

Interactive comment on “The AFWA Dust Emissions Scheme for the GOCART Aerosol Model in WRF-Chem” by Sandra L. LeGrand et al.

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Received and published: 1 November 2018

Reviewer 1

The manuscript provides a full documentation of the AFWA dust emission scheme in WRF-Chem, and the difference between dust emission produced by the three available dust emission schemes are also discussed. The manuscript is well-written and clearly presented.

We thank the Reviewer for considering our manuscript and his/her positive comments.

Suggestion on the manuscript.

C1

The authors should apply more observational data to show the difference between the results produced by the three dust emission schemes? Such as the daily AOD map from MODIS, or the surface AOD observations from AERONET program? It is hard to conclude with only the transects of CALIPSO extinction coefficient.

We thank the Reviewer for the suggestion. Figure 1 (new Fig. 8 in the manuscript) provides a comparison of simulated 8-hour average 550nm AOD (centered at 25 Jan 2010 10:00 UTC) to the 1km-resolution MCD19A2 MODIS daily AOD product from 25 Jan 2010 (provided by the NASA Land Processes Distributed Active Archive Center (LP DAAC), USGS/Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota [https://lpdaac.usgs.gov/data_access/data_pool]). The effect of clouds on the MODIS AOD retrieval is evident as much of the AOD in the image is masked out. In areas that are cloud free, we find the results are similar to the analysis presented in our CALIPSO comparison discussion. A regional peak in AOD is observed near the border of Iraq and Saudi Arabia. The general patterns of average AOD simulated for the same time period by the GOCART-WRF scheme are broadly consistent with the MODIS AOD product. Simulated AFWA scheme AOD is too strong over eastern Iraq but captures the extent of the plume across the southern half of Iraq towards Kuwait. There is less agreement with the UoC scheme, which produces several localized, high AOD values over Syria, Jordan, and western Iraq instead of the broader AOD patterns generated by the other two schemes.

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-169>, 2018.

C2

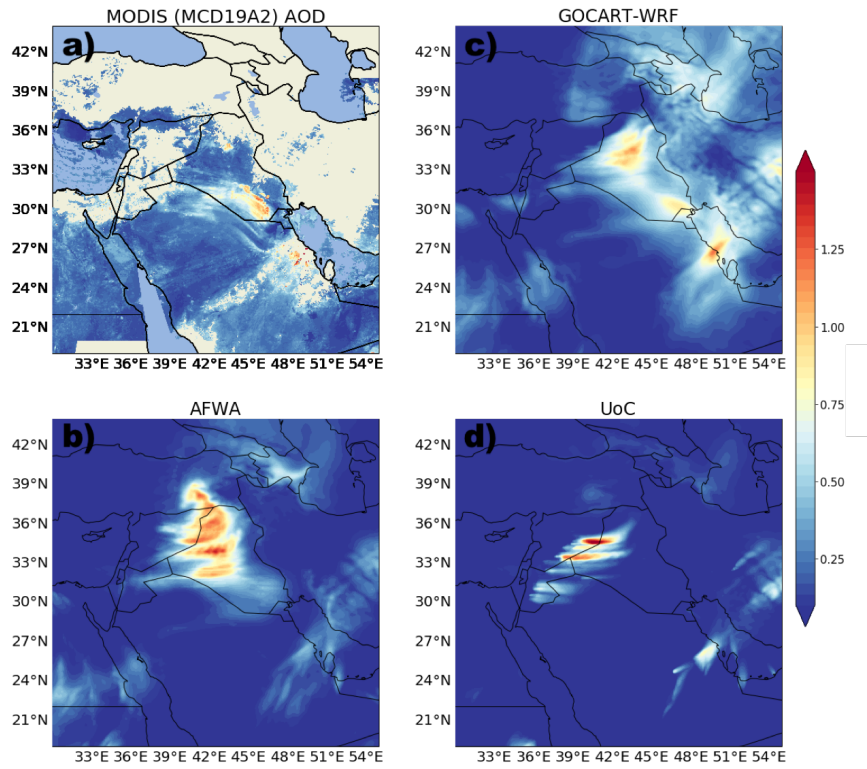


Fig. 1. The (a) MCD19A2 MODIS AOD product for 25 Jan 2010 and simulated 8-hour average 550nm AOD centered at 25 Jan 2010 10:00 UTC for (b) GOCART-WRF, (c) AFWA, and (d) UoC.