Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-87

Anonymous Referee #2

Referee comment on "Reduced-complexity air quality intervention modelling over China: development of the InMAPv1.6.1-China and comparison with the CMAQv5.2 model" by Ruili Wu et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2021-87-RC2, 2021

This is a one-stop modeling tool development to study various pollution scenarios and associated mortality rates. This is a well written document and easy to follow. I see that the authors have put in a significant effort to make this tool functional. This work will provide a foundation for the In-MAP-China model for future work to be conducted.

The main objective was to develop a tool for a faster turn-around time estimating mortality rate as the end point topic. However, the authors need to add some discussions as to how fast this new tool is as compared to CMAQ model operating at the same grid resolutions. It was not clear to me as to (1) what was the grid spacing used in the WRF-CMAQ model and (2) what were the computational speeds of each models – e.g., CMAQ vs In-MAP-China. Though authors used the coupled WRF-CMAQ model, it is possible to estimate CPU time used up for CMAQ alone. If authors wanted to minimize computational burden of In-MAP-Chine, then why not limit vertical layers to top of PBL and provide top boundary conditions to speed up computations? Just have fewer layers in the PBL and none in the free troposphere!

It is kind of a weak point that in-MAP-China depends solely on WRF-CMAQ simulations. It will be a great service to the CTM community had the authors tested and evaluated the in-MAP-China using the GEOS-Chem modeling platform since it uses a very coarse grid resolution plus it is global. Thus, in that case, the newly developed tool could be used for any region or country of choice without any major effort. This seemed to be truly a missed opportunity for now, but it is not too late I believe for the authors.

Reason(s) for underpredictions over southern China are not speculated or explained – or I could not find those reasons.

PM2.5 underpredictions are about -23%, a large bias given the magnitude of the PM2.5 concentrations over China and is being attributed to using a different chemical mechanism as compared to CMAQ. What were the reasons for NOT using CMAQ chemical mechanism in the In-MAP-China model beside computational constraints? For demonstration, one additional simulation using the CMAQ chemical scheme would have shed more light on this matter.

Authors stated that advection was weakened due to averaging wind vectors. I am not sure why authors could not average zonal and meridional wind components separately and then recompute the vertical wind to maintain mass balance. If this is what was done, then it should be stated accordingly and, in that case, averaging impacts should be minimal in my opinion since each wind component is processed separately.