

Interactive comment on “Effects of surface current/wind interaction in an eddy-rich general ocean circulation simulation of the Baltic Sea” by H. Dietze and U. Löptien

Anonymous Referee #2

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This manuscript presents a series of simulations that aim to quantify the influence of surface current effects on the surface stress and the resulting vertical exchange in the Baltic Sea. Overall, this is an interesting project and the manuscript is well written. I have one major comment regarding the experimental design and two minor comments:

Major: - The two simulations, one with and one without the relative wind correction, result in very different eddy fields. The simulation without the relative wind correction has much higher EKE. As a result of this fundamental difference in the two solutions, I do not see a clear path as to how one could use this comparison to quantify the influence of the relative wind correction on vertical exchange. This has been one of the primary criticisms of previous efforts to make such comparisons (e.g., Eden and

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Dietze, 2009). Without some sort of correction to account for the differences between the magnitude of the kinematic variability between the two simulation, the reader is left to wonder if the difference highlighted by the authors are indeed a result of the relative wind correction, or just the manifestation of a (likely) significantly less energetic solution in the simulations including the influence of the surface current on the surface stress. This could be address by redoing the simulations and using some other adjustment to bring the EKE of the two solutions closer together. Another option, and likely the easier one, would be to focus on mesoscale features and how the vertical exchange between them differer in the two simulations. This would also be more in-line with the current and previous research into this topic that highlights the influence of eddy-induced surface currents on imparting a curl in the surface stress.

Minor: - The discussion of how these results compare to some of the most important previous works in this field is missing. Once particularly appalling omission is the discussion of how this work builds on the fundamental work by Dewar and Flierl, 1987.

- On page 11, starting at line 4, the authors state that the inclusion of the relative wind correction on the surface stress "does not drive any additional near-surface diapycnal transport ..." This is not surprising as the use of the relative wind generates upwelling and downwelling, which alone, do not drive diapycnal transport. As such, this statement is moot.

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