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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Diurnal cycle of the dust instantaneous direct radiative forcing over the Arabian Peninsula" *by* S. Osipov et al.

Anonymous Referee #2

Received and published: 1 July 2015

Review of Dust instantaneous forcing from dust analyzed with a stand alone radiative code (RRTM)

The authors use observations from both LIDAR and AERONET stations to study the influence of dust on radiative fluxes both in both the SW and the LW spectrum. Interesting results are shown that contrast the role albedo from different surfaces: ocean, coastal plain and desert. This work extends the analysis to quantify the role of dust absorption during a particularly intense dust episode that took place from March 18th to 20th 2012 over the Arabian Peninsula. The interesting results and the characterization of the role of dust on radiative fluxes over the Arabian Peninsula makes this work worth publishing in this journal.

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Interactive Discussion
Discussion Paper

My only major remark has to do with the fact that RRTM (Rapid Radiative Transfer Model) is used only for clear-sky conditions. The authors never justify why they made the choice not to treat clouds and although clouds over the region are not ubiquitous and influence infrequently the scenes studied, accounting for them would have made the study even more relevant.

Minor points:

Page 12307 lines 8 to 10: “3. RRTM_SW error with respect to line-by-line calculations is 1Wm−2 for direct and 2Wm−2 for diffuse irradiance, respectively 4. RRTM_LW error with respect to line-by-line calculations is 1.5Wm−2 Âż Please explain why you give absolute errors for the SW and LW calculations. Are these errors independant of the of the value of the irradiance or are they given for the maximum daily value of the irradiance ?

Page 12309 Equation 5 : Please indicate that, σ, is in this equation, is the neperian log of the width of the size distribution.

Pages 12315-12316 : Âń At the same time, we have stronger forward scattering in calculations (partially because of the particle sphericity assumption and/or underestimating number of large particles by Aeronet, MuÌĹller et al., 2010; McConnell et al., 2008) then in observations as indicated by the positively biased diffuse flux (RMSE is 37Wm−2 and RMSE is 20 %). Âż When the proportion of larger particles increase, the forward scattering also increase, so if you underestimate these large particles you also underestimate the forward scattering. This goes against your explanation as to why you have larger forward scattering.

Please correct ‘then’ to ‘than’ in the sentence above.

Page 12320, line 5: you did not indicate the units of the chlorophyll concentration: “. . .chlorophyll concentration (chl = 0.15).”

Page 12320 and Figure 11 : for which period did you collect AERONET AOT level 2.0

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data to produce Fig. 11 ?

Page 12324, line 7, if you want to stay consistent with the rest of the text, replace : '' (Balkanski 1.5 %) '' with ''(B15)".

Figure captions

Fig. 2 : Indicate 'top panel' and 'bottom panel' before you describe what is on the Figure. Instead of '' SW surface downwelling perturbed experiment. . . are provided in the top panel" Indicate '' The top panel presents SW SW surface downwelling perturbed experiment. . ." idem for bottom panel.

Change red circles to red symbols and blue circles to blue symbols. Change green to green circles.

Fig 5 : Mention that you are showing outgoing fluxes.

Fig.10 : Instead of having 2 lines on the first panel, why not present only 1 line with the ratio of coarse AOD/fine AOD ? It is not clear from the Figure caption that σ, refers to the symbol in Equation 5. Is r0 a modal diameter on these figures, it it is, please indicate it in the caption !

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 12301, 2015.