

This manuscript presents a novel and valuable dataset detailing the complex behaviors of mesoscale eddies, specifically their splitting and merging. The work is generally well-organized and the figures are illustrative. However, there are still some aspects of the methodology, result and presentation require clarification and minor revision to enhance the manuscript's rigor, clarity, and overall quality before it can be considered for publication in ESSD.

Major Comments:

1. Lines 91-93, 142-143, 153-154, 160, Fig. 1: The definition and representation of 'Eddygroup' raise several interconnected questions:

(1) Polarity of dipole structures: The manuscript does not discuss the handling of dipole eddies (a cyclone and anticyclone in close proximity) within the 'Eddygroup' framework. What proportion of identified 'Eddygroup' are such dipoles? Is it physically meaningful to define a single polarity for an 'Eddygroup' that contains both cyclonic and anticyclonic features, as implied by the color-coding in Figure 1? This simplification could potentially bias the analysis of regional polarity distributions, such as the very low proportion of cyclonic eddies south of the Kuroshio Extension shown in Figure 2.

(2) Group size and scale: The concept of a 'root eddygroup' could theoretically grow to encompass basin-scale features (e.g., a gyre). What is the physical rationale for grouping such large-scale features? The manuscript should report the statistical distribution of 'Eddygroup' sizes (e.g., maximum diameter or area) over the 31-year dataset to provide context.

(3) There are inconsistencies in Figure 1 that need clarification. Specifically, 'Eddygroup 4' is shown without a 'seed point', which appears to contradict the definition provided in Lines 133-135. Furthermore, the caption for Figure 1 must explicitly state what the red and blue points signify.

2. (1) The exact role of a 'seed point' needs to be clarified (lines 133-135). What is its specific function, and how does it differ from the eddy's center of mass (centroid)? This distinction is crucial for understanding the tracking logic. (2) Lines 217-218: The threshold for grouping eddies, defined as up to 4000 grid points (equivalent to an area

of 500°x500°), appears exceptionally large—potentially covering half an ocean basin. Please verify and clarify this critical parameter. What is the observed maximum size of an ‘Eddygroup’ in the 31-year dataset? Additionally, please define the ‘shape error’ mentioned in Line 218. (3) In line 260, please specify if the "predicted position of an eddy" refers to its centroid.

Specific Comments and Minor Revisions:

1. The abstract would be significantly strengthened by including key quantitative results, such as the total number of eddies, seed points, Eddygroups, Eddytrees, and Eddygraphs identified in the dataset.
2. Line 40: When introducing eddy detection methods, the Lagrangian perspective should be given a brief (1-2 sentence) description. It would also be helpful to succinctly state the fundamental difference between the Eulerian and Lagrangian eddy detection methods.
3. Line 63: The authors' 2021 work is mentioned here. It would be highly informative to compare the characteristics of eddy splitting and merging in the North Pacific with those observed in other global oceans in the Results section (e.g., section 3.1).
4. Line 180: Does the analysis consider splitting or merging events involving more than two eddies simultaneously (e.g., three eddies merging into one eddy)? If so, what is the approximate proportion of such multi-eddy events?
5. Figure 9 (Line 265): Please add a legend or caption text to explain the meaning of the black, blue, and red points in Figure 9.
6. Figure 10 (Line 280): To improve clarity and align with the text, it is recommended to add a third schematic to the left side of Figure 10 illustrating a "new generation" of an eddy.
7. Figure 12 (Lines 295): This is a key figure for demonstrating the tracking. It would greatly benefit the readers if the specific dates (or timesteps) for the initiation and completion of each splitting and merging event were annotated directly on the figure panels. Also, please correct the figure citation in the text; it should be Figure 12, not Figure 18 (lines 303, 306).

8. Figure 14 (Line 350): For enhanced clarity, consider drawing a box on Figure 14 to highlight the Karman vortex street region near the Hawaiian Islands mentioned in the text (Line 345). Furthermore, the current colorbar makes it difficult to distinguish lifetime anomalies between -100 and 100 days. A suggested improvement is to use a diverging colormap with a clear break at zero, for example, a yellow-orange-red scheme for positive values (0-300 days) and a light-to-dark blue/purple scheme for negative values (-300-0 days).

9. Lines 395-398: The observation that the number of splitting events increases after filtering is counterintuitive, especially since earlier (Line 372) it was stated that before filtering, merging events were three times more frequent than splitting events. Please provide a clear explanation for why the filtering criteria preferentially retain or identify more splitting events.

10. Technical Corrections:

(1) Lines 142-143: This text appears to be a repetition of lines 135-137 and should be removed.

(2) Line 415: Please explicitly define $d(n)$ as the distance between the centroids of two eddies.