Geoscientific
Model Development
Discussions

Interactive comment on "Sensitivity of aerosol extinction to new mixing rules in the AEROPT submodel of the ECHAM5/MESSy1.9 atmospheric chemistry (EMAC) model" *by* K. Klingmüller et al.

Anonymous Referee #2

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This paper addresses the radiative effect of different aerosol mixings. This paper was previously submitted to JGR and I was one of the reviewers at the time. I raised many issues with the JGR version, and the GMDD version seemingly incorporated only some of the issues.

The most important finding of the paper is: "The global average of the TOA shortwave flux difference amounts to $0.53 Wm-2$ when comparing the internal mixture to the fully external mixture". (Please correct me if this is not a major finding of the paper.) Neither full internal mixture nor full external mixture is realistic. Obviously, the study does not attempt to assess the effect of a non-realistic mixing treatment in climate model in comparison with a realistic mixing treatment. If the study is just about comparing

one unrealistic situation to another unrealistic situation, there is not much value in the study. The authors, however, claim in the paper, "Most climate models assume the atmospheric aerosol mixture of chemical constituents to be either internal, assuming homogeneous particles, or external (Fig. 1)." If this claim is true, then their study has an important value, since it quantifies the difference between two common (unrealistic though) treatments in climate models. However, is their claim true? I know that many climate models use a 100% external mixture. Do some climate models use a 100% internal mixture? Give a list of such models, since I don't know of any.

In short, I would only support publication if the authors justify their study much better. Please justify the study better and explain the justification in both abstract and the main text.

Interactive comment on Geosci. Model Dev. Discuss., 7, 3367, 2014.