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Ocean Science Discussions

Interactive comment on "The effect of vertical mixing on the horizontal drift of oil spills" *by* Johannes Röhrs et al.

N. Laxague (Referee)

laxague@ldeo.columbia.edu

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True to the title, the authors present an investigation of the horizontal drift of oil using numerical simulations, focusing on the dependence of transport on vertical mixing processes. The first part of the manuscript makes use of the dataset described in Jones et al. [2016] in order to qualitatively validate the OpenDrift modeling framework given differing droplet size spectra and emulsion characteristics. The rest of the analysis rests in the model's description of three different simulated oil spills.

The topic is appropriate for Ocean Science Discussions. Its principal value seems to be in its building on the Jones et al. [2016] results and generalization toward real-world oil spill transport. I have a few comments on the way that the validation phase of the

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Discussion paper

study is presented, but ultimately feel that the manuscript is sound and represents a useful advance in the field.

1. It would be useful to move beyond the qualitative comparison of observed and modeled slick extent. How do we know that one droplet size spectrum (i.e., Johansen or Li) matches observations better than the other? It is stated that they were introduced in order to eliminate the need for model tuning. But isn't that what ends up happening as the emulsion characteristics in the model are adjusted to match SAR observations of slick extent?

2. It is stated in Jones et al. [2016] and in the present manuscript that the surface expression of oil is largely a creature of subsurface emulsified oil which is generally not transported by Stokes drift. Can you comment on the relative importance of this mode of transport vs. surface oil being moved by wind/Stokes drift? It seems that overall surface slick transport is a combination of the two. This leads directly to my final comment:

3. It is mentioned that SAR (P12, L30) does not show the whole downwind extent of the slick (as determined from a visual observer). This provides some context to the shortening of the slick line seen by SAR in between flights as shown in Figure 1. Does this merit any amount of reconsideration of the UAVSAR's status as the principal observational reference point? Do you think that the underestimation of downwind slick extent is causing the subsurface oil component to be overstated as a mode of surface slick transport?

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