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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying the range of the dust direct radiative effect due to source mineralogy uncertainty" *by* Longlei Li et al.

Anonymous Referee #1

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Review of "Quantifying the range of the dust direct radiative effect due to source mineralogy uncertainty," by Li et al., submitted to Atmospheric Chemistry and Physics.

This paper discusses the direct radiative forcing of mineral dust accounting for uncertainties in soil mineral abundance, composition, and optical properties.

Whereas, the paper appears comprehensive and includes many references, it doesn't discuss possibly the most related paper, that of Jacobson (2001). That study simulated the solar and thermal-IR global direct radiative forcing of several individual soil dust components, namely iron oxide, aluminum oxide, silicon dioxide, calcium carbonate, magnesium carbonate, potassium carbonate, and sodium carbonate, as well as soil dust as a whole. Of possible relevance, the present paper does not mention anywhere the role of absorption by aluminum in soil dust particles, Figure 4k of Jacobson (2001)

indicates that aluminum may be a strong absorber in soil dust particles.

Ideally, the authors would include aluminum in their calculations. I realize this could result in having to redo their entire calculations. At a minimum, the authors need to discuss this omission and the potential impact on results. The authors also should mention that study in the context of its findings with regards to individual chemical components and the overall soil dust radiative impact in the solar and thermal-IR.

Introduction. An additional impact of absorption by soil dust components is to contribute to cloud burn-off (Jacobson, 2012). Please discuss briefly.

Methods. "Two datasets currently exist. . ." Please clarify that FAO (1995) includes world soil data at 10 km resolution, and includes soil composition (SiO2, CaCO3, CaSO4, Fe2O3, Illite, Kaolinite, Smectite, Feldspars) in each data cell.

What is the source of solar- and thermal-infrared refractive index data for each chemical? It would be useful to see a plot of real and imaginary refractive indices of absorbing components versus wavelength.

What is missing is a comparison of aerosol absorption optical depth with global satellite data. This would give a better idea of the realism of the results here.

Figure S1. Please specify the wavelength range of "shortwave" radiation assumed. Also, please define "high-bound hematite" and "high-bound dust" in the figure caption.

Figure S2. Please provide the source of the data in the figure caption.

References

FAO, Soil Map of the World, Land and Water Dev. Div., Rome, Italy, 1995.

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