Dear Reviewer #3,

Thank you very much for your comprehensive review of our manuscript. Please find below our replies to your comments. Note that below your comments are written in italic.

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?

The snapshots of 15 May, 8 June and 3 July 2015 were chosen for the analysis of submesoscale eddy field just because they corresponded to three days in the beginning of the modelling period for which there were satellite images available (one of the images is presented in Fig. 1). The number of vortices to be processed (18 cyclones and 18 anticyclones) was determined by a compromise between the desire to obtain reliable statistics and not spend too much time on it (the procedure for calculating the rotary characteristics of the eddy described in Chapter 2.2 was not fully automated and therefore quite time-consuming). We will point the above circumstances out in the revised manuscript.

We do not exclude that there is some seasonality in the rotary characteristics of submesoscale eddies as well as some dependence on the eddy age and lifespan. These issues could not be investigated in the framework of this article and we would indicate them as a possible direction for future research in the end of revised manuscript.

- 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.

The particles were advected by velocities simulated in the uppermost sigma-layer whose thickness did not exceed 1.8 m – we will point it out in the revised manuscript. We agree with the reviewer that the velocity field used has a component directly caused by wind stress (i.e. the Ekman wind drift), but this component is unlikely to bias the rotary characteristics of submesoscale eddies in view of huge difference in horizontal length scale between atmospheric cyclones / anticyclones (~1000 km) and submesocale eddies in the ocean (~10 km).

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 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.

We agree with this remark.

Proposed action: Paragraph line 57-68 will be moved to the end of Introduction.

- 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.

Table 1 will be moved to Appendix.

- 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.

We will avoid using brackets in sentences like that of 280 and 309. However, in our opinion, a scientific article differs from fiction in that it is more difficult to read and the reader has to be prepared for this.

- 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 question could be mentioned in the end of the section.

A reflection on the sample size and the choice of the sample will be added to Chapter 2.2 (see above our reply to General Comments).

The differences in rotary characteristics of submesoscale cyclonic and anticyclonic eddies were statistically assessed from a limited model output for early summer 2015 in the southeast Baltic Sea, and we could not exclude seasonal and interannual variability of the studied parameters as well as some dependences on the eddy age and lifespan. These issues could be the subject for future research.

The latter paragraph will be added to the end of Discussion & Conclusion chapter.

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.

Fig. 3 was designed to explain the definitions of ω and r, the radius and frequency of the particle rotation, and it was not intended / suited to explain the definition of the eddy radius *R*. Meantime, to our mind, verbal definition of *R* in line 160-162 seems quite clear, unambiguous and constructive: “If a particle is deployed at a large enough distance from the eddy centre, the pseudo-trajectory will inevitably cease to be looped, and the largest *r* calculated from a still loop-shaped trajectory is taken for eddy radius *R*”.

Proposed action: none.

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

The temporal resolution of the velocity field was 10 minutes – the output from the model has been saved with 10 minute resolution for further numerical calculations of particle trajectories. We referred the reader to Väli et al. (2018) for details.

Proposed action: we will indicate the temporal resolution in the end of Chapter 2.2.

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

We will indicate exact time in the captions of Figs. 4-7.