Atmos. Chem. Phys. Discuss., 13, C182–C184, 2013
www.atmos-chem-phys-discuss.net/13/C182/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Radiative effects of desert dust on weather and regional climate" *by* C. Spyrou et al.

Anonymous Referee #1

Received and published: 19 February 2013

The paper presents an interesting evaluation of long term radiative effects of Sahara dust on weather and climate at regional scale. The target area of the study includes northern Africa, the Mediterranean basin and continental Europe. The paper is well written and addresses a relevant scientific issue. It is worth publishing after minor corrections.

Comments and questions:

Pag 1336 The comparison of modeled solar radiation with Crete measurements shows that SKIRON underestimates observed cloudiness even in WDE simulation. The observed radiation drops to very low values (about 100 W/m2 around midday). Can this behavior be explained with cirrus clouds underestimated by SKIRON or it should be attributed to concomitant smaller scale relevant cloudiness phenomena missed by the

model? Can the underestimation of cloudiness be explained, at least partially, by the lack of the indirect effect in SKIRON simulation?

Pag 1340 lines: 8-10 The incoming radiation flux at the surface is said to be obtained by the superposition of dust nighttime LW emission and daytime incoming solar radiation. Does this mean that the daytime LW dust emission contribution is neglectable?

Pag 1340 line29, pag 1341 line 2 The sentence "negative values denote an increase in the atmospheric absorption..." is not easy to understand on the basis of eq. 2 and should be better clarified to avoid confusion between negative and positive effects.

Pag 1342, line 22 The mentioned cooling over the Mediterranean area cannot be clearly observed from Figure 12 and 13 because colors do not completely separate positive and negative values (the first negative class is still green like the positive ones). Moreover, Figure 11 shows a different column integrated forcing during spring and summer over the central Mediterranean area. The overall cooling effect at surface should be better described.

As mentioned in the introduction, the optical properties of dust particles depend on their size. The size distribution of dust is expected to change with distance from the source along its transport path. Is any of the modeled radiative effects influenced by particle size, e.g. over continental Europe, or the dust mass concentration effect can be considered definitely dominant?

Minor technical corrections:

The last sentence of Section 3 (from pag. 1333, line 25), concerning RRTM cloud treatment, is rather obscure in the present form. The mentioned model details are not used in the paper and could be removed or should be better explained.

Pag 1342, lines 2-6 The cooling observed at 300 hPa is defined as “mid-tropospheric cooling”, while the heating observed at 600 hPa is defined as “mid-tropospheric heating”. The definition of the cooling area can be better specified to distinguish the different

ACPD

13, C182–C184, 2013

layers.

Units of the different terms of equation 1 at pag. 1335 are missing.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 1327, 2013.