

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

B. Rutherford and M. T. Montgomery

blake5rut@gmail.com

Received and published: 9 April 2012

The authors would like to thank Referee 1 for the very helpful and constructive comments, which we have carefully considered to improve the quality of this paper. We will submit a revised manuscript which will address each of the concerns. The comments are addressed individually.

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

We have now added appropriate references for the sensitivity of Lagrangian and Eulerian quantities for time varying fluid velocities.

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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.

In our comparison of methods, we now clarify which Eulerian and Lagrangian methods are objective and which methods are Galilean invariant.

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?

In the revised manuscript, we have clarified the numerical methods used for integration of trajectories. The mean-flow speed is measured at each output time that the global model analysis data is available. The advection of velocities is done by advecting the entire flow feature by the mean flow speed and then interpolating the velocities linearly in space and time. A precise mathematical expression for the computation of fluid velocities at intermediate times is now given.

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?

The green particles were all in the 3-degree circle on Sept 7, and their location on Sept 5 is shown in Figure 2. In the revised manuscript, we have clarified that the trajectories shown in Figure 2 are backward trajectories.

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.

We have adjusted the tilt angle of the volume-rendered figure to improve the visualization.

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Finally, we agree with and have included all of the technical corrections.

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

ACPD

11, C16338–C16340,
2012

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