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

Anonymous Referee #2

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In this paper, an investigation of the properties of relative dispersion, structure functions and spectra is presented, from drifters released in the German Bight. The paper is written in a rather clear and competent way, but the results are in my opinion insufficiently robust and inconclusive.

I think the paper is not publishable in its present form, and it should go through a major revision or a resubmission.

MAIN COMMENT

The data set is relatively small (a total of 19 drifter pairs), and the authors choose to present dispersion properties for each pair independently, attempting to discuss their individual characteristics and statistics. They justify this approach in terms of coastal

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inhomogeneity which would prevent a global statistical approach. This hypothesis, though, is not sufficiently substantiated by the data as discussed in the following, and the end result is that the statistics of each pair (with duration of 1-4 days) is too poor to reach robust conclusions.

My suggestion is the following. I think that the authors could indeed start with a description of the individual launches, in terms of geographical positions and wind and tidal forcing, without though going in the details of the individual dispersion plots and fits. After the general presentation, I think the authors should present some clear working hypotheses on parameters that could influence the statistics, that will then be consistently tested throughout the paper. The parameters could be related to topography, forcing or distance from offshore wind farms (OWF). These hypotheses will be tested though conditional statistics, using selected sub ensemble of data. Given the small number of data, the conditional sub ensembles should be as broad as possible, based on the chosen parameter.

The results from these conditional statistics will then be compared with the total statistics obtained from all the pairs, in order to verify whether or not significant differences emerge.

This will provide a logical structure to the paper, and a setting that will allow testing working hypothesis. It might be that the data set is too small and the errors are too big to actually differentiate between conditional statistics, but at least this will be shown in a quantitative way. In the present version of the paper, the authors actually take a similar approach for the discussion of the spectra and structure functions, but the hypotheses are not presented in a clear fashion and are not consistent throughout the paper.

DETAILED COMMENTS

Section 1 Lines 1-5. There are a number of recent papers that investigate "local" initial conditions (e.g. Ohlman et al, 2017; Berta et al., 2016; Poje et al., 2014)

Line 20 Please expand on the mechanisms through which OWF are expected to impact on surface dispersion

Section 2

Lines 10-20. Please discuss expected slippage errors of the MDO3 drifters. Have they been quantitatively tested? and compared with other types of drifters such as the classic CODE? Please provide references

Table 1. It should be improved or complemented by an other table. Initial distances between pairs and distances from OWFs should be included

Also in the text, in Section 2 and 3, please be more quantitative, avoid mentioning that pair are "close" or far, and refer to the i.c. in Table 1

Section 2.4. Please specify model initial distances between pairs and comment on the fact that given a model resolution of 900 m, local structures beyond 2-4 km are not correctly resolved.

Fig. 1. It should be improved, showing the deployment design and the topography

Section 3.

Fig.3 5,7 and related text. The exponential fit seems very arbitrary to me. Were other fits tested as well? The initial distances from which the fit start should be mentioned. Please discuss errors and confidence limits. In order to compare results, the initial distance should be comparable. See also the point on model pairs above. In general, please see General Comment above.

Section 3.2. The computed spectra are in time, while the general discussion in 2.2 is in terms of wavenumbers. Please discuss the hypotheses used to link the two types of spectra. The drifter spectra (except for one case) are obtained from time series of 1-3 days. Can they effectively resolve tidal frequency, even using MMT? Please discuss errors and confidence limits

Section 3.3. What do the authors mean by "Eulerian and Lagrangian" separation?

Section 3.4. What are the initial distances of the model pairs? Given the model resolution, the dynamics is not expected to be local beyond 2-4 km, so that the exponential behavior is simply a consequence of the setting..

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