

Geosci. Model Dev. Discuss., referee comment RC2  
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## Comment on gmd-2020-441

Anonymous Referee #2

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Referee comment on "WRF-GC (v2.0): online two-way coupling of WRF (v3.9.1.1) and GEOS-Chem (v12.7.2) for modeling regional atmospheric chemistry–meteorology interactions" by Xu Feng et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2020-441-RC2>, 2021

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This is a well-organized and written manuscript. Built on their previous work published on GMD, the authors further developed WRF-GC to enable feedbacks of aerosol-cloud and aerosol-radiation interactions. The latest model edition also supports the nest-domain capability. Both GEOS-Chem and WRF models are actively developed and embrace a large user base worldwide. Coupling them together is a great contribution to the modeling community. This reviewer recommends publication after minor revisions listed below.

- In the text, spell out all the acronyms, e.g., WRF-GC, CMAQ, COSMO, SSA, and many more, when they first appear.
- Line 45, replace "advances" with "advancement".
- Table 1, DST4 should be "dust bin 4".
- Line 389, change "over than 440 nm" to "over 440 nm".
- Line 400, why not include all the monitoring sites within a grid cell for model evaluation?
- Figure 3: it appears that WRF-GC severely underestimates monthly AOD across most of the domain in comparison with the VIIRS observations. What are the possible reasons? Is it mainly due to emissions, or meteorology (e.g., humidity)? A little in-depth analysis may provide useful information for both model improvement and satellite retrieval.
- Figure 4: why not converting the modeled AOD to the one at the observed wavelength for an apple-to-apple comparison?
- Line 451, add "cloud" after "stratocumulus or stratus".
- Line 474, change "2.5" in PM<sub>2.5</sub> from superscript to subscript.
- Line 550, change "WRF-GC'se" to "WRF-GC's".
- 27 km resolution has been applied in the study for model evaluation. This resolution is too coarse to resolve cloud processes to which the ACI is important. Some discussion may be necessary to clarify this.
- The ARI and ACI have been specifically linked to RRTMG scheme and Morrison two-moment microphysics scheme, respectively, in the application. Have the authors considered a more generalized method so that they can easily link to other radiation and microphysics schemes available to WRF?
- Has WRF-GC already been included in the community WRF release? Or will it be

included in the standard WRF release in the near future?