

Interactive comment on “Rotation of floating particles in submesoscale cyclonic and anticyclonic eddies: a model study for the southeastern Baltic Sea” by Victor Zhurbas et al.

Anonymous Referee #3

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Summary:

The paper provides an interesting view on the characteristics of submesoscale cyclonic and anticyclonic eddies. By applying different rotary characteristics and a particle trajectory approach to modelled velocity fields of the southeastern Baltic Sea, the authors try to assess the differences in cyclonic and anticyclonic eddies which explain the appearance of cyclonic eddies as spirals in satellite images. The paper therefore combines a phenomenon observed in satellite images and a modelling approach to assess the submesoscale dynamics behind it.

The particle approach shows the same spirals for cyclonic eddies as observed in satel-

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lite images. The differences in the rotary characteristics of cyclonic and anticyclonic eddies can be used to motivate the formation of spirals in case of cyclonic eddies.

All in all, the paper is an interesting piece of scientific work. The applied methods could also be useful for other regions of interest in the ocean to study the occurrence of spirals that are also visible in satellite images. I recommend acceptance with minor revisions.

General Comments:

- It is not clear to me how the 18 test eddies had been chosen. Has an eddy detection tool been applied? Are they chosen by hand? Why are specifically these 18 eddies chosen? Why have only eddies in the early summer and summer been chosen, when the modelled data also cover spring and autumn? Can annual differences be expected? Does the lifetime span of the eddies impact the formation of the spirals? Are short living eddies able to develop spirals?

- Additionally, it is not clear to me if the particle trajectories are calculated only from the surface velocity field or if the three dimensional velocity field is used. If only the surface velocity field is used the question remains of how large the impact of the wind field on the surface velocity would be and what would these results show.

Specific Comments:

- I would suggest rearranging the introduction and exchanging paragraph line 57-68 with paragraph line 69-79. It seems to me more logical for the structure of the introduction: First, you talk about spirals in general (line 29-38), then about mechanisms how they could arise (line 38-50) and about the modelling of submesoscale structures (line 50-56). If you then take paragraph 69-79 and skip the sentence “As it was mentioned above, a better visualization of the cyclonic spirals is supposedly related to some differences between floating particles rotation in submesoscale cyclonic and anticyclonic eddies which will be investigated hereafter.” you will give a clearer reason why to use

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the Baltic Sea as a study area. Afterwards, the paragraph line 57-68 motivates and presents the objectives of the paper. To conclude the introduction, it would be helpful for the reader to give a short outline of the structure of the paper at the end of the introduction. This would make it easier for the reader to find parts in the paper that are of interest and allows the reader to skip parts they are already familiar with.

- Table 1: Is it necessary to show the whole values in the paper? A table with mean, standard deviation and 95% conf. interval for both anticyclonic and cyclonic eddies could be sufficient for the paper and much more concise. The rest of the table could be shown in the appendix or the supplementary material. Furthermore, all values are also visible in Figure 8.

- It would be helpful for the reader if ideas that has been put in brackets as in line 280ff, 309, 311 or 331ff would be outlined in full sentences without brackets to improve the reading flow.

- Discussion and conclusion: I am missing a critical reflection of the sample size of 18 eddies and the choice of the sample: Only data for one summer in one year are chosen. What about other years or seasons? The paper does not need more data yet, but open or further research questions could be mentioned in the end of the section.

Technical Comments:

- Could the definition of the eddy radius in line 160-162 also be indicated in Figure 3? It would be easier to understand the definition and why it is a valid definition for this purpose.

- Section 2.1: Model setup: What is the temporal resolution of the velocity field?

- Figure 4-7: Please indicate not only the date but also the exact time as in Figure 3.

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