

Ocean Sci. Discuss., referee comment RC1  
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## Comment on os-2021-30

Anonymous Referee #1

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Referee comment on "Flow separation, dipole formation, and water exchange through tidal straits" by Ole Anders Nøst and Eli Børve, Ocean Sci. Discuss.,  
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The manuscript investigates formation and propagation of dipoles at tidal straits via numerical simulation. The authors derived equations to calculate dipole propagation velocity and to estimate net exchange through the strait. These equations show good agreements with the simulation results. This study advances the knowledge on transport mechanisms at tidal straits. The topic matches the scope of Ocean Science. It could be used as a basis for further studies on more realistic and more complex strait geometry and flow conditions. Thus, this manuscript is recommended to be accepted after some minor revisions listed below.

- Line 234: Here  $r$  is defined as the distance from the vortex center,  $a$  is the vortex radius. However, in Fig. 17 and Eq. 31, if I understand it right,  $r$  becomes the vortex radius. I recommend to make the variable names consistent.

- Figure 14: The tracked velocity is mostly lower than the theoretical values in (a), but higher than the theoretical values in (b). What might be the reasons?

- Line 374: The authors should provide, or at least discuss the valid range of Eq. 31. By ignoring the high order terms, Eq. 31 could be inaccurate when  $r$  is large (how to define "large"?). On the other hand,  $r=0$  is not a realistic situation either. Moreover,  $r/L_d$  seems to be unknown before numerical simulations are completed. So the question is, given so many limitations, how useful is Eq. 31 in estimating the net transport? Why not simply calculate net transport through numerical modeling? I think the authors should provide more explanation on the significance and the applicability of the kinematic model.

- Figure 19: This figure shows that  $S_d$  and  $S_t$  are similar, so why do we need  $S_d$ ? The authors state that  $S_t$  is "difficult to understand", but this is a very subjective statement. I encourage the authors to further explain the difference between  $S_d$  and  $S_t$ , as well as the

advantage of using  $S_d$  (rather than  $S_t$ ).

Overall, the language used in this manuscript is a little bit verbose. Unfortunately, as a non-native speaker, I cannot provide detailed recommendations on grammar. I suggest the authors try to make the language more succinct. A few typos I caught are:

- Line 386: Long straits produce less dipoles than "short" straits?

- Line 414: Our results "suggest" that ...?

- Line 460: Equation 15 and 18 "do" not have...?

The figures are generally informative. Some suggestions are:

- Figure 2: The figure labels "a" and "b" look similar to the variable names. The authors might consider separating them. For example, put labels outside the box, add parenthesis or change fonts.

- Figure 16, 18 and 19: Some markers are with grey halos and some are not. The difference between these two types of markers is not explained in the caption or in the legend.