Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-624-RC1, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "MICS-Asia III: Overview of model inter-comparison and evaluation of acid deposition over Asia" *by* Syuichi Itahashi et al.

Anonymous Referee #1

Received and published: 1 October 2019

General Comments: Authors compare nine meteorology-chemical transport model systems to estimate deposition amount of Sulfur, Nitrogen, and Ammonia. In general, this manuscript is well organized and delivers informative results and an interesting air quality issue over the Northeast Asia. For the model performance evaluations, authors compare the model outputs to the EANET observations. It is reasonable. However, those nine models may already present appreciable differences in airborne concentrations (authors address the companion papers in the text, but short discussion would be helpful for other readers), or may estimate different wet deposition amounts even under the same atmospheric concentrations due to difference in the implemented dry deposition mechanism in the models. Therefore, it would be better to explain more direct relationship between concentrations and dry/wet depositions for model inter-comparisons.

Authors evaluate the precipitation simulations, but wet deposition in CMAQ (6 out of 9 models) not only depends on the precipitation but the types (convective or non-convective). Moreover, water mixing ratio also plays an important role in CMAQ depending on the meteorological conditions. Those analyses will be very helpful to the air quality research community.

Scientific Comments: Table 1: It would be better to include the WRF configurations. Physical options in WRF may affect the wet depositions of those target species.

Figure 2: Wet scavenging is affected by not only the precipitation amounts but also precipitation intensity (and the lasting time), and types (at least in CMAQ parameterization). For example, convective precipitation in MCIP outputs for CMAQ may increase the total rain amounts in summer but may have less influence on fine particle removal, compared to non-convective rain during spring and fall. In case of wet removals of gases species, total surface areas of rain droplets as function of droplet size and ambient bulk concentrations would be important. Size distributions and concentrations of ambient aerosol would be critical for wet scavenging.

Figure 3: Wet depositions in current three dimensional grid models (CMAQ and CAMx) deal with both in-cloud and below-cloud scavenging together. It would be okay to explain total wet depositions, but may mislead to the comparisons to the EANET measurements.

Figures 3∼8: In terms of wet deposition comparisons, Figures and their explanations are well represented in the text. Considering that wet scavenging amounts are determined by airborne concentrations and removal mechanism, it is expected to relate modeled concentrations and wet deposition amounts, including the removal module used in the models.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-624, 2019.