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Nonlinear Processes in Geophysics
Discussions

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

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 gamma 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.

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