This data paper presents a nice framework for global eddy identification and tracking by enhancing the efficiency of the detection algorithm and incorporating a particle-drift approach for trajectory tracking. The authors provide a 31-year dataset (1993-2023) containing daily global eddy identification results and related parameters, together with annually compiled trajectories of eddy splitting and merging events. This dataset responds to the current demand for long-term, systematically organized records of eddy evolution and has high value for research on ocean transport processes and climate variability. Furthermore, the manuscript innovatively extracts representative splitting and merging cases from the tracking dataset and applies a normalization approach to investigate morphological changes of eddies and eddygroups during these interaction processes.

While the study demonstrates technical effort in dataset construction and attempts to summarize the statistical characteristics of eddy evolution, several aspects of the manuscript could be improved. Although the morphological analysis of eddies is meaningful, important methodological details remain insufficiently transparent; despite being described as a global dataset, the results seem to lack representation of high-latitude Arctic regions, raising questions about the effective spatial coverage of the dataset; the current analysis focuses primarily on morphological aspects of splitting and merging events, while further exploration of these processes could enhance the scientific depth of the study. In addition, the manuscript would benefit from improvements in language clarity and organization.

With clearer methodological description, more comprehensive spatial coverage, and strengthened analysis of eddy interaction processes, the dataset has the potential to make a valuable contribution to ESSD and the broader community studying oceanic eddies.

1. Inadequate Algorithm Description and Lack of Code to Reproduce the Dataset

The manuscript describes the algorithms used for eddy identification, as well as for tracking eddy splitting and merging. However, the implementation details provided are still insufficient, which limits the reproducibility of the dataset. The authors are therefore encouraged to:

- Publicly release or share the relevant source code;
- Provide a more thorough explanation of the eddy tracking process, specifically how segments are linked into branches and then structured into eddygraphs, as currently this is only depicted through schematic diagrams.

Without clearer methodological documentation, the reproducibility and long-term usability of the dataset could be limited.

2. Insufficient Detail in the Methodological Normalization Process

The manuscript presents a complete workflow for eddy identification, tracking, and morphological normalization. However, the explanation of the normalization procedure lacks sufficient technical detail to enable replication of the results. In particular, the normalization strategy for eddygroups is not clearly explained. In multi-eddy systems, it remains unclear how the relative spatial configuration among individual eddies and

the eddygroup is preserved during the normalization process, and whether the transformation might introduce geometric distortions.
The authors are therefore encouraged to:

- provide a more detailed description of the normalization algorithm and clearly explain how eddygroup structures are handled;
- consider providing code or pseudocode.

3. Lack of Sensitivity Analysis for Key Identification Parameters

The identification framework relies on several threshold-based criteria (e.g., $20 \leq I \leq 4000$, shape error $\leq 55\%$, amplitude ≥ 1 cm, and a 5×5 window for seed point detection). These parameters may produce region-dependent effects under different dynamical regimes (e.g., high vs. low latitudes, strong vs. weak current systems). However, the manuscript does not include a sensitivity analysis of these parameter choices. Specifically:

- the potential differences in detection results across different ocean regions under the same parameter settings, as well as the influence of alternative parameter values on eddy counts, spatial distribution, and splitting–merging statistics, are not investigated;
- the relationship between the amplitude threshold and the spatial resolution of the dataset is not discussed.

Without such analysis, the robustness and general applicability of the dataset remain insufficiently demonstrated.

4. Global Scope of the Dataset and Limited Representation of the Arctic Region

The dataset is described as a global ocean product; however, the figures presented in the manuscript show very limited or absent eddy detection in the high-latitude Arctic Ocean. Given the increasing importance of Arctic dynamics in the context of rapid sea-ice retreat and its role in the global climate system, mesoscale eddy activity in this region is of growing scientific interest. It remains unclear:

- whether the current methodology is capable of reliably identifying and tracking eddies in the Arctic Ocean;
- whether future versions of the dataset are planned to include the Arctic region.

At present, there appears to be a discrepancy between the dataset's stated global scope and its effective spatial coverage. This limitation should be clarified more transparently in the manuscript.

5. Limited Exploration of Dynamical and Kinematic Aspects

The analysis primarily focuses mainly on the morphological characteristics of eddies and eddygroups. While these results are useful for understanding structural evolution during eddy interactions, the dataset appears to contain additional daily dynamical parameters (e.g., amplitude, mean velocity, radius, and position) that could support further analysis. The manuscript would benefit from exploring the dynamical and kinematic aspects of splitting and merging processes. For example:

- examining changes in kinetic energy or intensity before and after splitting or

merging events;
- investigating whether trajectory deflections, angular momentum variation, or pre-splitting rotations occur during these processes;
- exploring the relationships among morphological, dynamical, and kinematic characteristics.

Such analyses could further enhance the scientific value of the dataset and its application to studies of eddy evolution.

Minor comments:

The manuscript still contains several issues related to grammar, wording clarity, redundancy, and terminology consistency. Some sentences are overly long or contain ambiguous expressions. The authors are encouraged to carefully proofread the manuscript and improve language clarity.
Below are several specific suggestions.
Line 11:
"… that encloses a seed point (a local extremum) …"
"(a local extremum)" should be "(local extremum)". The definition is somewhat wordy.

Line 46:
"… the SLA-based method is not constrained by threshold parameters …"
This is potentially misleading: SLA-based methods typically still use thresholds (amplitude, radius, contour step).
Suggested revision: "…is less dependent on certain threshold parameters…"

Line 47:
"… the most widely eddy identification method at present."
Suggested revision: "…the most widely used eddy identification method at present."

Line 51:
"… essential for understanding of interactions between eddies."
Suggested revision: "…essential for understanding interactions between eddies." (or "…for understanding eddy–eddy interactions.")

Line 53:
"… do not introduce new kind of vertical structures…"
Should be: "…do not introduce new kinds of vertical structures…"

Line 95:
"… makes the following contributions:(1) We …"
Missing space after colon.

Line 98:
"… leading to the creation of splitting and merging tracking algorithm …"

Missing article. Should be: "… leading to the creation of a splitting and merging tracking algorithm …"

Line 103:
"… and anticyclonic eddytrees structures …"
Redundancy. Should be: "… and anticyclonic eddytree structures …"

Line 176:
"… and underscore that …" should be "… and underscores that …"

Line 214:
"… with the primary distinction arising from the spatial resolution of the dataset."
Later you specify 0.125°×0.125°, but it may help to explicitly state how resolution affects thresholds (I, amplitude, contour interval).

Line 225:
"… area-sorted eddygroups are inputted …"
"inputted" should be "input".

Line 273:
"… points of brunches likewise …"
"brunches" should be "branches".

Line 303 and 306:
You are discussing Figure 12 but refer to Fig. 18a/18b.

Line 422:
"… and rotated to aligned with …"
"to aligned" should be "to align".

Line 446:
"… the dull pole contains the …"
Should be: "… the dull pole containing the …"

Line 474:
"a_1 and a_2 represent the longer and shorter major semi-axes"
Please verify whether the formula is correct. Otherwise, the value of A would always be negative.

Line 551:
"… However, many works remain to be done in the future."
Suggested revision: "However, several topics remain for future work."