

Dear Anonymous Reviewer #2,

Thank you for your feedback regarding our paper *Radiative Influence of Dust Aerosols on the Evolution of Tropical Storm Hermine*. We plan on implementing the following changes to our paper in response to your feedback. We hope that these changes will make the paper more understandable and scientifically rigorous.

#### Key points

- 1) We will include more details about the simulations in the write ups accompanying the figures. We also plan to include storm centered Hovmoller diagrams for several key metrics. This will allow more analysis on net effects.
- 2) We will remove references to microphysical effects throughout the manuscript. This revision should reduce confusion and make the scope of the simulations clearer to the reader. Unfortunately, re-running the model with different schemes is outside the scope and timeline of this paper.

#### Major comments:

L126- Wet deposition is included in the simulation. This will be mentioned in the paper.

L175- A Hovmoller diagram will be added to show a timeseries of how relative humidity evolves over time and space with the system.

L186- Dust contours will be added to the figure. Unfortunately, ensembles are also outside the scope of the paper. Specific humidity information will be added to the paper. The vertical motion lines up with the areas of changes. This is focused on more when those figures are presented. We will add more explicit mentioning of this link.

Figure 6 and later figures- We agree that references to microphysical effects may create confusion regarding the scope of the simulations. Therefore, we will remove such references throughout the manuscript and clarify that the study focuses on the radiative influence of dust aerosols. Re-running the model with alternative microphysics schemes would require a separate set of sensitivity experiments and is beyond the scope and timeline of the present study.

L217- We can add a Hovmoller diagram with vertical velocity to clear up some of these details. The Extra case's extra convection likely weakened the center of the circulation, leading to a lot of the changes described in the paper. We will go into greater detail with the vorticity section to provide more details about the mechanisms in action in this section.

Section 3.5- The section focused on Intermediate because there were slight track differences between Extra and Clean. While this did not lead to vastly different environmental conditions (as discussed in the track section), it did lead to a dipole structure in the point-by-point difference plots. Due to the fact that Intermediate did not have this issue, by virtue of being closer to Clean, it was chosen for this figure.

L250- We will add more analysis of the parameters mentioned.

Minor comments:

L28- We will add selected references to the Introduction/Literature Review to better contextualize the study. However, the manuscript is not intended to be a comprehensive review article. Given the large body of literature on dust–tropical cyclone interactions, we will focus on studies most directly relevant to the objectives and interpretation of this work.

L35- We will add this information to the paper.

L45- We will add some of these sources to the paper. See comment for L28.

L59- We plan on adding MODIS satellite images, including AOD and visible imagery.

L71- This will be corrected.

L74- This will be corrected by adding more details.

L75- A mention of generality will be included earlier in the paper.

L104- The coefficients doubled were the mapping coefficients used by the code that converted CAMS data into WRF-Chem parameters. In practice this doubled the dust concentrations in Extra when compared to Intermediate.

L111- This will be corrected.

L113- This will be clarified.

L120- The microphysics scheme accounts for wet removal of aerosols. We will clarify this point in the next revision.

L146- This will be clarified.

L146- See comments about L104.

L159- Extinction coefficients were calculated by calculating the AOD at each layer.

L161- We meant the HALO data. This will be explicitly stated to reduce confusion.

L166- If the value exceeded .4, then the color would just be the darkest shade of yellow on the colormap. The white values are areas without data from the HALO flightpath. Contours of water content can be added to reinforce this point.

Figures 3 and 5- A cross-section point can be made, perhaps on the model setup figure earlier in the paper. Alternatively, a companion subplot can be made with this information if deemed necessary.

L188- This figure was included to drive home the point that the simulations existed in the same arid environment. The figure was meant to provide an example of the initial conditions experienced by all simulations. Information about Dunkerton et al. (2009) can be included as a caveat.

L202- This figure can be replaced with a timeseries plot or a raw values plot of the radiative differences.

L225- Information about wind shear can be added. In addition, if wind shear values were significantly different with the different simulations, that information can be included as well.

L296- Clean's SLP was consistently the lowest out of all of the simulations. While the intensity of Extra was higher than Intermediate, it was still lower than Clean. Differences in the simulations consistently showed this pattern, including earlier simulations not featured. Small

changes in the intensity of Extra relative to Intermediate could have been caused by stochastic changes.

L298- The initial dust loadings were the only thing changed. Subsequent dust emissions were not modified, although this contributed a miniscule amount of dust compared to the initial loadings.

See Figure 2d for an example of how minor subsequent dust emissions were.

L303- This statement was intended to reference the reflectivity plots showing increased convection at the edges of Extra. This will be corrected.

L318- This will be removed.

L321- This will be removed and replaced with a separate paper, if scientifically justifiable.

#### Technical Corrections:

L34- This will be corrected.

L54- This will be clarified.

L55- The acronym will be spelled out here.

L58- This will be fixed.

L88- The CAMS acronym comes from Copernicus Atmosphere Monitoring Service.

L142- This sentence will be changed to the suggested wording.

Figures- Figures will be regenerated from accessibility, including making the text larger.

L247- This will be changed.

Thank you for your detailed comments and feedback regarding our paper. We hope that the planned corrections and amendments will clear up some of the confusion and benefit the scientific community.