

Review for the manuscript

'Application of wave-current coupled sediment transport models with variable grain properties for coastal morphodynamics: A case study of the Changhua River, Hainan'

by Wu et al.2024

Dear editor,

I have read the most recent version of the manuscript by Wu et al.2024. The authors have improved the quality of their paper and answered satisfactorily the points I raised in my first review. They have also extended their results analysis by including a chapter where they are looking at the effect of residual currents on sediment transport.

However, I reckon that the science of this paper is undermined by the way it is presented. I would ask the authors to try and make their paper more concise and reconsider the way their results are illustrated in the figures. I am not aware of any limit on the number of figures, but I find that they are too many and there are certainly options for grouping them and merge content from different ones. Another solution could be to move some of these in the Supplementary. Very often, geographical info is repeated while on the contrary some critical elements are missing (e.g., calibration stations). In my comments, I made some suggestions which could be useful.

I would also ask that they check the numbering of their figures and tables. In many instances, they refer to the wrong figure number in their manuscript which makes it very confusing for the reader.

Even though, these are largely minor comments, there is still an obscure point regarding a discrepancy in their sediment transport calibration which needs to be clarified.

Abstract:

Line 15,18 and 22. I would recommend avoiding mentioning specific locations in the abstract. At this stage, the reader is unaware of the geographical context. The abstract should be written in a way that captures the attention of the reader based on the scientific outcomes of the study.

Line 17 There is no theoretical method in the new version. This must be removed.

Introduction

Figure 1 I reckon most of the information regarding stations should be included here in separate figure panels. For example, the current map provides an overview of the study case (although the upper and middle reaches are not really of interest). There could be one more panel with the sampling points (Figure 3) and another one with the ADCP stations and calibration stations. I couldn't find any figure showing where the Baoqiao and Bosua stations are. Giving their coordinates is not enough. Such changes could make the manuscript more concise and precise.

Line 81-91: This paragraph is important as it gives the motivation and goal of this study. To my understanding, what this paper tries to highlight is the role of wave action on determining sediment transport in multi-channel estuaries with small sediment concentrations and the need to use coupled wave - current and sediment transport models for this purpose. A general comment is that the abstract and conclusions do not emphasize on how these results prove this statement.

Section 2

Figure 2 I don't think this figure is really needed. Citing Van Rijn's paper where this figure can be found should be enough. Otherwise, it is just an unnecessary waste of space. I would also recommend moving some of the figures and tables to the Supplementary. For example, Figure 4 and 6b could be moved there.

Figure 7 Add units

Line 122 Shields parameter

Line 126 Influence

Section 3

Figure 6 I'm afraid there is still an inconsistency between the lat and lon stated in line 210 and what we see in panels a and c. Especially in c, the right limit is cut at $108^{\circ} 43'$ and not $108^{\circ} 50'$. Please remove the 'open' and 'land' boundary indications in Figure 6c, these are not correctly placed, and the boundary locations are quite obvious from the bathymetry. Figure 6 b could go in a Supplementary. I would suggest following the pattern of Figure 5, having the bathymetry over a basemap so that everything is given in one panel. The lat and lon coordinates in Figure 5 seem correct and in accordance with line 210. The study area has also been given in Figure 1. No need to repeat it.

Line 234 what means accuracy of 1cm?

Line 235 The authors need to mention what the abbreviation ECMWF stands for

Be careful with the exponents in the units (e.g., line 239 and line 241).

Line 248 I deem this sounds a bit superfluous. Are there really limitations in FVCOM for wave calculations? If yes, they need to be mentioned.

Line 249 Being a model package issued by Deltares, I recommend that the authors cite SWAN by referring to its manual as e.g., (Deltares, 2024) or whatever version of the model they are using.

Table 4 Manning equal to 28 is unrealistic. Do you mean 0,028? I recommend removing Shoreline and Bathymetry from the table, these are not really parameters. Info about bathymetry is already given in the manuscript. There is no mention of GSHHS in the manuscript.

Line 250 Table 5 not 6

Figure 7 Add units in the axes

Section 4

Line 278 The location of the Basuo station needs to be included in Figure 9 together with the ADCP stations. Giving only its coordinates is not useful.

Figure 10 It would be good to add hours in the x axis in panel b where results are given only for one day.

I think the results analysis described in this section does not correspond to the figures mentioned. In the manuscript, lines 303-307 mention Figure 10b and c but they obviously mean

Figure 11. Please check these inconsistencies throughout the manuscript as this makes it very difficult for the reader to understand the arguments.

Line 305 It is probably better to say 'outside of the lower reaches of Changhua River' and not outside the estuary.

Line 316 Figure 12 and not 11

Line 317 The authors name A,B and C as estuaries but later in the conclusions they refer to them as channels. First, there needs to be a consistency in the terminology throughout the manuscript. Second, whether these can be defined as estuaries or channels can be subjective. Personally, I see these more as sub estuaries and not real estuaries.

Figure 12 Choose a different colour for the flow vectors or change the colourmap. The arrows can't be seen.

Figure 13 I find the type of figures presented here a nice addition to the paper. I believe the results could be better communicated through such figures. It would be nice to have the speed and the arrows on top for selected time moments but for the entire field. The content of Figure 11 and 12 could be presented in this way. The authors could reduce the spacing of the arrows if there are concerns about the figures' clarity. It is much helpful to be able to assess the flow field in the entire domain.

Section 5

Line 371 where is Baoqiao station? I can't find it in the figures. Figure 14 not 13

Line 376 Wrong figures number

Line 390 Figure 14 . Separate the figure's panels into a and b and add units at the y axis of the absolute error graph.

Line 381-386

I don't understand this. It is implied that for a 5-day period, the authors get lower currents in their model than the real ones and yet higher suspended sediment concentrations. I would expect lower currents to result in lower suspension of sediments through a section. Even if the sign of the wave and tide induced currents counteracts with each other, this cannot happen for five days. Later in the text (line 426), the authors themselves claim that slower current lead to further sediment deposition. This is a bit confusing. Which of the two arguments is true?

The authors also mention a second possible reason for this discrepancy which has to do with the grain size distribution. I tend to believe more this because if the grain size is not accurate it could lead to an underestimation of settling velocities or overestimation of bed shear stresses. On the other hand, Figure 3 shows a quiet dense field of samplings. From what is shown in Figure 7, the waves calibration seems successful. Have they checked their results in other stations?

Figure 15 is not mentioned at all in the manuscript. It needs to be mentioned when a channel is referred so the reader can understand which area we are looking at.

Figure 16 The caption needs to be more detailed. The authors should describe better what is depicted in the figures.

Line 417 Figure 16h and not 14

Line 425 I think you mean under the influence of the neap tide.

Line 426 Saying that slower currents led to enhanced sedimentation is enough. You don't need that sentence.

Conclusion

The same comment for the abstract applies here. The readers will want to know the conclusions and key messages and may have not read the entire manuscript to know where these specific locations are. In addition, as mentioned in a previous comment, there is an inconsistency about A,B and C which to this point, the authors always referred to as estuaries but here they refer to them as channels. In any case, a potential reader may have not read the full manuscript so it is useless to mention them as A,B and C. I would recommend to include more general statements in the conclusions so that the value and significance of the results can be emphasized and also how these contribute to the research on this topic.