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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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I will like to thank Dr Schuttelaars for his comments, which I am sure will improve the paper.

As I already mention to Prof Prandle, the article was proof read by a native speaker before submission. I will endeavour to have this done thoroughly before the final submission.

The aim of this paper is three fold 1) to establish the use of the Stokes number as the correct number to be used when considering the effects of friction over inertia; 2) to highlight the effect of the Earth's rotation on frictional tidal processes; 3) To use the

tidal mixing fronts as a test of this influence.

We will make it clear that we are talking about the effects of the Earth's rotation; although it is very clear from the abstract that we are talking about the Earth's rotation. I will change the title of the section instead of: "The rotational Stokes number" to "The effect of the Earth's rotation on the Stokes number".

Prandle and Burchard have always defined the Strouhal number as U/wL, which is really the inverse of the Strouhal number; So Prandle (1981), Burchard (2009) and Burchard and Hetland (2010) have the wrong definition of the Strouhal number. They have change this recently, after I pointed out that their definition was wrong.

I agree the Steadiness number, commonly used by Dutch researchers, is equivalent to the Strouhal number. I mention this during the Review of Huijts et al (2011); where the Stokes number is defined as the ratios of frictional depth to total depth and the Strouhal number is defined as the ratio of local to advective acceleration. Nevertheless Burchard in his series of papers he has used the Strouhal number to assess frictional influences. If Burchard et al (2011) change the use to look at advective acceleration that is not clear to me from that paper.

The parameter delta is used in (2) and define in (3) this should not be a problems, its often done. Further more delta definition is explained before two as: "the depth of frictional influence is given by the parameter delta".

Yes I believe that the papers with exception of Huijts et al (2011) look at frictional processes and might be wise just o mention the Stokes number. But one of the aims of this paper as mention before is that researches use the correct numbers and correct terminology. So the fact that there are many articles recent and past using the Strouhal number wrongly that I wanted to include it. My original idea was exactly this that the article should focus on the right use of the Stokes number and that it should not be the Strouhal number. I should probably Change the Title as: "The use of the Stokes number not the Strouhal number on describing frictional dynamics and water column

in shelf seas".

The effective boundary layer is the actual height of the boundary layer, which is not the cyclonic or anticyclonic components but a combination of both, which depends on the ellipticity of the tidal currents.

We present clear effects of the effect of rotation in the first paragraph of the results line 135 "The results in table one show that the Stokes number varies between 0.5 for ε = 1 and 5.4 for ε = -1, with a value of 2.9 for the rectilinear currents". In here you can see how the see how rectilinear currents, i.e. ellipticity of 0, show.

We also spend a long time discussing the effects in the Irish Sea: "We can observe again that the non-rotational Stokes number over estimates the values in the shallow parts of the eastern Irish Sea (i.e. Liverpool Bay and Cardigan Bay) where StkR $\sim$ 1. This is also apparent in the Celtic Sea and in the deep area west of the Isle of Man, although, here it is less critical as StkR $\sim$ 0."

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