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Interactive comment on “The fate of Saharan dust across the Atlantic and implications for a Central American dust barrier” by E. Nowotnick et al.

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In this paper the authors present a case study from July 2007 during the TC4 campaign of an intriguing dust feature in the Subtropical Atlantic- a perceived Saharan dust barrier around Central America. From satellite data, clearly there are much higher dust AOTs on the eastern side of the isthmus, and virtually none on the western side. There are two competing hypotheses presented: 1) Dust is removed by the significant convection over Central America; or 2) Dust is advected away by meridional transport to the north into Mexico and the southern US. Both are analyzed thoroughly with observations and model analyses. Technically, I have few substantive complaints about the study that would get in the way of publication. Although, some of the simulations were not how I would have done them, but that's fine. They got the job done. It is certainly

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a worth while topic. Structurally, I think the paper could be presented in much clearer light, as my comments below reflect. Overall, I recommend publications with “minor to moderate” revisions.

Recently, I have become much more sensitive to papers which claim to “discover” some aerosol phenomenon which in fact has been well known in the community, but is nevertheless new to the authors. I think the dust barrier is one such case and the authors should acknowledge that fact. Many of us in the dust community were aware of this feature, and in fact several proposals submitted to TC4 noted the dust barrier feature. Indeed, given the case studied in this paper was picked specifically because it coincided with the TC4 tropical convection campaign should be a pretty good a-priori indicator as to which way the hypotheses would go down. However the authors have a solid point that this important feature has never been adequately studied and the rationale should be framed in that way.

Along these same lines, the paper is framed so much like a case study it excludes the solid climatological grade verification which they perform. The paper perhaps would be better served in a format such a a) Look there is this interesting dust barrier feature that nobody has fully explored. B) It is important for understanding aerosol lifecycle, with both important geochemical cycling and air quality implications. C) This feature has been persistent and this is its overall phenomenology (it took me 20 minutes on GIOVANNI to show that MODIS, MISR and OMI show this exact feature every summer June-August for the last 10 years, another 30 minutes on the NCAR reanalysis site to reasonably accept hypothesis 1-scavenging. If as a reviewer I can take this trouble, so can the authors) D) During TC4 we have observations, it suggest hypothesis 1-scavenging too e) This partially verifies in the model, but the model has some shortcomings which we need to correct in our sink terms. Laid out like this, it tells a great story. As it is now, the results section is a bit buried and waffly. That said, I think the organizational weakness in the results is well mitigated in the discussion section which is very is well constructed and clear (in fact, I enjoyed reading this section greatly- more

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than the rest of the paper).

Along the some lines, the paper is prey the common pitfall of many climate model researchers: Trying to understand a high frequency process with monthly statistics. Here it is even worse in that they only have 1 month! Using model with satellite AOT and precipitation data they should demonstrate a specific event even more thoroughly. Figure 7 and its associated discussion could be expanded to show satellite precipitation (We like CMORPH for this). I would also combine the AQUA AOT field with Terra-as you need to only be qualitative here, getting an exact matchup is not totally necessary. I would also lay out the GEOS 5 wind and precipitation fields.

As for other work such as surrounds figure 11, I would look for specific events which transport into Mexico and Texas, rather than rely on a monthly mean. This is even a good case for trajectories spawned every day in the Caribbean at key model levels. Where do they go? This seems more straightforward to me. In regards to their problem with scavenging, monthly means do not give the problem justice. This is why in Xian et al., (2009) we substituted CMORPH precip for model precip in our scavenging routines. Also, it is nice to see that GEOS-5 captures the fact that dust is frequently in the boundary layer, a key PRIDE finding that historically models have had difficulty replicating. But this then leads to how dry scavenging is handled in GEOS-5. If parameterized incorrectly, it could induce a huge sensitivity. Given the transport pathway of dust, this could covary with precipitation, confounding the analysis. This should at least be briefly discussed.

Finally, I understand this paper is as much about GEOS-5/TC4 as the dust phenomenon studied, but I would focus on one.

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