

Interactive comment on “Sensitive dependence of trajectories on tracer seeding positions – coherent structures in German Bight surface drift simulations” by Ulrich Callies

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Dear Editor, dear Author, I appreciate the presented work on LCS in the German Bight, North Sea very much. Its application and usage for oceanographic purposes is not new but has not been applied to this region, yet. However, several major concerns arose during the reading of the manuscript. I find the presented topic worth it to be published and thus I want share these concerns which will hopefully be considered in case of a manuscript revision. The order does not represent their priority:

- What is the reason for the choice of the time periods used for LCS analyses considering the high variability of the LCS structures? Are they representative oceanographic

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states of the German Bight? Why not using temporal averaged fields? - The citation of earlier studies of the German Bight with focus on Lagrangian methods would be very useful in the introduction. This is essential also with respect to a comparison of LCS and the results of earlier studies (see also below). For example, Ricker and Stanev (2020, doi:10.5194/os-16-637-2020) show a particle accumulation pattern in the German Bight being similar to the major LCS pattern with north-south orientation. - With respect to other regions, some important works (e.g., by G. Haller) have been mentioned. Nevertheless, I'm missing representative studies with a more practical and oceanographic background; an example is I. Rypina. Such studies would probably enable direct comparisons of the results between different regions of interest. - Why is not the density shown instead of T and S? Why are only instantaneous fields shown? The LCS are obtained from a 250-h period. In addition, a validation of the surface temperature fields would be nice. Some of them seem to be unrealistic. - Page 2, line 50: Examples of the German Bight should also be cited, e.g. Meyerjürgens et al. (2020). - I'm missing an explanation of the underlying dynamics favouring the LCS structures. There is no discussion taking into account the physical oceanography of the German Bight. What about frontal dynamics? - The hydrodynamic model: The number of vertical layers is missing. How can the use of a 5 m surface layer be reasoned if the region of interest has depth range of 20-40 m? Is the setup able to realistically resolve vertical processes which, probably, lead to pronounced LCS patterns? - Why are the three quantities (FTLE, FLD and dilation rate) chosen if they are so similar? Is there a physical reason? What is expected to be different among them? - Are there more practical conclusions that can be drawn from the study? What about oil and floating marine litter? I'm missing the actual aim of the study which should be stronger highlighted in the introduction. - Page 3, line 65: Stanev et al. (2019, doi:10.1016/j.csr.2019.03.003) is a more recent example demonstrating the complete reversal of the North Sea currents due to atmospheric forcing. - Page 3, line 66: However, distinct long term current patterns do exist in the German Bight. They are important for long term tracer dynamics. There are several examples in the literature also in case of the North Sea. - Some fig-

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ure descriptions are in the text and not in the figure captions - Is there a reason for the 1 km seeding grid? - What is the link between observations and modelling? Which role do the MARNET stations play? Is there a proof of different water masses separated by LCS in the station data? - It is mentioned that tides have a strong influence on the LCS and dispersion patterns. What does this influence mean for the analysis of FTLE and dispersion? - I'm missing a clear structure in the discussion. Technical details are also included. As mentioned before, the link between LCS and the hydrography should be discussed in detail. In addition, the discussion also lacks of Lagrangian studies (GPS drifters as well as simulations) of the German Bight and how the presented results could be related to them.

Yours sincerely, Jens Meyerjürgens

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