

## ***Interactive comment on “Modeling a typical winter-time dust event over the Arabian Peninsula and the Red Sea” by S. Kalenderski et al.***

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1) We would like to thank Dr. Otto for insightful comments. We fully agree that for realistic modeling of dust phenomena a spectrally varying complex refractive index is essential. However models are not the real world and have some capability restrictions. In WRF-Chem the imaginary part of the dust refractive index is wavelength dependent only in longwave bands (16 bands) and set to a constant for shortwave bands (4 bands). It was shown (Balkanski et al. 2007) that shortwave refractive index strongly depends on dust mineralogy, which is not well known for Arabian aerosols, and could be a bigger source of uncertainty than the wave dependence in short wave bands. Therefore in this study we choose to quantify this effect and conducted sensitivity calculations for different imaginary parts of short-wave refractive indexes in solar

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spectrum disregarding, in first approximation, their wave dependence. The results were partly discussed in section 4.2.2 and 4.3.1. For our simulations the shortwave refractive index value of dust was selected in order to obtain maximum consistent with previous results and available observations from AERONET and MODIS instruments over the Arabian Peninsula.

2) We agree that the coarse mode fraction affects significantly the aerosols optical properties and especially in the regions close to dust sources where the coarse fraction is abandoned. We believe that this mode is well represented in our results, see for example Fig. 3 and 4.

3) The dust emission scheme used in this study (GOCART) is well known and widely employed in regional and global models (Ginoux et al. 2001). It has been tested in many other studies (e.g. Zhao et al. 2010). The model transports dust aerosol concentrations for coarse and accumulation modes. The emissions scheme does not provide directly the log-normal size distribution parameters of emitted dust. For more details how this was implemented in WRF-Chem see Zhao et al. 2010, and section 4.1.2.

4) SSA is a key parameter that defines the effect of dust aerosol on the radiative balance. In this study we tuned our calculations using available AERONET and MODIS observations. We believe this is an important step in the right direction. More in situ observations of Arabian aerosols is necessary to better constrain its radiative effect. We are looking forward to more data available for this region.

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