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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A Lagrangian analysis of a developing and non-developing disturbance observed during the PREDICT experiment" *by* B. Rutherford and M. T. Montgomery

Anonymous Referee #1

Received and published: 12 February 2012

General Comments:

The manuscript, "A Lagrangian analysis of a developing and non-developing disturbance observed during the PREDICT experiment" by Rutherford and Montgomery provides an overview of a two-dimensional, finite-time Lagrangian coherent structure identification method that can provide an accurate and insightful description of particle trajectory behavior in a region containing an incipient tropical disturbance. The finite-time Lagrangian scalar techniques described here offer a substantial improvement over Eulerian methods (e.g., Okubo-Weiss criterion) that have been recently applied to understanding moving tropical disturbances. Moveover, this introduction of the ever-growing

physics-mathematics-engineering literature on objective Lagrangian coherent structure identification to the tropical cyclones community is sorely needed.

In studying a developing and non-developing disturbance in PREDICT, the authors demonstrate that the objective identification of flow boundaries is a useful tool to interpret observational or forecast data. Their techniques help discern how dry air may or may not impinge into the core of a moving and evolving tropical disturbance and, as such, they should be helpful to research studies and perhaps, at some point, certain operational techniques. It is quite likely this technique will be useful in a variety of areas in tropical cyclone research and in other meteorological applications. The paper is well written and appears to offer a solid analysis of the technique. Publication is recommended after some very minor revisions that are related to clarifying some points that caused confusion for this reviewer, and as such, may cause some confusion for some other readers.

Minor comments:

p. 33278, line 28: A reference is recommended for the aspect of sensitivity to time varying fluid velocities.

p. 33279, line 6: it might be worthwhile mentioning “objective Lagrangian measures”, since Eulerian methods can also be objective too, even if not ideal for this application.

p. 33287, line 24: Please define the mean-flow speed. Is this a local speed or defined over a large region and is it time dependent? Also, the description of velocity interpolation is still unclear. Just to be clear, is the advection of velocity the advection of the Lagrangian particle velocity while the fluid velocity just an instantaneous velocity field for the domain?

Fig. 2: The wording in the caption (and text on p. 33291) is slightly confusing. Are the green particle locations their location on 7 September? And if so, were all of these green dots within the 3-degree circle on 5 September?

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Fig. 14: Fig. 14 is very difficult to visually interpret. Reducing the number of trajectories shown and/or tweaking the angle at which the 3D graph is presented may improve visualization of the trajectories and LCSs through time and space.

Technical Corrections:

p. 33277, line 2: Montgomery et al. (2001) should be 2011.

p.33283, line 4: There is a missing period between “directly” and “For”.

p. 33294, line 9: A sentence has been accidentally truncated.

p. 33294, line 22: “Values of autocorrelation have” might work better than “Autocorrelation have”.

p. 33294, line 24: “vorticity an OW” should be “vorticity and OW”.

p. 33298, line 4: “have a time scales” should be “have timescales”.

p. 33300, line 16: “an repelling” should be “a repelling”.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 33273, 2011.

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Interactive Comment