

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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In this paper the author discusses the importance of considering earth rotation in evaluating the Stokes number (through the the frictional depth) in tidal currents. Using this definition of the Stokes number (the 'rotational' Stokes number) results in improved predictions of fronts in shallow seas.

This paper gives an important contribution to the shallow sea/estuarine community, stressing to include rotational effects in typical dimensionless parameters. I recommend publication, but would like the author to consider the following remarks/questions:

1) Improve the english/remove the many typos (there are 7 already in the abstract!)

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2) Make clear that rotation is earth rotation

3) Considering the Strouhal and Stokes number. I agree with both the definition of the Stokes number (a measure of the ratio of frictional effects and inertia), and of the Strouhal number (ratio of local to advective acceleration). I like the point you make concerning this difference in interpretation, but then I donot understand your remark concerning the Burchard (2009) and Burchard and Hetland (2010) paper, as the parameter defined there (should be the inverse, as you say on page 3726, around line 25), measures in my opinion the ration between local and advective acceleration (which is seen in eqn (21), not evident from the momentum equations) and the paper of Burchard et al (2011, JPO, 41, pp548..). Your discussion above implies that the unsteadiness-number defined there is equal to the Strouhal number (as it is the ratio of local to advective acceleration). Maybe add this to try to get a more unified terminology in the literature.

4) The parameter delta is only defined in (3) but used before. please add in words what it is.

5) In section 2: if you are convinced all these papers only look at the balance between friction and local inertia, maybe move the first sentence of section 3 to this section and discuss in terms of Stokes number only! Maybe change the title of the paper to only include Stokes, as the Strouhal number measures the ration of two other processes.

6) What's the interpretation of the 'effective' boundary layer?

7) What's the use of the first paragraph in section 4? If you want to leave this in, please discuss these results with and without Coriolis in calculating the Stokes number (i.e. compare St_k and St_{k_R}) to illustrate the importance of including rotation. Now this is only done when discussing figure 1. What are the values for δ_{+} and δ_{-} ? How do the Stokes numbers associated with the (anti-)cyclonic components compare with Str_R ?

8) On page 3730 you mention Figure 5, should be figure 4? Furthermore, I guess you mean west of the Isle of Man instead of East. Add the line from page 3731 concerning the Stokes number as predictor to the second paragraph on page 3730.

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