



EGUsphere, referee comment RC2
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Comment on egusphere-2022-1191

Anonymous Referee #2

Referee comment on "Variable effects of spatial resolution on modeling of nitrogen oxides" by Chi Li et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-1191-RC2>, 2022

The study by Li et al. evaluates the dependency of NO_x-chemistry on spatial resolution at different regions with contrast chemical regime, time (daytime vs nighttime, winter vs summer), and vertical layers. The authors have made use of the new capability of a state-of-art chemical transport model GEOS-Chem to conduct the simulations at different resolution. The different regional and temporal NO_x-resolution dependences are well explained by the NO_x-HO_x-ozone chemistry, and the implications for satellite application has been discussed. Overall this is a novel, comprehensive, and nicely-designed study, and is clearly-written. The figures and analyses are high quality. The results have important scientific implications, not only for application of satellite observations to infer NO_x concentration and emissions, but also for modelers to understand model bias of NO_x and ozone. I recommend publication in ACP after minor revision.

The overall mechanisms to explain NO_x-resolution dependency are convincing, but I wonder to whether other factors, such as the difference in meteorological fields at different resolution, may contribute to the NO_x-resolution dependency. I understand this might be hard to quantitatively explore but some discussions are beneficial.

Some technical issues

(1) Line 79: Are the EDGAR emissions in line with NEI? Why not use EDGAR inventory for VOCs as well?

(2) Line 135: Would it be helpful to plot the spatial distribution of chemical lifetime of NO_x and the change with resolutions?

(3) Figure 3: I spend some minutes on understanding Fig.3 and finally find out that I misunderstand the dashed lines (in particular for ozone) as absolute values of concentrations for the coarser resolution. I feel that other readers may be confused as well so I would suggest the authors disregard the relative change in the right axis.

(4) I also feel that I have to jump between the main text and supplementary materials during reading. Please consider moving important figures from SI to the main text.