Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "A 2-D process-based model for suspended sediment dynamics: a first step towards ecological modeling" *by* F. M. Achete et al.

Anonymous Referee #1

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In their paper

"A 2-D process-based model for suspended sediment dynamics: a first step towards ecological modeling" Achate et al. present a case study of suspended sediment transport in the San Francisco Estuary using a 2d height integrated flow model coupled with classical equations for sediment transport, erosion and deposition. Furthermore they present a sensitivity analysis of the calibrated model run.

Beside reporting the application/calibration process of an existing model to a specific region, the authors should emphasize the relevance of their scientific contribution by

considering some/several of the following points:

1. Does the work apply novel numerical/conceptual techniques?

   (a) new numerical techniques (e.g. polyhedral mesh) and their advantage

   (b) novel algorithms for fast or parallel processing (please note that a computational focused paper would be more suited for a journal like Computers Geoscience rather than HESS)

   (c) novel transport equations and couplings.

2. What insight can be obtained from choosing this specific field site?

   (a) Is the field site characteristic end member case of transport?

   (b) Is the field site very well suited for calibration/model output comparison due to high quality available flow/topographic data?

   (c) Is the field site of specific importance, especially with respect to the ecological focus of the paper's title.

3. What general conclusions can be drawn from the analysis beside comparing (calibrated) simulation with field observations?

In general the paper is well written and lays out the problem clearly. However the authors have to focus on the implications of their modeling results rather than reporting modeling numbers and the description of the calibration process, which should be possible based on the described modling results.. In case the authors consider these suggestions an updated manuscript can be recommended for publication in HESS.

P2, Line 24- P3, Line 16 What do the anthropogenic impacts mentioned here have to do with the presented results? Please clarify how this paragraph contributes to the understanding of context of the presented analysis.

P2, Line 6: "A robust sediment model ..." Do the authors mean sediment transport? Please clarify. Also 'chain of models' as the authors describe several. P2, Line 20: "...are subject..." should be "are subjected"

P4, Line 3-7: Please explain shortly what the "2DH process based model" physically is? I suppose it integrates height averaged Saint-Vernant type equations, together with some transport equations for sediment as mentioned three pages later. However a (short) physical explanation should be given when the modeling framework is introduced in the text.

For example adding a phrase like "...solves the 2d height integrated shallow water equations coupled with advective diffusive transport ..." would help a lot to understand the physics behind the 2DH process based model.

P4 Line 6 "sediment budgets [..] in time (days)" seems to contradict line 8 "... yearly sediment budget ...". Please clarify.

P6 Line 8: Pumping keeps salinity constant. How does this justify the height integrated modeling approach? The (possible) justification for this, (limited saltwater-freshwater interaction in the Delta) is given only 2 pages later. The authors should justify their statements at the point where these are made rather than assuming that the reader has already advanced several paragraphs in the text.

P10 Line 10-15: Please explain abbreviations at first usage.

Equation 3 and 4 are confusing. The index over which the sum runs is "i" and the summation is from "i-1" to "N". I suppose it should be "i=1" under the sum.

Fig. 2 The labels and the location points of the calibration stations are too small. Please increase the font size.

Fig. 3: It is hardly visible that the blue line is dashed. The authors may increase the dash spacing or simply plot a blue line.

Fig.4: Same problem with red dashed line as in Fig. 3. Increasing the dash spacing and plotting the dashed line on top of the solid line may also improve the visibility where both lines overlap considerably.

Fig.8: The 3D flow effects mentioned in the caption are not discussed in the main text. Please update the manuscript accordingly.

Figure A1: The figure is too small