Ocean Sci. Discuss., 9, C1480–C1484, 2013
www.ocean-sci-discuss.net/9/C1480/2013/

Ocean Science 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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Received and published: 14 January 2013

Dear Professor Prandle thank you for acting as a reviewer for this paper. I certainly appreciate your kind comments and will follow most of your suggestions.

This article started as I felt very uncomfortable, as authors have been using the Strouhal/Stokes number as a way to describe dynamics in ROFIs and estuaries without taking into account rotation and in trying to demonstrate the importance of the Earth rotation. As I revisited some of the literature, I found that the rotational Stokes number is a very good predictor of the position of tidal mixing fronts. Although the main aim of the article was not the use of the Stokes number as a frontal predictor, it is certainly an

important result and we will emphasise it better following most of your suggestions.

1) The article was proof read by a native English speaker; nevertheless the English will be revised again with the help of another native English speaker.

2) I will improve section two and include diagram as suggested. You could observe how the Strouhal/Stokes number control the circulation as shown in the figure 1 attached taken from Souza et al (2013) this has been calculated using GOTM, but it could as easily been drawn from theory from Stokes (1851), from Lamb (1932) or Batchelor (1967).

3) I am not sure that the description of the of the GOTM the k-epsilon turbulence closure model against the use of constant eddy viscosity will benefit the paper, as the article is not about the correctness of POLCOMS and the closure it uses. But as shown in Figure 1 the use of a turbulence closure model agrees with ideas of the control of the Stokes/Strouhal number on the description of the velocity profile. I suppose the inter-relatedness of the approach is that in both cases assume boundary mixing, hence relationship to U*. There will be more similitude on the mixed areas, where the turbulence balance will be only the product of Turbulence Kinetic Energy (TKE) production and dissipation; than on the stratified areas where buoyancy inputs will be important, although according to our argument to have the stratification it needs the surface layer to be free-stream. Obviously this is different in case of ROFIs.

4) We will include a SST composite image to compare with tidal mixing front predictions (see figure 2 attached), although as you know, this image only represents the surface temperature and not the stratifications, so there will be areas where the front wont be well defined by the surface signature, as is the case of Liverpool Bay, where the stratification is a combination of temperature and salinity.

5) I will work on a summarising figure along your suggestions, but have to find the correct non-dimensional parameters. I currently think that the best way to do this will be to use the non-rotational Stokes number against the ellipticity in your suggested

contour plot.

I will like to thank you again for your comments that will definitely improve the article. I will work on including your comments for the final version.

Acknowledgements.

The Author will like to thank NEODAAS for the SST satellite image.

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Interactive comment on Ocean Sci. Discuss., 9, 3723, 2012.

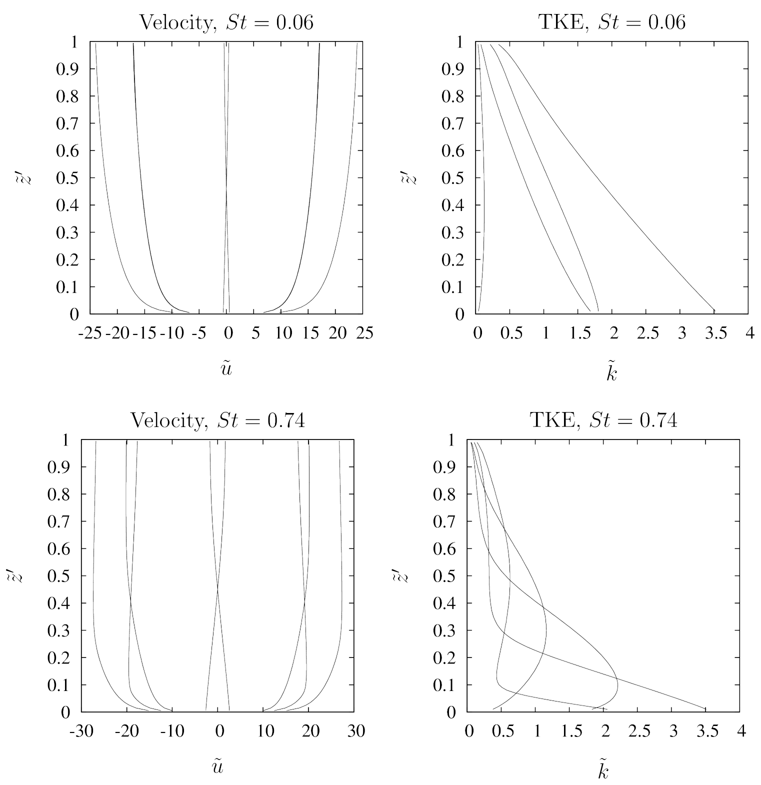

Fig. 1.

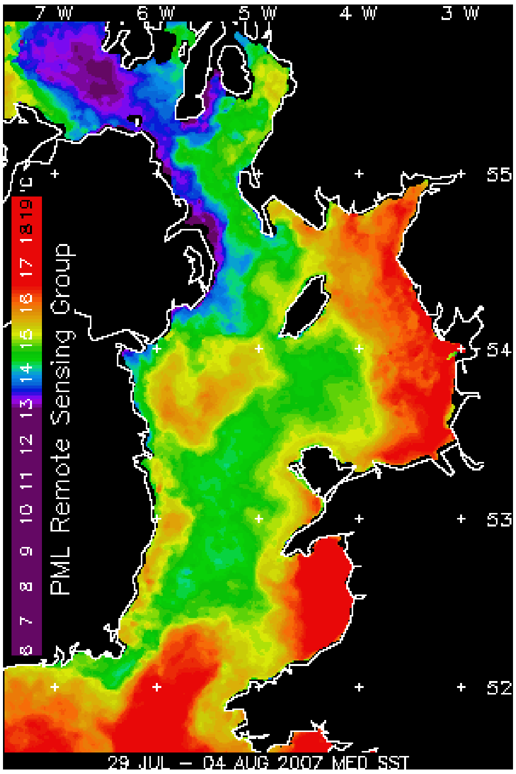
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Fig. 2.