, doi:10.3739/rikusui.52.27. Sedimentation engineering : processes, measurements, modeling, and practice. Marcelo H García Published in 2008 in Reston, Va. by American Society of Civil Engineers.

Interactive comment on Earth Surf. Dynam. Discuss., https://doi.org/10.5194/esurf-2017-63, 2017.