

Dear editor and reviewers,

On behalf of my co-authors, we thank you for giving us a chance to revise and improve the quality of our article.

We have read your comments carefully and have made revision. We have tried our best to revise our manuscript according to the comments: "Application of Wave-current coupled Sediment Transport Models with Variable Grain Properties for Coastal Morphodynamics: A Case Study of the Changhua River, Hainan (egosphere-2024-2154)".

The main revisions in the new manuscript are:

1. **Model Validation Enhancement:** The manuscript has been revised to include a more rigorous validation of the hydrodynamic model, particularly regarding wave modeling.
2. **Clarification of Terminology:** The manuscript has been updated to correct and define ambiguous terms.
3. **Enhanced Data Presentation:** Narrative descriptions of data have been transformed into tabular formats to improve the readability and comparison of data.
4. **Correlation of Figures and Data:** The manuscript has been revised to improve the readability of figures and to ensure that data in tables correspond with the locations indicated in figures.
5. **Grammar and Sentence Structure Refinement:** Grammatical errors and awkward sentence structures have been corrected to improve the flow and readability of the manuscript.
6. **Clarification of Time Periods and Seasonality:** The manuscript has been updated to clearly define time periods and seasonality to avoid confusion with tidal high and low waters, using terms like "dry season" and "wet season" for consistency.

Here is a point-by-point response to the comments and concerns (42 comments.).

Thank you for taking the time to consider our research and we look forward to hearing from you at your earliest convenience.

Sincerely,

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Comment: Firstly, I have not found a proper response to referee 1 point 6 about validating model currents and waves other than tides. Indeed (lines 294-295) “substantial agreement . . . particularly in regions where tidal currents are predominant” suggests that other currents (e.g. due to winds) are not so well modelled and there is nothing about waves.

Response: Thank you for your feedback and for raising the important point regarding the validation of our hydrodynamic model's currents and waves, as noted by Referee 1 in point 6. We appreciate your guidance on ensuring the accuracy and reliability of our model's predictions.

In response to the comments, we would like to clarify that our hydrodynamic model does incorporate wind fields as a driving force, and the sea current validation is based on in situ ADCP velocity and direction measurements. But there is something wrong with the statement in lines 294 to 295, and I have deleted this sentence. To further address the referee's concern about the validation of waves, we have included wave validation using empirical wave data from the Dongfang Wave Station for November 2013, as presented in Wang (2023) paper. This data includes maximum wave height and peak wave period, which are crucial parameters for assessing the model's performance in simulating wave dynamics.

The added part now reads:

“To substantiate the accuracy of our hydrodynamic model, we incorporated wave validation using comprehensive wave data from Wang (2023), which includes the maximum wave height and peak wave period observed throughout November 2013. The wave validation results are depicted in Fig. 7. The figure illustrates a substantial agreement between the modeled and observed wave parameters, affirming the reliability of our model in reproducing wave conditions. The agreement between the model's wave predictions and the empirical data underscores the robustness of our wave model.”

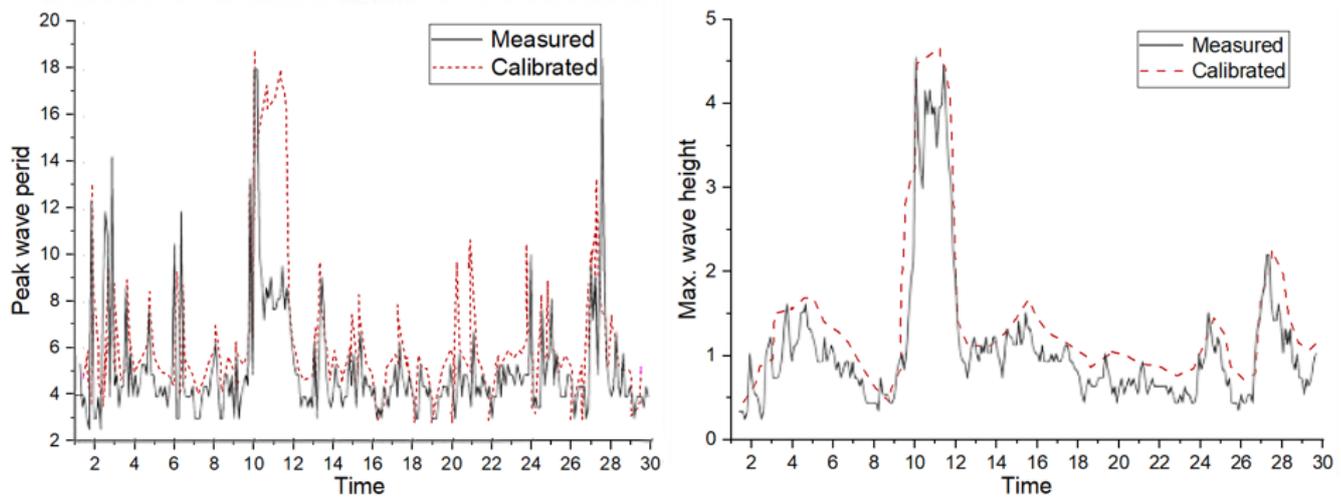


Figure 7: Comparison of maximum wave height and peak wave period calculated with the calibrated model against the field measured (Adapted from the study by Wang (2023)).

”

Detailed comments part:

Point 1: Line 9. “downstream” is an adjective; it should describe a noun, e.g. “downstream reaches”. Later (line 13) you use “lower reaches”. Anyway here you need to describe how much of the Changhua River is included.

Response (Lines 14-17): Thank you for your insightful comments and for drawing our attention to the need for clarity in our manuscript. We have taken your advice to heart and have revised the sentence on line 9 to more accurately reflect the specific section of the Changhua River that is the focus of our study. The term "downstream" has been replaced with a descriptive phrase to clarify the geographical scope of our research. The updated sentence now reads:

“.... This study focuses on the lower reaches of the Changhua River in Hainan Island, specifically from Chahe to the river's mouth at Changhua Port, spanning approximately 39 kilometres. Topographic data and sediment sampling were conducted in this area, complemented by remote sensing techniques.”

Point 2 : Equation (4) looks correct for u^* so line 112 “ u^* is the bed concentration” seems wrong. “ u_s ” in (3) needs definition. “ V ” in (7) needs definition here, not later. If (line 112) “ ν is the kinematic viscosity” then what is v in (9)? Line 113: symbol for shear stress is missing.

Response (Lines 117-119): Thank you for your careful review and for pointing out the inconsistencies in our manuscript. Upon reviewing the comments, we realized that during the formatting process of the paper, an oversight led to the omission of a variable symbol, which resulted in the corresponding errors and omissions you mentioned.

We have now corrected these issues, and all variables are properly defined and correspond correctly. Specifically:

“ ν is the kinematic viscosity and approximately equal to $10^{-6} \text{ m}^2/\text{s}$ for water; C_a is the bed concentration; u_ is the friction velocity; u_s is the initiation velocity, which is the critical flow velocity at which sediment particles begin to move; τ is the shear stress at the bed*

surface; ...".

Point 3: Line 110. I do not understand "which under the current". "Shield" → "Shields".

Response (Line 115): Thank you for your continued attention to our manuscript and for highlighting the areas that require clarification. We have carefully reviewed the points you raised, and we appreciate your diligence in ensuring the accuracy and clarity of our work.

Regarding the phrase on line 110, "which under the current," we recognize that this was a formatting oversight that led to confusion. The correct phrase should indeed clarify the context in which "current" is being used. We have revised this to ensure that it accurately reflects the scientific meaning intended. The corrected sentence now reads: "which are influenced by the current conditions," which we believe provides the necessary clarity. Additionally, you correctly noted the inconsistency with the term "Shield." We have amended this to the correct usage, "Shields," to align with the standard notation in fluid dynamics and sediment transport literature.

Point 4: In equation (12) the second term inside the square-root has the wrong dimension. You need to state whether you actually use (1) or (10)-(13) for the suspended load.

Response: Thank you for your careful review and for pointing out the dimensional inconsistency in Equation (12) within our manuscript. We apologize for the oversight and appreciate your attention to detail, which is crucial for the accuracy of our scientific work.

Regarding the confusion in Equation (12), you are correct that the second term inside the square-root was incorrectly dimensioned. The intended calculation for the shear velocity due to waves and current should indeed be the vector sum of the shear velocities due to wave action and current flow, which is the square root of the sum of their squares. This ensures that both terms within the square root have the correct dimensions and that the equation accurately represents the combined effect of waves and current on shear velocity.

Regarding the calculation of suspended load, we confirm that our study utilizes Equation (1) for this purpose. The inclusion of Equations (10) to (13) was intended to provide a comprehensive overview of the different aspects of sediment transport. However, we understand that this may have led to confusion regarding which equations were actually used in our analysis.

In response to your feedback and to avoid any misinterpretation, we have decided to remove Equations (10) to (13) and their associated descriptions from the manuscript. This decision was made to streamline the presentation and focus on the core equations that are directly relevant to our study's findings and conclusions. We believe this will enhance the clarity and readability of the paper for the readers.

Point 5: Line 140. This is not clear – missing verb with “usually”?

Response (Line 133): Thank you for your patience and for clarifying the issue on line 140. We understand that the phrase "usually" was causing confusion. Upon reviewing the sentence, we agree that it can be made clearer by removing the ambiguous term.

The sentence has been revised to:

"Line 133 (revised): The model of sediment transport to calculate the influence of the waves through a comprehensive consideration of various factors that encapsulate the impact of waves on sediment transport."

Point 6: Line 179. The 40 points are in the lower reaches; you do not want to refer to the estuary here.

Response: Thank you for your keen observation and for pointing out the inconsistency on line 179. I apologize for the confusion caused by the reference to the "estuary" when discussing the 40 points in the lower reaches. Upon reviewing the context, it is clear that the focus should be solely on the river channel sampling, and not the estuary.

To address your next comment and to improve the clarity of the presentation, I have decided to remove the textual description of the sampling points and instead, present this information in a tabular format. This change will provide a clearer and more organized overview of the sampling locations and their characteristics, avoiding any potential overlap or confusion with the estuary sampling.

Point 7: Lines 176 to 182. All these values might be better in a small table. Do the % values really help?

Response (Lines 169-177): Thank you for your suggestion to improve the presentation of the data in lines 176 to 182. We agree that a tabular representation would provide a clearer and more concise overview of the values, allowing readers to quickly grasp the key points.

In response to your feedback, we have decided to replace the narrative description with a table that presents the data in a structured format. This table will include the relevant values, and we have chosen to use percentages to express the data. We believe that percentages are beneficial as they provide a standardized way to compare the relative proportions of different sediment components, which is crucial for understanding the sediment dynamics in the study area.

The text surrounding the table will focus on drawing conclusions from the data presented, rather than listing specific numbers. The revised part now reads as follows:

“...The high proportion of samples with smaller median grain diameters (0-1 ϕ) suggests that these areas are likely under higher energy hydrodynamic conditions where coarser particles settle initially. The lower proportion of samples with larger median grain diameters (3 ϕ -7 ϕ) indicates that these areas may be in lower energy environments where finer particles are more likely to be transported and deposited. Samples with median grain diameters between 1 ϕ and 3 ϕ represent intermediate energy transition zones. Through these data (Table 4), we can conclude that the majority of the areas are characterized by turbulent, high-energy hydrodynamic environments, while fewer areas are associated with static, low-energy conditions.

Table 2 Distribution of Sediment Grain Size Classes in Estuary and River Channel

Estuary		River channel	
Range	Frequency	Range	Frequency
-1 ϕ - 0	20%	-1 ϕ - 0	2.5 %
0 - 1 ϕ	60 %	0 - 1 ϕ	60 %
1 ϕ - 3 ϕ	20%	1 ϕ - 3 ϕ	20 %
3 ϕ - 7 ϕ	0	3 ϕ - 7 ϕ	17.5 %

”

Point 8: Figure 3 and Tables 2, 3. The location labels in figure 3 are very hard to read. If you think the tables are useful then you need to relate each table row to a location in Figure 3. Similarly, the sample numbers in Figure 4 should be related to locations in Figure 3.

Response: Thank you for your helpful feedback on lines 176 to 182, as well as your comments on Figure 3 and Tables 2 and 3. We have taken your suggestions to heart and have made the following revisions to improve the clarity and effectiveness of our presentation:

Figure 3 Revision: We have enhanced the readability of the location labels in Figure 3. The points now correspond clearly with those in Figure 4, ensuring that the visual representation is both clear and directly related to the sampling data.

Tabular Presentation: In response to your suggestion that the values might be better in a small table, we have decided to focus on the conclusions that can be drawn from the data rather than listing specific numbers. We have chosen to use percentages to express the data, which provides a standardized way to compare the relative proportions of different sediment components.

Streamlining of Tables: After careful consideration of your comments on the usefulness of Tables 2 and 3, we have decided to remove these tables due to their redundancy and the potential for confusion. Instead, we will retain Table 4, which succinctly represents the sampling points' information in a clear and concise manner. This table will be directly related to the locations indicated in Figure 3, ensuring that the connection between the visual data and

the tabular data is explicit and easy to follow.

The revised figure 3 now reads as follows:

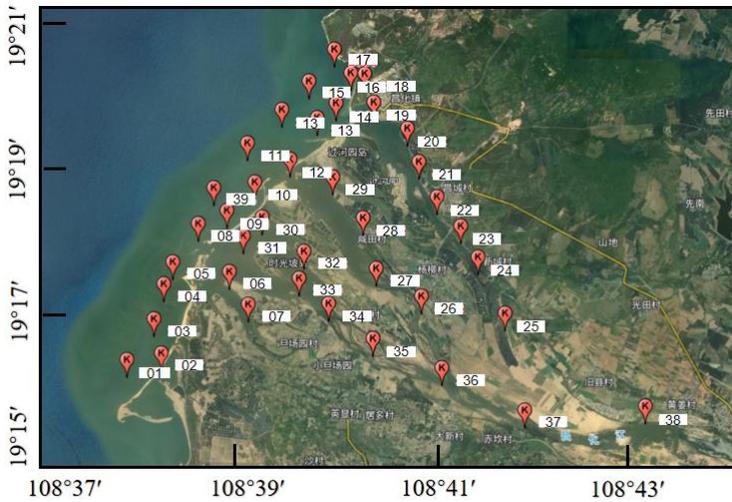


Figure 3: Location of sediment sampling point in the channel (map origination: <https://hainan.tianditu.gov.cn/>)

Point 9: Line 200. “used in” → “is used in the”

Response (Line 193): Thank you for your careful review and for drawing our attention to the grammatical point on line 200. We appreciate your attention to detail, which is essential for the precision and clarity of our manuscript.

In response to your suggestion, we have made the appropriate correction to ensure the sentence is grammatically accurate and reads smoothly. The revised sentence on line 200 now reads:

"After calculating, the dry bulk density is 1210.9 kg/m³, which is used in the sand transport model."

Point 10: Line 214. I think NSE can be negative – very poor!

Response (Line 208): Thank you for your insightful comment regarding the possibility of the Nash-Sutcliffe Efficiency (NSE) being negative. You are correct that in certain cases, NSE can

indeed be negative, indicating a very poor model performance. I have updated the text to include this information, as it is an important aspect of the NSE metric.

The revised sentence now reads:

“...When $NSE < 0$, the fitting degree of the model is very poor.”

Point 11: Lines 220-225. Is FVCOM 3D? You need to say. If so it may need more than tidal level data at an open boundary.

Response (Lines 213-215) Thank you for your insightful comments and for bringing to our attention the need to clarify the dimensionality of our FVCOM model and the associated open boundary conditions in our manuscript, particularly in the section spanning lines 220-225.

Firstly, we confirm that FVCOM is indeed a three-dimensional (3D) model capable of simulating both the vertical and horizontal components of flow and transport processes. The revised sentence now reads:

“The prognostic, unstructured-grid, Finite-Volume, free-surface, three-dimensional primitive equation Coastal Ocean circulation Model (FVCOM) (Chen et al., 2003) was used to simulate the hydrodynamic background and hydrological features.”

We acknowledge your concern regarding the potential need for more than just tidal level data at the open boundaries for a 3D model like FVCOM. While it is true that 3D models like FVCOM have the capacity to incorporate a range of forcing mechanisms, the literature and common practice often focus on the use of tidal level data as the primary open boundary condition. We have reviewed the literature and our model setup in light of your comments and would like to provide the following clarification and justification for our approach.

In our study, we are primarily focused on the hydrodynamic behavior and sediment transport patterns within the lower reaches and estuary of the Changhua River, Hainan Island. Given the specific objectives of our research, which are centered on understanding the influence of wave and current actions on sediment dynamics, we have employed FVCOM in its 3D mode. This allows us to capture the vertical structure of the flow, which is crucial for accurately simulating sediment transport processes.

However, after careful consideration of the available data and the scope of our study, we have determined that the inclusion of tidal level data as the primary open boundary condition is sufficient for our purposes. The rationale for this decision is as follows:

Tidal Dominance: The study area is significantly influenced by tidal dynamics, and the tidal range is a dominant factor affecting the water level and flow patterns. The tidal elevation data from the TPXO8 model, which we use as our open boundary condition, adequately captures the necessary forcing for our simulations.

Model Validation: We have validated our model results against available field observations of water levels and sediment concentrations at key locations within the study area. The agreement between the model simulations and observed data provides confidence in the adequacy of our boundary conditions.

In light of these considerations, we believe that the use of tidal level data as the primary open boundary condition is appropriate for our study. We have clarified in the manuscript that FVCOM is indeed used in its 3D mode and that the open boundary conditions are tailored to the specific requirements of our research, with a focus on tidal dynamics as the primary driver of the system.

We hope this explanation addresses your concerns and provides a clear rationale for our

approach to open boundary conditions in the FVCOM model. We are grateful for your guidance and are open to any further suggestions or questions you may have.

Point 12: Line 227. “ADCP collection points” are very unclear in Figure 6(b). Better to refer to Figure 8?

Response: Thank you for your comment on lines 220-225 and for raising the issue regarding the clarity of "ADCP collection points" in Figure 6(b). We appreciate your efforts to ensure that our figures and their references are clear and accurate.

Upon reviewing the figures and the associated text, we have noted that Figure 6(b) indeed displays the points where bathymetric data was collected using a shipboard ADCP, which is distinct from the current velocity and direction measurements depicted in Figure 8. These two figures serve different purposes in our study: Figure 6(b) illustrates the spatial coverage of our bathymetric surveys, which are crucial for understanding the underwater topography and its influence on flow patterns, while Figure 8 shows the specific locations where current velocity and direction were measured to validate our hydrodynamic model.

We have revised Figure 6(b) to now display the track of the survey vessel equipped with the ADCP. This change addresses the issue of cluttered points and overlapping labels by providing a visual representation of the vessel's path, which allows for a clearer depiction of the data collection route rather than individual points.

The revised figure and sentence now read as follows:

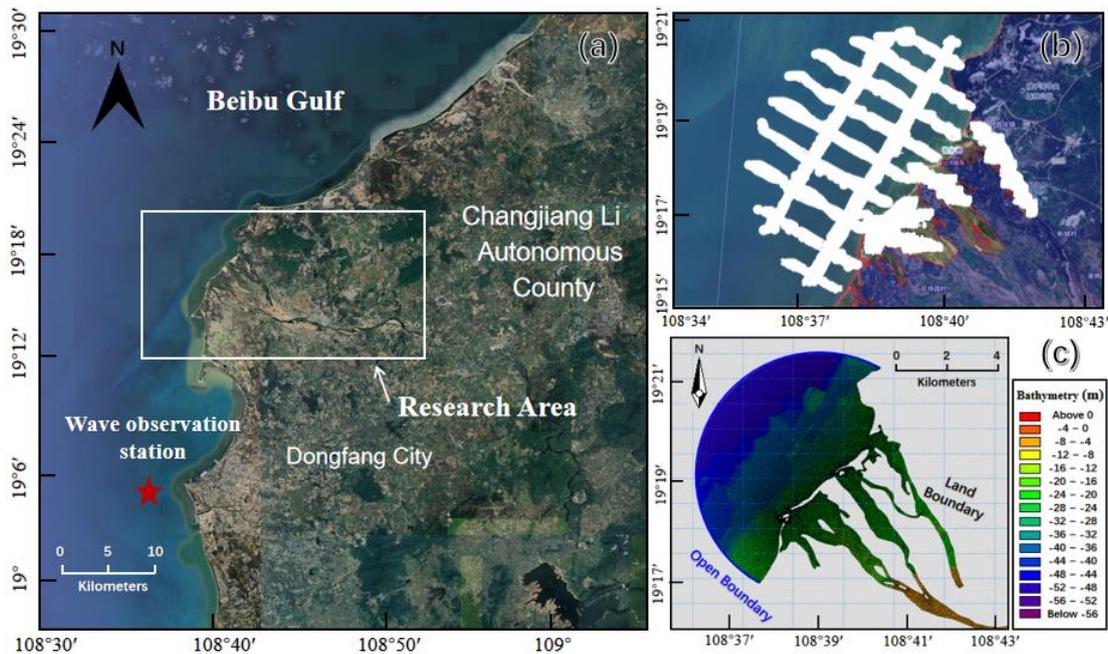


Figure 6: (a) Scope of study area (the white frame) and wave observation (the red star) from Dongfang; (b) The track of the survey vessel equipped with the ADCP; (c) Grids and boundaries (map origination: <https://hainan.tianditu.gov.cn/>)

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Point 13: Line 245. “upper” → “upstream”

Response (Line 237): Thank you for your attention to detail and for pointing out the potential improvement on line 245. We appreciate your efforts to enhance the precision of our manuscript.

Upon reviewing the context, we agree that "upstream" is the more appropriate term than "upper" in this instance. The revised sentence now reads:

"The upstream boundary of the model is set based on the multi-year average monthly flow and sediment concentration data from the Baoqiao Hydrological Station in Chahe Town."

Point 14: Table 5, rows “Time Period”. For the first row here, I think seven days imply you mean “Spring to neap tide”. In the second row, I do not understand “High water period” of more than one month.

Response: Thank you for your insightful comments on Table 5, specifically regarding the clarification needed for the "Time Period" rows.

For the first row, as you correctly pointed out, the seven-day period we indicated corresponds to the transition from spring tide to neap tide, which is a critical phase for our hydrodynamic model calibration. We have revised the entry to explicitly state this tidal cycle:

"23/4/2023 00:00-30/4/2023 00:00 (Spring to neap tide)"

Regarding the second row, we appreciate your feedback on the "High water period" of more than one month. To provide better clarity and to align with the seasonal hydrological patterns, we have decided to change this period to reflect the "wet season" which is more representative of the conditions we aimed to capture. The revised entry now reads:

"28/6/2022 00:00-1/8/2022 00:00 (Wet season period)"

Point 15: Line 294 and Figure 9 caption (twice). Replace "velocity" by "speed". Refer to figure 9 in the text.

Response (Lines 295-296): Thank you for your continued review and for pointing out the consistency needed in our use of terms related to "velocity" and "speed" in line 294 and the caption of Figure 9.

We understand the importance of using precise terminology, especially in scientific writing. Upon your suggestion, we have replaced the term "velocity" with "speed" in line 294 and in the caption of Figure 9 to maintain consistency throughout the manuscript. This change reflects our commitment to clarity and accuracy in our work.

The revised text in line 296 now reads:

"The model accurately replicates the speed fluctuations, ..."

And the caption for Figure 9 has been updated to:

"Current speed and direction verification. (a) speed verification of ADCP 01; (b) speed verification of ADCP 02; (c) verification of current direction of ADCP 01; (d) verification of

current direction of ADCP 02."

We have also ensured that Figure 9 is properly referenced in the text, as you suggested. The inserted sentence now reads as follows:

"Figure 10 provides a comparison between the model simulations and the in situ ADCP measurements, highlighting the model's accuracy in capturing the tidal current dynamics."

Point 16: Figures 9 to 11. If the model is 3D you need to state the depth (or height above bottom) of the model current shown, and also the depth (or height above bottom) of the ADCP bin in figure 9.

Response: Thank you for your guidance on Figures 9 to 11 and for highlighting the need to specify the depth details for the model current and the ADCP bin.

We appreciate your guidance and have revised the figure captions and the text to include the necessary depth information. As you correctly noted, it is important to clarify that the model current shown represents the depth-averaged flow velocity across the entire water column. This means that the model current is an average of the flow velocities at all depths within the water body, providing a comprehensive representation of the flow conditions.

We have made the necessary revisions to address your comments. In the Table 7 and captions for Figures 10 and 11.

Revised Table 7:

Table 7 Information of fixed-point current station

Number	Depth	Position	Observation
ADCP 01	20.9 m	108 ° 37'28"E, 19 ° 18'10"N	April 23rd at 10: 00 - April 24th at 11: 00
ADCP 02	22.8 m	108 ° 39'21"E, 19 ° 20'55"N	April 24th at 17: 00 - April 25th at 18: 00

Revised Caption for Figure 10:

Figure 10: Study area and coastal current direction, displaying depth-averaged flow velocities across the water column. (a) location map of the study area; (b) detailed zoom of the map

in Fig. 10a with NE current; (c) detailed zoom of the map in Fig. 10a with SW current. (map origination: <https://hainan.tianditu.gov.cn/>)

Revised Caption for Figure 10:

Figure 11: Flow field inside the estuary, displaying depth-averaged flow velocities across the water column. (a) moment of the maximum flood current; (b) moment of the maximum ebb current

Point 17: Lines 341-342. “The sand spit at the downstream estuary” – which estuary is this?

Response (Lines 342-343): Thank you for your comment on lines 341-342 regarding the specificity of the "sand spit at the downstream estuary." We appreciate your attention to detail and understand the importance of clarity in our geographical references.

The revised sentence now shows as follows:

“The sand spits at the downstream estuary A and B alter the flow direction and velocity.”

Point 18: Lines 380-382. “The maximum error . . . at . . . the end of the month . . . may be due to the use of monthly average flow and sediment data”. I think this will not explain why the model sustains larger concentrations during 21-25 July than before or after that period. However, you should be able to diagnose the reason from the inputs to the model.

Response (Lines 382-387): Thank you for your guidance on lines 380-382 and for requesting a more detailed analysis of the reasons behind the model's higher concentrations during 21-25 July compared to before or after that period.

In response to your feedback, we have conducted a thorough review of the model inputs and parameters, focusing on identifying the specific factors that could contribute to the higher simulated suspended sediment concentrations during the specified period:

Wave Intensity: The Van Rijn model accounts for the combined action of waves and currents on sediment transport. If the model does not accurately capture the interaction between waves and currents, it could lead to overestimation of concentrations, especially during periods of high wave activity or strong currents. The higher wave activity during this period may not have been fully represented in the model inputs, leading to an overestimation of sediment concentrations.

Sediment Parameters: The initial sediment parameters, particularly the grain size distribution, were interpolated from a limited number of sampling points due to the narrowness of the river channel. This interpolation may have introduced significant errors in the sediment grain size parameters in the river channel, which in turn could lead to a mismatch between the simulated and actual suspended sediment concentrations. The scarcity of sampling points and the resulting interpolation errors could explain the higher simulated concentrations during the period in question.

We have revised the text to reflect these findings and to provide a more detailed explanation for the model's performance during the specified period. The revised text now reads:

"The model's higher concentrations during 21-25 July can be attributed to two primary factors. Firstly, the increased wave intensity during this period may not have been fully captured in the model inputs, leading to an overestimation of sediment concentrations due to the combined action of waves and currents on sediment transport. Secondly, the initial sediment parameters, especially the grain size distribution, were interpolated from a limited number of sampling points in the narrow river channel, introducing significant errors and contributing to the discrepancy between simulated and actual suspended sediment concentrations."

Point 19: Figure 13 caption. "deposition" → "concentration"

Response: We have reviewed the caption and have made the necessary correction to ensure the terminology is accurate and consistent with the content of the figure. The term "deposition"

has been replaced with "concentration" to accurately reflect the data presented in the figure, which shows the suspended sediment concentration rather than the physical deposition of sediment.

The revised caption for Figure 13 now reads:

Figure 13: Selection point for sediment concentration verification

Point 20: Line 397. Which "figure"?

Response: Thank you for your comment on line 397. We have recognized that the reference to the figure, which has been removed, still remains in the text. We apologize for this oversight and have taken immediate steps to revise the text to ensure it is self-contained and does not rely on the presence of a figure.

The section previously mentioned the figure to describe the areas of deposition in the study area. To address your concern, we have rephrased the paragraph to describe the findings directly within the text. The revised text now reads:

"To elucidate the sedimentary characteristics of the study area, we extract the bed level change data of a point in the obvious change area of river bed, and take this point as the whole area."

Point 21: Lines 399-401. I think you mean (line 400) ". . and take this point to represent the whole area. . ." However, this is an arbitrary choice and you cannot say "Therefore . ."

Response (Lines 402-405): Thank you for your comment on lines 399-401, and for highlighting the need for clarification regarding our approach to representing the sediment deposition characteristics of the study area.

We understand your concern about the arbitrary choice of using a single point to represent the entire area and the implication of using "Therefore" to connect this choice with the analysis. To address this, we have revised the text to better explain our methodology and the rationale behind selecting a representative point for analysis.

The revised text now reads:

“To elucidate the sedimentary characteristics of the study area, we extract the bed level change data of a point in the obvious change area of river bed, and take this point as the whole area. By examining the bed level changes at this point, we aim to gain insights into the sediment deposition characteristics that may be occurring throughout the area. This approach allows us to infer patterns and trends in sediment deposition based on observable changes at a specific location.”

Point 22: Line 422. The overall increase in deposition thickness of 0.59 cm was from April 23rd (not 27th) to 30th.

Response (Line 423): Thank you for your attention to detail in noting the discrepancy in the timing of the sediment deposition thickness increase. You are correct that the overall increase in deposition thickness of 0.59 cm occurred from April 23rd to 30th, not from the 27th as previously stated.

We have made the necessary correction to ensure the accuracy of the dates mentioned in relation to the sediment deposition event. The revised sentence now accurately reflects the time frame of the observed increase in deposition thickness:

“From April 23rd to 30th, an overall increase in deposition thickness was noted, reaching approximately 0.59 cm.”

Point 23: Line 424. I do not understand “The second phase” here.

Response (Line 425-427): I apologize for the confusion caused by the reference to "The second phase" on line 424. Thank you for your feedback on line 424, where you've pointed out the confusion regarding the reference to "The second phase." We appreciate your guidance in clarifying this matter.

Upon reviewing the text, we have revised the sentence to provide a clear and direct explanation, ensuring that the context is well-defined and the narrative is coherent.

The term "The second phase" was intended to refer to the period following April 27th, which was influenced by the spring neap tide, characterized by lower water levels and reduced tidal ranges. During this time, the currents slowed down, enhancing sedimentation and weakening lateral erosion.

The revised text now reads:

“The second phase following April 27th, under the influence of the spring neap tide, the reduced tidal amplitude and slower currents led to enhanced sediment deposition. The slower currents allowed for the deposition of a wider range of sediment sizes, not just fine particles.”

Point 24: Lines 426-427. I think you should refer to figure 16. Figure 16 needs hours on the time axis; the same date at four times is not useful.

Response (Lines 425, 430): Thank you for your feedback on lines 426-427, and for pointing out the need for clarity and specificity in our reference to Figure 16.

We understand your concern about the presentation of time data on the time axis of Figure 16. To address this, we have revised Figure 16 to include hours on the time axis, which will provide a more detailed and useful representation of the data over time. This change will allow readers

to better understand the temporal dynamics of the sediment deposition process being described.

The revised figure now includes a time axis with specific hours, which will replace the previous format that showed the same date at four different times. This improvement will enhance the readability and interpretability of the figure, ensuring that the data aligns with the temporal resolution necessary for the analysis.

We have also updated the text in lines 426-427 to reflect these changes and to guide the reader to the revised Figure 16, which now accurately represents the sediment deposition characteristics at the specified times.

The revised text and figure now reads:

“on April 23rd from 13:30 to 20:30, coincided with astronomical mid-tide but exhibited lower current velocities than expected, as per ADCP 01 measurements (Figure 17).”

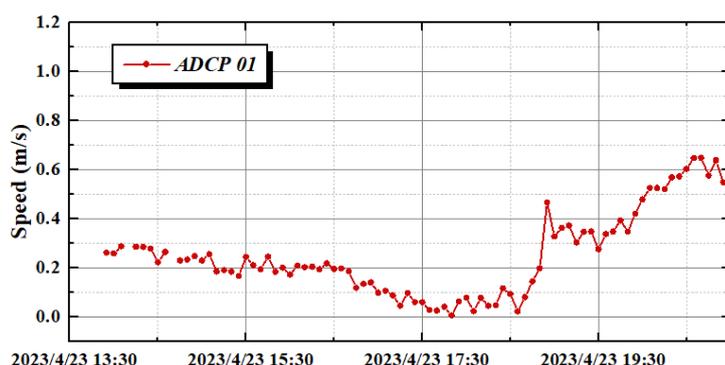


Figure 17: Current speed on April 23rd

Point 25: Lines 429-430. Please check what you mean here. If fine grains can settle then surely coarse grains can settle too. Maybe you mean that only fine grains are available to settle.

Response (Line 427): Thank you for your attention to the details in our manuscript, particularly regarding the sediment deposition process described in lines 429-430.

I apologize for any confusion caused by our previous statement. Upon your feedback, we have

reviewed and understood that our initial description may have been misleading. We appreciate your patience and your effort to ensure the accuracy of our scientific communication.

To clarify, our intention was to convey that during the period of slower currents, a broader spectrum of sediment sizes became susceptible to deposition, encompassing not only fine particles but also coarser grains. The corrected and clarified statement is as follows:

“The slower currents allowed for the deposition of a wider range of sediment sizes, not just fine particles.”

Point 26: Lines 435-443 should refer to figure 17.

Response (Line 436): Thank you for your feedback regarding lines 435-443 and for pointing out the need to refer to Figure 17 for clarity and context.

We apologize for the oversight and appreciate your guidance. Upon your suggestion, we have updated the text to properly reference it, ensuring that the discussion of sediment deposition dynamics is aligned with the visual data presented in the figure.

The revised text now includes a direct reference to Figure 17, which provides a visual representation of the sediment deposition patterns discussed in the manuscript. The specific changes are as follows:

“... The maximum observed deposition thickness within the estuary is 0.58 cm at Location 2, while other areas exhibit thicknesses between 0.3 cm and 0.5 cm (Figure 18).”

Point 27: Lines 489-490. “potentially hindering the river's natural evolution”? This is unclear. I think you have just described natural evolution.

Response (Lines 486-488): Thank you for your feedback on lines 489-490 and for highlighting the need for clarity regarding the phrase "potentially hindering the river's natural evolution."

We understand your concern and agree that the statement as it stands may be ambiguous. We intended to convey that the sediment deposition patterns we've described are a part of the river's natural evolution, but we acknowledge that the wording could suggest an impediment to this process, which may not be our intent.

To clarify, we have revised the text to better reflect our intent:

“... The sediment deposition patterns contribute to the river's natural evolution by altering its course and morphology over time. This process is a fundamental aspect of the river's dynamic landscape, shaping its future state through the deposition of sediments.”

Point 28: Lines 504-505. “after removing the periodic astronomical tide” is confusing since you then go on to have the residual “depend on the strength and duration of the ebb and flood tidal velocities”

Response (Lines 501-504): Thank you for your valuable feedback regarding lines 504-505. I appreciate your attention to detail and the opportunity to clarify our description of the Eulerian residual current.

I would like to explain that the phrase "after removing the periodic astronomical tide" is indeed a valid description of the Eulerian residual current. In the literature, the Eulerian residual current can be understood from two perspectives:

Average Flow Considering Periodic Tides: This definition emphasizes that the average flow velocity observed at a fixed location over multiple tidal cycles represents the net flow direction and magnitude after accounting for the periodic tidal influences.

Flow Velocity After Removing Tidal Effects: This perspective focuses on obtaining the non-periodic average flow by filtering out the periodic tidal components from the instantaneous flow velocity.

Both definitions describe the same physical phenomenon but highlight different aspects. The

first definition emphasizes the average effect after considering tidal influences, while the second focuses on the process of isolating the non-periodic component from the instantaneous flow.

We understand that the current wording may create confusion, especially since we subsequently reference the residual currents depending on the strength and duration of the ebb and flood tidal velocities. To address this, we have revised the text for clarity and coherence.

The revised text now reads:

“...The Eulerian residual current refers to the average flow after accounting for the periodic astronomical tide, which reflects the net flow direction and magnitude resulting from the ebb and flood tidal velocities. This residual current is influenced by the strength and duration of these tidal velocities, providing insight into the overall sediment transport dynamics in the study area.”

Point 29: Line 508. In principle I think the Lagrangian residual current IS the result of the long-term tracking of real particles but that you want to state that HERE it is estimated as “the result of the superposition of Eulerian residual current and Stokes’ drift”

Response (Lines 506-508): Thank you for your comment on line 508 and for the opportunity to clarify our description of the Lagrangian residual current in our study.

We appreciate your insight and agree that the Lagrangian residual current, in principle, is indeed the result of the long-term tracking of real particles. However, in the context of our study and as it pertains to our specific calculations and data, we have chosen to estimate the Lagrangian residual current as "the result of the superposition of the Eulerian residual current and Stokes' drift." This approach is consistent with the understanding that the Lagrangian flow is the sum of the Eulerian flow and the Stokes drift, which accounts for the mean kinetic energy

and coastal nonlinear interaction.

We have revised lines 506-508 to reflect this understanding more accurately:

“The Lagrangian residual current is considered the result of the superposition of the Eulerian residual current and Stokes' drift, which together provide a comprehensive representation of the long-term particle trajectories and the mean flow in our coastal environment.”

Point 30: Lines 503-514. There is much repetition within these paragraphs.

Response (Lines 501-510): Thank you for your observation regarding the repetition within lines 503-514. We appreciate your feedback and understand the importance of conciseness and clarity in scientific communication.

Upon reviewing the paragraphs, we have identified the repetitive elements and have taken steps to consolidate and streamline the content. Our goal was to maintain the essential information while eliminating redundancy, ensuring that each point is articulated clearly and succinctly.

The revised section now reads:

“The Eulerian residual current refers to the average flow after accounting for the periodic astronomical tide, which reflects the net flow direction and magnitude resulting from the ebb and flood tidal velocities. This residual current is influenced by the strength and duration of these tidal velocities, providing insight into the overall sediment transport dynamics in the study area. Stokes' drift characterizes the net drift of the water body, and its numerical size directly reflects the correlation between the tidal range and the change in flow velocity within the tidal cycle, and the sum of the two is the Lagrangian residual current. The Lagrangian residual current is considered the result of the superposition of the Eulerian residual current and Stokes' drift, which together provide a comprehensive representation of the long-term

particle trajectories and the mean flow in our coastal environment. The formulas for calculating these currents are based on established studies (Longuet-Higgins, 1969; Uncles and Jordan, 1980; Li and O'Donnell, 1997)."

Point 31: Line 518. "tidal current field data from hydrodynamic numerical simulation". If the information is from "numerical simulation" then it is not "field data". Omit "data".

Response (Line 513): Thank you for your valuable feedback regarding line 518. I appreciate your attention to detail and your clarification regarding the terminology used in our manuscript. You are correct that the phrase "tidal current field data from hydrodynamic numerical simulation" is misleading, as data derived from numerical simulations should not be referred to as "field data." To address this issue, we have revised the sentence to eliminate the term "data" and ensure clarity.

The revised sentence now reads:

"In this section, based on the tidal current field from hydrodynamic numerical simulation..."

Point 32: Lines 520-521. "thereby enhancing the credibility of the residual flow field." Only if you include the model estimates in Table 8 and show a good comparison.

Response (Lines 514-516): Thank you for your feedback on lines 520-521. We appreciate your guidance on ensuring the credibility of our residual flow field analysis.

We have revised the text to clarify that the validation of our hydrodynamic model through water level data confirms the model's effectiveness, and by extension, the reliability of the residual flow field derived from it. The revised text now reads:

"The validation of our hydrodynamic model against observed current confirms the model's

accuracy and reliability (Figure 10). Consequently, the residual flow field, as simulated by the model, is also considered credible.”

Point 33: Table 8 caption. “spring neap” is meaningless. You need to state the averaging period for the values in the table, and also the basis for the elevations involved in calculating the Stokes’ drift.

Response: Thank you for your feedback on the caption of Table 8, particularly regarding the term "spring neap" and the need for clarity on the averaging period and the basis for the elevations involved in calculating Stokes' drift.

We have revised the caption of Table 8 to provide a clear explanation of the averaging period and the basis for the elevations used in our calculations. The revised caption now reads:

“Table 8: Residual Currents at Monitoring Stations - Eulerian Residual Current and Stokes’ Drift. Values are averaged over a 15-day periods. Elevations used in the calculation of Stokes’ drift are based on mean sea level (MSL) as the reference datum”

Point 34: Lines 523-524. There is no need to repeat figures from Table 8. The speeds you give in the text are not those in the Table.

Response: Thank you for your feedback on lines 523-524, and for drawing our attention to the repetition of data from Table 8.

We have taken your advice and removed the redundant mention of speeds in the text, as the information is already adequately presented in Table 8. This removal helps to streamline the narrative and avoids any potential confusion for the reader.

Point 35: Lines 528, 530-531 and figure 21. You must define “low water period” and the averaging you are using to obtain the Eulerian residual current. Perhaps see comment on line 553.

Response (Lines 523, 525-526, 545): Thank you for your feedback on lines 528, 530-531, and Figure 21, particularly regarding the need to define the "low water period" and the averaging method used to obtain the Eulerian residual current.

In accordance with your advice, we have replaced the term "low water period" with "dry season" to clearly distinguish it from tidal low water. This change will help prevent any misunderstanding and align our terminology with the seasonal variations in river flow. Additionally, we have specified that the Eulerian residual current values presented in Figure 21 are derived from a 15-day averaging period. This period was chosen to ensure a comprehensive representation of the flow dynamics, capturing the net effects of ebb and flood tidal velocities.

To address your comments, we have made the following revisions and clarifications:

“...Figure 22 is derived from averaging the instantaneous flow data over a standard 15-day period....”

Figure 22: Eulerian residual current field during the dry season

Point 36: Line 538. “below” → “south of”?

Response (Line 533): Thank you for your attention to detail and for your suggestion regarding line 538. We appreciate your efforts to ensure the precision and clarity of our manuscript.

Upon reviewing the context, we agree that "south of" would be a more accurate and geographically specific term than "below" in describing the location referenced in the text.

This change will provide a clearer understanding of the spatial relationship being discussed.

“The northeastward Eulerian residual current, after divergence, encounters the obstruction of the headland (Topped wall Angle) and forms a counterclockwise circulation south of Topped wall Angle.”

Point 37: Line 546. “. . . opposite to the southern one may exist north of Topped . . .”?

Response (Lines 540-541): Thank you for your comment on line 546 regarding the phrasing "opposite to the southern one may exist north of Topped." We appreciate your attention to clarity in our manuscript.

To address your concern, we recognize that the wording may be ambiguous. We intend to convey that a clockwise residual current vortex exists in a location that is distinct from the southern vortex. To improve clarity, we have revised the sentence as follows:

“A clockwise residual current vortex may exist north of Topped wall Angle, opposite to the southern vortex.”

Point 38: Lines 551, 554 and figure 22. You must define “high water period” and the averaging you are using to obtain the Eulerian residual current. Perhaps see comment on line 553.

Response (Lines 546, 548-549, 562): Thank you for your feedback on lines 551, 554, and Figure 22, as well as your comment on line 553. We appreciate your guidance on clarifying the terminology and methodology used in our study.

In response to your suggestions, we have made the following revisions:

“The figure 23 displays the Eulerian residual current field over a standard 15-day period

during the wet season”

Figure 23: Eulerian residual current field during the wet season

Point 39: Line 553. What do you mean by “flood season”. Is this related to river flow? If “low water” and “high water” refer to river flow than please use different terms so as not to confuse with tidal high and low water. Maybe you should always use “dry season” and “wet season” as later.

Response: Thank you for your feedback on line 553 and for your guidance on clarifying the terminology related to "flood season." We understand the importance of distinguishing between river flow terms and tidal terms to avoid confusion.

In response to your comments, we have decided to replace the term "flood season" with "wet season" to maintain consistency with our earlier use of "dry season" and "wet season" to describe periods of low and high river flow, respectively. This change will help to clearly communicate the seasonal variations in river flow without conflating them with tidal high and low water terms.

Point 40: Line 569. What is the evidence for “successfully applied a wave-current coupled sediment transport model”? Figure 13 does show reasonable modelled sediment concentration but transport is a further step and deposition (convergence of transport) yet another step.

Response (Line 564): I apologize for any confusion in my previous responses. I appreciate your patience and guidance on this matter.

In response to your feedback regarding line 569, we acknowledge your concern about the claim of the "successful application" of our wave-current coupled sediment transport model. We

understand that our initial statement may have been overly assertive without sufficient evidence to support the full scope of sediment transport and deposition processes.

“The study conducted dynamic simulations of sediment transport in the lower reaches of the Changhua River in Hainan Island....”

Point 41: Line 587. “beneath” → “south of”

Response (Line 582): Thank you for your feedback on line 587. We appreciate your attention to detail and your guidance on improving the geographical accuracy of our manuscript.

In response to your suggestion, we have revised the term "beneath" to "south of" to correctly describe the location referenced in the text. This change aligns with the geographical context and provides clarity to the readers.

The revised sentence now reads:

“There exists a counterclockwise residual current eddy south of Topped wall Angle, ...”

Point 42: Line 588. “above” → “north of”

Response (Line 583): Thank you for your feedback on line 588 We appreciate your attention to detail and your guidance on improving the geographical accuracy of our manuscript.

In response to your suggestion, we have revised the term "above" to "north of" to correctly describe the location referenced in the text. This change aligns with the geographical context and provides clarity to the readers.

The revised sentence now reads:

“...and it is timed with a clockwise residual current eddy north of Topped wall Angle.”

Once again, we appreciate the time and effort you have dedicated to evaluating our manuscript. Your expertise and guidance have been invaluable in strengthening our research!