**Effective aerosol forcing in EAMv2 candidate models and the impact of imposing a lower bound for cloud droplet number concentrations**

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**Abstract**

The global mean effective aerosol forcing (ERFaer) simulated in EAMv1 is relatively large compared to the CMIP5 model estimates. During EAMv2 development, efforts were made to reduce ERFaer through proper model tuning and the associated changes in cloud properties. In this work, we assess ERFaer in the EAMv2 candidate models and investigate how the parameter tuning as well as other factors (such as changes in model grid, transport, ice nucleation, and etc.). Consistent with previous work, proper parameter tuning significantly reduces the ERFaer in both the shortwave (SW) and longwave (LW) components. On the other hand, the global mean ERFaer is relatively small due to the compensation between the two components. Imposing a minimum cloud droplet number concentration (CDNCmin) of 10-30 cm-3 in the EAMv2 candidate has a large impact on the net ERFaer (less negative by 0.4-0.8 Wm-2), which is consistent with previous studies. Large impact of CDNCmin is found in regions/seasons (e.g. high-latitudes in boreal summer) where the CDNC is very small in pre-industrial era but much larger in present-day condition. This suggests the cloud and aerosol parameterizations in EAM still need to be improved to better represent the pre-industrial climate.