

Interactive comment on “Perturbations of the optical properties of mineral dust particles by mixing with black carbon: a numerical simulation study” by B. V. Scarnato et al.

Anonymous Referee #1

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This manuscript reports optical properties of mineral dust, black carbon, and their mixtures using the DDSCAT calculation model as well as the observed shapes. They show an importance of mixing states of these particles on the optical properties. The topic is important to the atmospheric science, although further understanding of the abundance of mineral dust particles with black carbon in atmosphere is needed as the authors pointed out.

General comments: I suggest having a brief discussion regarding why and how optical properties of mineral dust mixed with black carbon differ from those of bare mineral dust/black carbon. I assume that microphysical configuration such as lens effect (Bond

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et al., 2006) and shadowing of mineral dust particles to black carbon may contribute to the optical properties of mineral dust/black carbon mixed particles. This discussion will be useful to have a general conclusion since this paper discuss a limited number of modeled particles. Example is Page 2504 Line 27-28: While DDSCAT predicts for internally mixed particles larger than 500nm (BL2S3–BL2S5) an increase of SSA at all wavelengths compared to bare dust particles (S3–S4–S5). Please discuss the reason.

Specific and technical comments:

P2488L14-16 The meaning of “the opposites” is not clear here.

P2489 L18: Semicolon (;) may be comma.

P2493 L9: Take out parenthesis.

P2494: L4 and 7: Some words are italic. Is there any intention?

P2496 L7: In this study, we modeled dust aerosols as spheroids and rectangular prisms with an intermediate aspect ratio of 1.75... (see Table 3). The aspect ratio of 1.75 is not intermediate but the maximum value (Table 3).

P2498 L18 For synthetic aggregates presented in Fig. 2, ... I am not sure why the number of each particle has standard deviation (SD). Is this an averaged number? Please explain the meaning.

P2500 L27: Table 4 should be Table 5.

Table 2: Table 2 is not useful unless the refractive indices values are shown. Also Wagner et al. (2012) showed a range of refractive index for mineral dust. Which values did the authors use?

Table 3: Please indicate how many particles were analyzed to obtain these values.

Figure 1: It will be useful to have arrows to indicate black carbon on the mineral dust particles.

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Reference Bond, T. C., G. Habib, and R. W. Bergstrom (2006), Limitations in the enhancement of visible light absorption due to mixing state, *J. Geophys. Res.*, 111, D20211, doi:10.1029/2006JD007315

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