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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Radiative forcing and climate response to projected 21st century aerosol decreases" *by* D. M. Westervelt et al.

Anonymous Referee #1

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This is a clear presentation of a well-designed study of the radiative and climatic impacts of future changes in global aerosol emission to the year 2100. While the model used has its limitations, the results are likely to be consistent with those from more complex and comprehensive models. Only minor modifications are need to address several comments.

Page 9301, line 6. Since the size distributions of the accumulation mode aerosol are prescribed, some discussion of the limitations of this approach is needed. This treatment is not able to distinguish between processes that influence mass but not number (condensation) and those that effect number but not mass (coagulation). It is likely to bias the estimate of aerosol effects on clouds. Modal representations overcome this limitation.

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Page 9301, lines 11-16. If nitrate has no optical or microphysical effect, why is so much chemistry used in the simulations? Sulfur oxidation can be treated with prescribed oxidants and diagnosed peroxide. Do the oxidant concentrations change that much in the difference scenarios? If so, then oxidants should be described more in the following RCP section. Could you also comment on the role of oxidant changes in the estimated aerosol radiative forcing?

Page 9306, line 1. Typo.

Page 9306, line 2. Since the cloud lifetime effect is included, a description of how the cloud microphysics depends on droplet number should be added to the model description.

Figure 8. Aren't there any regions where the response to call forcing is opposite in sign to the global mean? If so, discuss.

Section 5.2. Consider showing relationships Delta C/Delta AOD instead of correlations, where C is the climate parameter. This provides a quantitative measure of the relationship.

Page 9323, lines 8-22. Should also discuss the effect of precipitation changes on AOD through wet removal.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 9293, 2015.