

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

Anonymous Referee #2

Received and published: 5 October 2020

The manuscript describes the uncertainty of the top-of-the-atmosphere dust direct radiative forcing due to current uncertainties in the surface soil mineralogy. Especially the importance of iron oxides is high-lighted.

The manuscript is well-organized and include detailed description of the results. It is recommended for publication after consideration of the minor comments below.

Comments

- **Page 2, lines 45-46:** The sentence starting with “These two...” is unclear. Please rewrite.

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- **Page 2, line 54:** The net dust DRE is given. May you also include numbers for other DREs so the reader can have an idea about the dust DRE magnitude in relation to other processes?
- **Page 7, line 193:** Remove “in the model”.
- **Page 10, line 297:** Remove “.” after “)”.
- **Page 10, line 297:** What is a “simple double call”?
- **Page 15, line 465:** Should ΔF_{upp} be ΔF_{hig} ?
- **Page 21, line 650:** Change “7a” to “7”.
- **Page 24, line 752:** The region of Australia is marked with a star in Fig 11a, indicating that the result is statistically significant. This is the opposite of what is said in the text.
- **Page 25, line 784:** Change “African” to “Africa”.
- **Page 26, lines 797-808:** The radiative parameterization is discussed. However, it is not clear that the same radiative transfer solution method is used in both the line-by-line and the parameterized calculations. If the methods are different, for example if one of the methods use more streams, this will potentially cause significant differences.
- **Page 28, line 867:** Change “that goethite” to “than goethite”.
- **Page 30, line 922:** Change “of other” to “of the other”.
- **Page 31, lines 956-958:** Unclear sentence (too many whiles?), please rewrite.
- **Page 31, line 958:** Change “”exits” to “exists”.

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- **Page 45, line 1370:** What is meant by “and are repeated”?
- **Page 46, line 1388; page 47, line 1392; page 48, line 1404; page 52, line 1456; Fig. S13:** The acronym DOD is used in the captions and figures. It is not mentioned anywhere in the text. In the text you use AOD_{dust} . Please use only one notation for the dust AOD throughout the manuscript.
- **Page 53, lines 1474-1475:** Unclear sentence, please rewrite.
- **Table S2:** Please provide full reference to the CESM User Guide.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-547>, 2020.

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