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Discussions

Interactive comment on "On the use of the Strouhal/Stokes number to explain the dynamics and water column structure on shelf seas" *by* A. J. Souza

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Dear Kelly Cole,

Thank you for your kind comments; I will certainly get the English improved, and have the paper written in correct British English.

I thank your comments and I must agree with you on most of them. I originally did not put a bathymetric map, as this is a well-known area of European Shelf, nevertheless I should for completeness; I will add a short description of the area on the final paper.

I will also include an explanation of how the boundary layers and the Stokes number

develops in both rotational and non-rotational cases, following your and Prof. Prandle's suggestion.

Section 5 clearly states: "Where Bs is the surface buoyancy flux due to solar heating and N2 is the square of the buoyancy frequency, these have been calculated using the mean values for the warming half of the year (March to September)." The calculation of the Stokes number uses an M2 Barotropic tidal current, so it really does not matter when is it done although the ellipses were calculated for the same period. The Stokes number will vary depending on the spring-neap and on monthly cycles due to the fact that your actual oscillatory current will change from interactions of M2-S2-N2.

Wind won't modify the Stokes number, this is derived from bottom friction and wind will affect the surface frictional layers. In shallow areas like ROFIs and estuaries the surface and bottom boundary layers might overlap, complicating things. What is true is that some numerical models and energy models have shown that they need wind forcing to correctly predict the tidal mixing front position.

Tidal mixing fronts are the result of the heating from solar radiation and mixing primarily by tidal currents. So they will only develop during the summer months. There is a lot of evidence of the location of fronts both in-situ (Hill et al, 1994; Brown et al, 2003) and from satellite imagery (e.g. Bowers and Simpson, 1987).

In the response to Prof. Prandle you can see a weeklong SST composite during the middle of summer 2007, which is the year used in the simulation, and can see that there is a fair agreement with the Stokes number (this image will be included in the final paper). The problem of using SST is that it only gives you the surface representation of the front and it does not show the water column structure, so it does not tell us anything about the stratification, or the bottom fronts, which N2* would.

I should thank you again for your comments, which will definitely improve this article.

References.

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