

Interactive comment on “Particle Clustering and Subclustering as a Proxy for Mixing in Geophysical Flows” by Rishiraj Chakraborty et al.

Anonymous Referee #2

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The manuscript “Particle Clustering and Subclustering as a Proxy for Mixing in Geophysical Flows” by Chakraborty, Coutino, and Stastna addresses the problem of mixing in geophysical flows by means of a particle-based Lagrangian approach. The authors identify clusters and subclusters of particles in their simulation and draw conclusions on the flow based on them.

What I like in the paper is the careful description of the theoretical background, which takes a large part in the text but it is definitely important to understand the results.

There are two main points that I see problematic in the paper:

- In a paper based on simulations I would expect some critical discussion about the influence of the numerics on the results. In the manuscript this is missing, although in

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principle the topic of mixing cannot be treated without considering what happens near the resolution scales. I would ask the authors to add details about it, like for instance a resolution study or more in-depth considerations on the numerical tools that they are using, and how they can affect their results.

- Despite of the detailed theoretical description, most of the analysis of the results is based on a qualitative assessment of the figures. Would it be possible to define some quantitative diagnostics to support what the authors infer?

Minor points:

- the style of citations should be improved. Not everything should go in brackets, i.e. sometimes `\citet` should be used instead of `\citep` (assuming the authors used LaTeX for editing);

- p.8, eq. (4): do I understand correctly that γ is in the interval between 0 and 1? If it is the case, please mention in the text.

Besides these comments, I think that the paper meets the quality and scientific standards for publication on NPG. I would recommend to accept it, after the points listed above are properly taken into account by the authors.

Interactive comment on Nonlin. Processes Geophys. Discuss., <https://doi.org/10.5194/npg-2019-6>, 2019.

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