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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The radiative impact of desert dust on orographic rain in the Cevennes–Vivarais area: a case study from HyMeX" *by* C. Flamant et al.

Anonymous Referee #1

Received and published: 16 September 2015

General comments:

The authors present the results of quite a large research effort: A case study on the radiative impact of desert on convective precipitation in complex orography in the Mediterranean. In a first step, combined measurements with two water-vapor and aerosol Raman lidars, an airborne water vapor DIAL, sun-photometers, different types of satellite instruments (MODIS, SEVIRI), and ground-based networks of meteorological stations are used for the verification of a convection-permitting mesoscale dust model. Second, model runs with and without dust are compared. It turns out that the impact of the dust on the simulated convective precipitation is weak in this case. Finally, the authors give

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an outlook for future refinements of related research activities.

That the impact of dust is weak ("marginal") in this case should not be taken as a weak point of the manuscript. On the contrary, the science community needs in the same way the publication of a study if the result is a weak impact as it needs the publication of the result if the impact should be large.

The manuscript is well written. The discussion is mostly clear (see specific comments below for details). The conclusions seem all justified.

Thus, I recommend accepting the manuscript after minor revisions.

Specific comments:

Title: The title seems to suggest that the impact is significant. As this is not the case here, I suggest that you write it clearly already in the title, e.g., "Weak/marginal radiative impact of desert dust on convective precipitation in complex terrain: A case study in the Cevennes-Vivarais area from HyMeX" or similar

Section 2.4.: Aoshima et al. (2008) used a BT threshold of 250 K instead of 230 K. Maybe this would fit better? Please comment.

Section 3: Does RTTOV include the effect of the dust in the model? Please comment.

Section 5, first paragraph: Please quantify "rather low" etc.

Page 22464, line 21: I think "overall complex structure . . . well" is overstating the result. How about "The general structure of the dust plume is reproduced by the simulation. . ."

Page 22464: Can you comment on the differences between WALI and AERONET data?

Page 22465, line 7: "is also simulated deeper. . ."?

Figure 5 and 6: I think it would be very interesting to show the clouds which are detected by the lidars and compare them with the clouds in the model runs. Are there

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clouds the BASIL data in the morning of the 18 above 3 km? Are there no clouds in the WALI data?

Page 22466: I am confused by the selection of the locations taken for the model data for the comparisons. You write that both were “the best match obtained with the LEANDRE 2 observed dust plume”. Do you mean “moisture field” in the case of “dry”? But why “dry”? How do you determine “best match”?

Page 22468, line 8: “unambiguously” seems too strong for me here. How about “generally” and “especially in the upper part of the dust layer”?

Page 22471, line 17. “to reproduce realistically” is too strong for me here; this would mean near perfect agreement. I suggest “to simulate the most intense. . .”.

Figs. 2, 3, 11, 12: It is difficult to distinguish the precipitation values in Fig. 2 as the dots are so small and all green-blue in the VR area. But anyway you show the zoom in the VR area in Fig. 3. Therefore, I suggest that you omit the precipitation plots of Fig. 2. The temporal relation to the SEVIRI data is anyway not given (average versus snapshot). But also the SEVIRI plots in Fig. 2 are redundant with the SEVIRI data in Fig. 11 and 12. I thus suggest that you show SEVIRI data in Fig. 2 and the corresponding model data in Figs. 11 and 12. In addition to the DUST images in Figs. 11 and 12, I would be interested to see the NODUST images too.

Technical corrections:

Please introduce BT (page 22459, line 9) and use it throughout. In figure 10 you write TB (caption and panels).

You write “dusty forecast” which sounds a little bit odd to me. I suggest just “dust forecast”.

Page 22460, line 2: “subgrid”

Page 22460, line 18: “Then, dust data at the end. . .”

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Page 22461, line 6: Delete “use”

Page 22461, line 14: “precipitation”

Page 22466, line 5 and 19: “carried out”

Page 22466, line 25: The reference “Berhendt et al. 2011” is missing. I guess you mean Behrendt et al., 2011 (which is also missing)?

Page 22468, line 1: “boundaries” instead of “envelop”?

You write several times “highlight” (e.g., page 22468, line 18). I would prefer “show”, “present” etc.

Page 22480: “overlaid”

Page 22489: “black box”

References:

Aoshima et al., 2008: Statistics of convection initiation by use of Meteosat rapid scan data during the Convection and Orographically-induced Precipitation Study (COPS). Meteorol. Z. 17: 921–930.

Behrendt et al., 2011: Observation of convection initiation processes with a suite of state-of-the-art research instruments during COPS IOP8b, Q. J. Roy. Meteor. Soc., 137, 81–100, doi:10.1002/qj.758, 2011.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 22451, 2015.