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Earth Surface Dynamics Discussions

Interactive comment on "Flocculation processes and sedimentation of fine sediments in the open annular flume – experiment and numerical modeling" *by* I. Klassen et al.

Anonymous Referee #2

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I have reviewed the Article "Flocculation processes and sedimentation of fine sediments in the open annular flume – experiment and numerical modeling"

General comments The authors present experimental results and numerical simulations to study the temporal evolution of the flocculation process in an annular flume. Although both the experiments and numerical model are complex, the results the authors finally obtain are in poor agreement and no good explanation for this is presented. Particularly, the possibility of using a simpler model should be considered. I believe the presented work has potential but the authors need to work harder on the analysis of the experimental data and the numerical model results in order to present original and concluding results.

My recommendation is that the manuscript should be rejected for publication in the present from. However, I encourage the authors to resubmit their work and I have included the following comments that they may find useful.

Particular comments 438 "Insufficient results were obtained when neglecting flocculation processes and using Stokes settling velocity equation, as it is often done in numerical models which do not include a flocculation algorithm." This comment is not relevant; the simplest numerical models dealing with cohesive sediments use at least a constant settling velocity close to 1 mm/s, which accounts for the existence of flocs.

441 "A major characteristic of the test rig are the distinct secondary currents due to the curve and the rotation of the annular flume." and 457 "For the sake of simplicity the erosion process was neglected in these numerical studies." These are major issues with annular flumes since the velocity of the secondary currents can be larger than the settling velocity. These issues should be addressed in the manuscript since they have the potential to explain some of the observed deviations between experiments and simulations.

441 "...three-dimensional measurements using Acoustic Doppler Velocimetry" The measurements with the ADV are probably biased since the ADV probe is large enough to affect the flow inside a 1.2m diameter, 0.375m by 0.8m section annular flume with smooth walls. This can be tested by introducing the ADV once the flume is running and check for the steadiness of the recorded signal. The same can be said about the CCD-camera.

447 "And a snowflake with equal distribution in all three spatial directions would have a value of about 3." This phrase can be misleading, since a solid 3D body has a fractal dimension of 3. A snowflake with equal distribution in all three spatial directions can have any fractal dimension depending on its structure.

449-453 The authors tested five fractal dimensions n_{fc}=1.4, 1.7, 2.0, 2.3 and 2.6. However, they finally selected the lowest n_{fc}=1.4. This is particularly problematic

since it leaves open the possibility for obtaining better results using n_{fc} smaller than 1.4. The authors should test their model with smaller values of n_{fc} and find the optimal value between 0 and 1.4.

458 This section should be renamed “Summary and future work” since no new conclusions or real applications are introduced.

Figures 1 and 2 do not add any information and should be removed. In figure 2 the correct word is motor not engine.

In Figures 3 and 4 some scale should be included in the picture or dimensions included in the captions.

Figure 5 and pp 442 “For measuring the suspended sediment concentration the turbidity was recorded continuously (every 30 s) combined with taking sediment samples” the authors should be aware that the relation between turbidity and concentration is affected by flocculation.

Figure 10 does not add any information and should be removed.

Interactive comment on Earth Surf. Dynam. Discuss., 1, 437, 2013.