Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-511-RC1, 2018

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Sediment transport modelling in riverine environments: on the importance of grain-size distribution, sediment density and boundary conditions" *by* Jérémy Lepesqueur et al.

Anonymous Referee #1

Received and published: 4 December 2018

The paper focuses on the prognosis of suspended matter concentrations in rivers. For this purpose the authors use the program combination of TELEMAC and SISYPHE. Testing area is the Orne river in north-eastern France.

The authors state that TELEMAC/SISYPHE in its original version can only handle two sediment classes which is not sufficient in case of the natural grain size distributions. Therefore, the authors enhanced SISYPHE for handling 10 fractions. As a result, the simulated suspended sediment concentration (SSC) is markedly improved when the natural sediment mixture is represented by not only two but 10 fractions.

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Discussion paper

A special problem arises in the Orne River (and so in different other rivers) due to cohesive parts of bed sediments. The authors, on the one hand considered an erosion and transport behavior of the non cohesive sediments parts, not influenced by the cohesives, as long as the latter are less than 30%. On the other hand, beyond 50% cohesives the cohesive regime is assumed. It is recommended to explain this assignment in more detail.

However, a main message of this paper is that the TELEMAC / SISYPHE software is now being enhanced for use with 10 sediment fractions instead of just two. This is of interest especially to TELEMAC / SISYPHE users, but not to the wider community. The part describing TELEMAC / SISYPHE covers 1/3 of the paper. The second part leads to the conclusion that in the Orne River a simulation with 10 grain fractions at SSC gives a better result than just two fractions. That was expectable. It must also be noted that there are already other hydromorphodynamic software systems, eg, DELFT and MIKE (and others too) which have been multi-fractional for many years and work with a large number of soil layers. Also hydro-morphodynamic programs for especially fluid mud have been developed.

Before this background, it is recommended to shift the main content of the paper from an enhancement of the software to a better understandig of physical effects/processes. An example could be the interaction and erosion behavior of cohesive and cohesionless sediment within mixtures and their modeling. Also, a more deeply explanation why it is possible to linearly interpolate between the behavior of cohesionless sediment with that of cohesive parts (page 5, line 18).

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