Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-1179-RC1, 2021

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Insights into seasonal variation of wet deposition over Southeast Asia via precipitation adjustment from the findings of MICS-Asia III" *by* Syuichi Itahashi et al.

Anonymous Referee #1

Received and published: 28 January 2021

General comments

This study presents an interesting analysis of modeled wet deposition in Southeast Asian and proposes an approach to improve wet deposition estimates using two precipitation datasets. The manuscript is well written and clearly structured, the figures and tables are of high quality, and the analysis methods and underlying model simulations are sound. My comments mainly focus on the interpretation of the results which I feel could be expanded and improved upon prior to publication.

Specific comments

Page 4, lines 5 – 12: While the details of the model configurations have been published

Printer-friendly version

Discussion paper

before, I think it would be useful to add a table summarizing some key aspects (model resolution, chemical mechanism, aerosol scheme, wet and dry deposition scheme) of the models used in this study. This would help in the interpretation of model performance, model-to-model variability, ensemble construction, and needs for future model development.

Page 4, line 17: My interpretation of Solazzo et al. (2012) is that ensemble approaches other than averaging over all available models with equal weights performed better than the ensemble mean. Were such other ensemble approaches explored in MICS-Asia Phase 3, especially given that 5 of the 7 models used in this study were CMAQ and may have had greater similarity than the other two models?

Page 5, Lines 35 – 37: please clarify how the aggregation of weekly or ten day observations to monthly values was handled when a sampling period spanned across two months, and whether the same approach was used to calculate monthly model values in these instances.

Page 7, line 96: can you please state what criteria were used to define an “acceptable level”?

Page 8, lines 48 – 50: I think it would be really important to expand this discussion and provide a motivation why the precipitation-adjustment approach was viewed as the most appropriate and effective avenue for improving model performance. I agree that biases in precipitation are critical to consider when evaluating and trying to improve modeled wet deposition, but I would also like to see a discussion (maybe a summary of Itahashi et al., 2020) of other potential drivers of model biases, not just in wet deposition but also the actual concentrations of the compounds analyzed in this study. For example, what is known from other MICS-Asia work about whether some of the wet deposition performance issues might be caused by errors in the emissions of oxidized and reduced nitrogen and uncertainties in the representation of atmospheric chemistry in the models? The model-to-model variability indicated by the whiskers in Figures 1

– 7 is substantial and is not driven by precipitation since all models used the same WRF fields, yet no mention of this variability is made in sections 3.1.1 – 3.1.7 and its implications for improving the modeled wet deposition fields are not discussed in this section. An acknowledgment that precipitation errors are likely not the sole drivers of error in wet deposition should also be added to the abstract (page 2, lines, 39-40) and conclusions (page 13, lines 04-05)

Page 9, lines 73 – 80: I like the idea of including both the EANET observations and TRMM satellite data in this analysis. What I find interesting and would like to see discussed in more detail is the fact that the squared correlation coefficient between EANET and TRMM data is only about 0.5, i.e. only about 50% of the precipitation variability seen in the point observations is captured by the satellite product. To the extent that these point observations (both for precipitation and wet deposition) are used to evaluate the model, what does this relatively low correlation say about the spatial scales represented by the three different datasets (observations, model simulations, and TRMM), their commensurability, and inferences drawn from differences between them?

Page 9, lines 82-83: I am not sure I follow this argument. If the EANET observations are the ground truth and TRMM has a correlation of only 0.7 with them, why would one consider the TRMM-based AS adjustment AS over AO? I realize that the conceptual benefit is that AS can be applied across the entire domain while AO is limited to specific stations as discussed at the beginning of section 4.3, but this is not the argument I'm reading here.

Page 13, lines 77 – 83, discussion of Figure 17. I recommend avoiding the terms "overestimation" and "underestimation" when discussing the spatial patterns of wet deposition rather than precipitation results. I suggest to instead use terms like "higher values" and "lower values". Aside from the EANET station analysis already presented in Figures 10 – 16, no observational data is available to judge whether the AS deposition patterns are higher or lower than reality.

Page 13, lines 89 – 90: Since no actual country-wide observations are available aside from the EANET point measurements, I recommend avoiding terms like “reproducibility” and “accurate estimation” when discussing Figure 18.

Technical corrections

Page 2, Line 40: change “scaling” to “scaled”

Page 2, Line 42: suggesting changing “spatio-and-temporal” to “spatio-temporal”

Page 3, Line 97: change “The participating model was requested” to “The participating models were requested”

Page 6, line 79: suggest changing “calculated” to “modeled”

Page 13, lines 01 – 02: please double check the wording of this sentence, it reads like a contradiction to me “Generally, the ensemble model can capture the observed wet deposition; however, the models failed to capture the wet deposition, even the ensemble mean . . .”

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-1179, 2020.