Nonlin. Processes Geophys. Discuss.,
https://doi.org/10.5194/npg-2020-18-RC1, 2020
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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Detecting flow features in scarce trajectory data using networks derived from symbolic itineraries: an application to surface drifters in the North Atlantic" *by* David Wichmann et al.

Anonymous Referee #1

Received and published: 26 June 2020

The authors describe a method to cluster trajectory data in fluid flows, so that similar trajectories become identified and lead to a partition of the fluid domain, suitable for identifying coherent structures. The method is applied to the double-gyre model system an to drifter data in the North Atlantic.

The method seems to be powerful, although an exhaustive comparison with other available methodologies has not been performed. The most interesting feature is the robustness no missing data, which is clearly of interest in oceanography. The major limitation of the method seems to be the discard of any time-ordering information in the visited

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locations. There are some comments about this in the manuscript, which I found sufficient.

I find the paper useful to the community (although perhaps written in a too mathematical language) and I would recommend publication provided the authors address the following minor points:

- The method share many aspects with standard spectral clustering methods (e.g. Fiedler's). One of the known limitations of these methods is that they partition the network in 'balanced' (i.e. not too different sizes) parts. This is usually an advantage in image processing and in computer-load redistribution, but I find this an important limitation in the present application to fluid flows. I ask the authors to state if this is a limitation of the present method and its possible impact on applications.

- Is there any criterion to determine an 'optimum' number K of network parts, or when to stop the iterative hierarchical partitioning?

- In the application to the North-Atlantic drifter data set, the authors declare to look for 'rigid, stationary features'. Nevertheless, the particle position at the beginning of the trajectories and at the end (Figs 6a and 6b) are different. Could you discuss the implications of this on the 'stationarity' of the structures and in relationship with trajectory duration?

- Could you comment on the reasons for the change in size of the ellipsoidal structures identified in Fig. 4 with respect to the ones in Fig. 3?

- The set S in the denominator of Eq. (6) is not defined.

- the authors use the word 'similar' in lines 172, 341 and 350 in an unclear meaning, specially because in other parts of the manuscript some 'similarity' measures are defined and used. Please use 'equivalent' o 'equal' if this is the intended meaning of 'similar' there, of choose a more precise word if it is not.

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