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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 #3

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The manuscript discusses the direct radiative effect of dust aerosol (as defined as soil particles suspended in the atmosphere) due to source mineralogy uncertainty, focusing on the relation to the dust aerosol composition. It is well-organized. I read over the manuscript and the comments from referees #1 and #2 as well as the reply of the author. Basically, I agree with those comments and the reply from the author.

However, I do have a seeming important question. This manuscript tried to estimate the direct radiative effect of dust aerosol and only considered the mineral aerosol as it is defined. The direct radiative effect of dust aerosol happened during the long-range transport of dust aerosol. While the dust aerosol travels to thousands of kilometers away from its source area, the mineral aerosol will certainly mixes and interacts with the pollution aerosol and its chemical composition of the aerosol would be changed

and its optical properties would in turn be changed, so as its direct radiative effect. Therefore, this manuscript estimate the direct radiative effect of only mineral aerosol without considering its mixing and the interactive reaction with pollution aerosol, such an approach could be the biggest fact causing the uncertainty to the estimation of the direct radiative effect???

In 2010, Huang et al. studied the "Relation between optical and chemical properties of dust aerosol" (Huang et al, JGR-atmos. , 115, D00K16, doi:10.1029/2009JD013212). The strong heterogeneous chemical reaction on dust, and the mixing of dust with various pollutants during the longâĂŘrange/regional transport of dust plumes was observed. they found the linear relationship between optical properties and aerosol chemical composition. Soluble ions, i.e., SO42−, NO3−, NH4+, and K+, were the major contributors to the light extinction in fine particles, while mineral aerosol contributed more to that in coarse particles. Black carbon, as a strong light absorbing species, was found to contribute to the light extinction in both fine and coarse particles. Strong absorbing of aerosol at 439 nm was observed due to the significant proportion of iron oxides in the dust aerosol other than black carbon. The transport pathways of dust, concentrations of pollutant precursors and meteorological conditions were the main factors affecting the mixing extent of pollutants with dust.

In the references of the manuscript "Quantifying the range of the dust direct radiative effect due to source mineralogy uncertainty" by Longlei Li et al." , the paper mention above of Huang et al. (JGR-Atmos, 2010) was not cited and this manuscript totally ignored the direct radiation effect caused by the mixing and interactive reaction of dust aerosol with pollution aerosol, so as the correctness of such an estimation would be questionable!

I suggest that this manuscript should have a major revision considering the mixing and interactive reaction of dust aerosol with pollution aerosol during its long-range transport in the atmosphere.

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