Review on ‘egusphere-2024-1364: Disentangling spring-neap SPM dynamics in estuaries’.

The article investigates the variations in suspended particulate matter (SPM) concentrations in estuaries, particularly in relation to the spring-neap tidal cycle. It introduces a structured framework designed to analyze the factors contributing to these variations, emphasizing the roles of sediment transport capacity and bottom pool dynamics. This framework aims to enhance the understanding of the complex interactions between sediment trapping, re-suspension, and transport within estuarine environments. The study presents two model cases implemented in the iFlow model to demonstrate the utility of this framework: an idealized test case and a case representative of the Loire estuary.

While the article provides a detailed examination of SPM dynamics and proposes a useful method for systematic analysis, there are several points that could benefit from further exploration and clarification. E.g. how the bed shear stress and stratification combine to determine the magnitude of mixing, therefore influence the ETM? What are their relative roles?

My specific comments are as follows.

1. Near line 15: The full name of ETM (Estuarine Turbidity Maximum) should be given when it first appears.
2. Line 30: what is the contribution of baroclinic tides (internal tides) to the mixing here? is the mixing mainly induced by internal tidal shear?
3. Line 35: Is there a positive feedback between tidal mixing and shear stress? How do shear stress and tidal mixing individually and collectively contribute to sediment dynamics?
4. Line 40: What is the full name of SSC? I believe this is the first time this abbreviation appears.
5. Line 40: Can you refer to it as an interaction, or is it merely a relation?
6. Line 65: Perhaps you should provide a schematic figure illustrating the model domain and settings. This would be much more informative.
7. Line 80: In the real ocean, these two parameters are highly likely to be inhomogeneous. You may want to discuss this point and the challenges associated with using a more realistic parameterization.

8. Line115: How do you specify the M4 component? The nonlinear effects of M2 will also generate M4 frequencies.
9. Line 150: typo 'columnis' and 'i..e.'
10. Line 205: what would be the contribution of baroclinic tide, comparing to low-frequency baroclinic currents?
11. Line 240: Can you explain the parameters are set to which fixed value and why?
12. Line 245: what is the vertical resolution for the model?
13. Line 270: The ETM is not very distinct near the 8 km mark. What causes the rapid growth and decrease of the ETM before and after the 55 km point?
14. Line 285: I also observe a transition point near the 17 km mark during the spring tide.
15. Line 300: Most of the explanations here focus on the mathematical perspective. I believe a more dynamic explanation is needed. E.g. What is the dynamical difference between internal and external D4 forcing?
16. Line 325: This somewhat contrasts with the aforementioned statement. The strong bed shear stress definitely plays an essential role here. How can you argue that the bottom pool is more important? Can you explain more in detail?
17. Line 395: In Figure 6c, I can also identify a time period with an abruptly decreased ETM at 8 km point, so saying 'ETM remains present' might not be accurate. Perhaps some discussion on why this interval appears near the 8 km mark but is not as significant as in the quasi-static case is needed.
18. Line 400: The mixing magnitude is very interesting and worthy of exploration. Could you show the relative roles of shear stress and stratification in determining the magnitude of mixing here? Is the Osborn relation valid for estimating the mixing magnitude in this context?
19. Line 415: Can you also show the variations in shear stress and stratification, as well as the corresponding variations in mixing?