Review of manuscript egusphere-2024-2773 entitled " Advances in Surface Water and Ocean Topography for Fine-scale Eddy Identification from Altimeter Sea Surface Height Merging Maps in the South China Sea"

Main comment:
I thoroughfully read the author responses to both reviewer and I think they globally addressed the issues in a satisfactory way. In my opinion the paper has improved and is a good contribution for the community to assess the performances of the 2DVAR method. I therefore recommend publication after minor comments have been addressed.

1) Thanks for using a later version of SWOT data. I noticed that some figures have changed from previous version (Fig. 3 and 4) by selecting other dates as examples. Is this due to the difference in SWOT version ?

2) Section 3.2 still lack from statistical evidences. As far as I am concerned, it only shows few visual examples of section 3.1 results. For instance, the dates of the data shown are completely arbitrary (or not ?) so one might wonder how would it look like if another period is taken. Also only one drifter trajectory is used so one might think that the authors only show an example of 2DVAR performing better than AVISO. Can we find examples of AVISO performing better than 2DVAR ? Presented as is, it seems the authors chose the right example to illustrate what they want to demonstrate but is it statistically true ? I do not question the authors scientific integrity here but it seems to me this section provides insufficient evidences as compared to the other sections presenting more robust (statistically) results.

L 24-25: "The SWOT data provide a greater potential for resolving fine-scale to mesoscale eddies in the South China Sea compared with conventional in-situ data, such as drifting buoys." This sentence has not been changed in the revised manuscript although it is in the "diff" file. The response given to Reviewer#2 is clear and the suggested modification should appear in the revised version of the manuscript.

L 59-60: "Fine-scale..": I think this sentence would better fit in the text at lines 32-33.

L63: "diverse merging methods". Please specify here which one will be tested in the study for clarity.

L80: "11219285" Is it a reference ?

L84: Specifically they include SWOT nadir data.

Figure 1: Caption should be updated since on the new version (a) SWOT, (b) 2DVAR …

L126: Typo: "a difference".

Figure 3 and 4: How did the author fill the gap between SWOT swaths (linear interpolation..)? Also in the caption of Figure 4 it is mentioned that nadir data from swot are used, however on lines 75-77 it is stated they were excluded.

L280: "However, due to being constantly entrained by a single eddy and rotating within it, the number of eddies that can be detected by a drifter buoy is limited compared to the rapid mapping provided by SWOT". These observation platforms are inherently different so by definition a single buoy cannot sample as many eddies as SWOT. However, by using a sufficiently high number of drifters one can catch a similar number of eddies as SWOT. This sentence is not relevant, I suggest to remove it.
Figure 7: How did the authors get a gridded SWOT map of eddy radius? Is using several SWOT tracks filling the entire area ? The methodology here needs to be clearly stated.

L322: "the method is validated through in-situ observations". If the authors refers to SWOT observations I would not use "in situ". If the authors refer to the drifter observation, it is only one observation.

L353: Typo: "ot"