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Ocean Science Discussions

Interactive comment on "Submesoscale dispersion of surface drifters in a coastal sea near offshore wind farms" *by* Ulrich Callies et al.

Anonymous Referee #1

Received and published: 26 December 2018

This is a very nice paper on dispersion characteristics in German Bight. What makes this paper quite special is the existence of offshore wind farms (OWFs) in the region, even though these effects do not really show up in the results. Also, the authors did an excellent job in executing the paper as well discussing at length with respect to all previous work (maybe with the exception of some, as suggested below). Some of this discussion is fueled by the inconclusive nature of the results, which seem to be mainly due to the small number of drifters; something that could be improved in the future. Nevertheless, overall it is a great, careful study and I recommend acceptance subject to possible modification as per my minor comments below:

* page 3: In a variation of the nice literature review laid out by the authors, the following paper (on the basis of 300 drifters) says that local and non-local anti-dispersion disper-

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Discussion paper

sion can be imbedded in each other; namely, as the larger scale tracer cloud grows in size, parts of it get concentrated by surface convergence, or ageostrophic motions:

D'Asaro et al., 2018: Ocean convergence and dispersion of flotsam. PNAS, https://doi.org/10.1073/pnas.1718453115.

It is a bit more complicated but perhaps more accurate depiction of what could be going on in the ocean. Especially considering that wakes from OWFs here, maybe it is applicable.

* page 4, paragraph 20: regarding how GPS errors reflect to some dispersion metrics, the following paper has some analysis:

Haza et al., 2014: How does drifter position uncertainty affect ocean dispersion estimates? J. Atmos. Ocean Tech., 31, 2809-2828.

* page 8, paragraph 20: how was beta=0.006 determined? Is it based particularly for these types of drifters? I am asking because typical wind drift is about 3%:

Bye, J.A.T., 1967: The wave-drift current. J. Mar. Res. 25, 95-102. Bye, J.A.T., 1988: The coupling of wave drift and wind velocity profiles. J. Mar. Res. 46, 457-472. Wu, J., 1975: Wind-induced drift currents. J. Fluid Mech., 68, 49-70. Wu, J., 1983: Sea-Surface Drift Currents Induced by Wind and Waves. J. Phys. Oceanogr. 13, 1441-1451.

* page 9, line -2: I do not quite understand this conclusion: is the large amplitude sinusoidal behavior in the trajectories governed by wind or tidal cycle? If wind only, is there no influence of the tides there (I am not familiar with the area)?

* If wind is very important, the authors should explain a bit more whether wind effect is happening due to coefficient beta (which is smaller than I expected) or the model BSHchmod. I am asking this because no ocean model I have seen is very good in simulating current/wind/wave effect in the upper 0.5 m of the water column.

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* page 16, figure 6: very impressive agreement between real and modeled trajectories! Can the authors comment why the agreement is so good? Is it the wind, or lack of coherent structures in the ocean (which usually tend to lead to chaos), or..?

* page 28: Veron-Bera and LaCasce (2016) filter at inertial time scales, which coincide with the temporal range of submesoscale. They could be throwing the baby with the bathwater.

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