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Interactive comment on “Modeling dust as component minerals in the Community Atmosphere Model: development of framework and impact on radiative forcing” by R. A. Scanza et al.

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Review on “Modeling dust as component minerals in the Community Atmosphere Model: development of framework and impact on radiative forcing” by R. A. Scanza et al. S. Nickovic (Referee)

This study for the first time explores, using two versions of a global atmospheric-dust model how multiple mineral fractions in dust affect the atmospheric radiation. This work is also a basis for authors to build a modelling framework to be used in the fu-

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ture to study the influence of different minerals to processes other than radiation (e.g. ocean productivity due to deposited dust carrying soluble iron; role of minerals in cloud formation).

The manuscript is well organized and clearly written. The importance of the study objective and the obtained results qualify the article to be published. Before publishing I would ask the authors to consider the following comments and suggestions:

Pg 3. Lines 12-18. Long sentence and difficult to follow. It would be re-written. (Based on these simulations, we estimate the all-sky direct radiative forcing at the top of the atmosphere as $+0.05 \text{ Wm}^{-2}$ for both CAM4 and CAM5 simulations with mineralogy and compare this both with simulations of dust in release versions of CAM4 and CAM5 ($+0.08$ and $+0.17 \text{ Wm}^{-2}$) and of dust with optimized optical properties, wet scavenging and particle size distribution in CAM4 and CAM5, -0.05 and -0.17 Wm^{-2} , respectively)

Pg 4. Lines 14-15. Goethite is mentioned, although not later explicitly considered; please clarify (Efforts to separate the components of absorbing dust single out the iron oxides, e.g., hematite and goethite.)

Pg 4. Line 18 Add Journet et al, 2014 reference

Liu et al., 2013 not in the reference list

Pg 13. Lines 1-4 Why the given fractions in Mahowald are used instead of the fractions from the mineralogy database? (CAM3 optics were used (Mahowald et al., 2006), which were computed assuming Maxwell-Garnett mixing of 47.6% quartz, 25% illite, 25% montmorillonite, 2% calcite and 0.4% hematite by volume, with density = 2500 kgm^{-3} and hygroscopicity prescribed at 0.14)

Comment please the effects of using of different radiation schemes in CAM4 and CAM5 on comparability between two groups of simulations. Was this not possible to use a unique radiation model?

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Pg 13. Lines 25-27. The argument of not using the same number of minerals in both model due to computational requirements does not sounds convincing. Remove it or offer different justification. Personally, I think it limits the comparability of results from two models and generality of the study. (The fewer tracers in CAM5 were simply for computational efficiency; the capability to add the additional minerals included in CAM4 is feasible and future simulations may involve including these.)

Define the term dynamic variability

It would be useful if the authors in Discussion and conclusion compare their results on radiation forcing with other similar studies (e.g. Balkanski et al, 2007, etc.) and discuss reasons for substantial differences (if any)

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