

## ***Interactive comment on “The genesis of Hurricane Nate and its interaction with a nearby environment of very dry air” by Blake Rutherford et al.***

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Received and published: 15 March 2017

### General Comments

This paper extends the marsupial paradigm of tropical cyclogenesis to a non-African Easterly Wave. Without a wave-centric reference frame, air parcels around the storm are divided into two camps: those inside the pouch and outside. It is shown that some mixing occurs across the pouch boundary due to lobes breaking off, but dry air is shielded from the inner vortex by a shearing sheath that can be traced back to the manifolds that separate pouch and non-pouch air.

I almost cut my review short because I had never heard of the word “manifold” outside of a car engine setting, but after reading through the paper, which is fairly well written, I now have a decent idea of what it means. Now that I’ve read the paper, the abstract

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and introduction make much more sense.

Later in the paper there is a weaker section with some mistakes in the figure and text, but overall this is ready for publication. My technical corrections are the main component of this review.

Some of the paper is still way beyond my area of expertise, and I have no idea whether it is right or wrong, such as the section on “Manifold computations” (pages 7-8).

### Specific comments

After rereading the abstract it isn’t clear why source the ‘tilting’ mechanism is given such prominence. It is barely mentioned again in the paper.

The adjective “layer-wise” used in the abstract and other places is confusing. Could you replace “layer-wise advection”? with “advection on a constant pressure level”?

Page 3, line 5. It isn’t clear what “non-advective fluxes” are. This becomes apparent later on, but it is first mentioned here without any explanation.

Page 9, line 15. It is not obvious that the pouch region that originated from Lee still contains high potential vorticity air. From the figure, PV is muddled and similar to the PV in the portion with Gulf origins.

### Technical corrections

Page 3, footnote 2. Change “if” to “of”.

Page 7, Figure 1 caption. Change ‘L2’ to ‘L4’.

Page 7, line 9. What is an “LCS”?

Page 7, line 10. What is “FTLE”?

Page 8, line 29. U2 is never labeled in the figure. That would be nice.

Page 9, line 2, 3rd-to-last word. Change “northeast” to “southwest”.

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Page 9, line 6, last term should be S1(I4,H1), not S2(I4,H1).

Page 9, footnote 7. What is "VS"?

Page 10, line 19. Can the lobe labels of L3 and L4 in Figure 2 (a) be reversed so as to match the order of the labels in Fig. 1? In other words, change L3 to L4 and change L4 to L3. ?

Page 10, line 25. Explicitly reference Fig. 2 after mentioning the gradient of theta-e. I was incorrectly looking for it (theta-e) in Fig. 3.

Page 10, line 26. "north" should not be capitalized.

Page 12, Figure 3 caption. Is the satellite panel described accurately? The text says it is 0.6 um, but isn't that visible? Wouldn't that be white for clouds? Not sure what the units are of the color table and it isn't clear how it could be 0.6 um imagery.

Page 13, Line 21. Manifolds are overlaid on water vapor not vorticity in Figure 5.

Page 14, first paragraph. Fig doesn't seem to go with text. Text talks about 700 mb vorticity and area. Figure has circulation and mean vorticity. Figure would also benefit from un-squished text. Y-axis ranges of panel (a) should be same as panel (b).

Page 14, line 18. Panel labels don't start with (a) in text reference or actual Figure 8.

Page 14, last paragraph. This paragraph is confusing. In line 21, when you say "as the vorticity moves inward", do you mean the vorticity maximum (in the radial profile) is moving inward? And in line 27 what is meant by "the stability of the unstable manifold"?

Fig 10, and Page 15, line 28. I think this time range is Sep 6 to 8, but can't read the time labels on some panels.

Page 16, line 6. The term "limit cycle" is first used. I was familiar with it, but I understand it now after reading further.

Page 16, lines 8-10. Something with wrong with references to Fig. 9 (c)-(h), which

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don't exist.

Page 20, Fig. 8. Need units in figure or caption.

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-1028, 2017.

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