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Discussions

Interactive comment on "An analysis of the September 2015 severe dust event in the Eastern Mediterranean" *by* Philipp Gasch et al.

A. Ansmann

albert@tropos.de

The paper is well written and the results are very exciting. The enormous potential of the ICON model coupled with the state-of-the-art aerosol module ART is documented in a fascinating way.

Nevertheless, I was thinking some comments from my side should be given and may improve the paper a bit.

As a co-author of the papers of Mamouri et al., ACP, 2016, and Solomos et al., 2017, both dealing with this record dust storm in September 2015, and, in addition, as a lidar expert having a long-term cooperation with the lidar group at CUT, Limassol, I would like to recommend the following:

P1, L22: Please check the paper of Nisantzi et al., ACP, 2015, they report Saharan and Middle East lidar observations (2011-2014), perfomed in Cyprus, and provide statistical results. This article could be mentioned in the introduction.

P2, L8-13: We need a short discussion on the existing literature for this September 2015 dust storm, i.e., a short discussion of Mamouri et al., ACP, 2016 and the companion paper of Solomos et al., ACP, 2017 (just finally published on 27 March). This is the normal 'way of life' in science, i.e., to discuss previous work, to discuss what is already known, and what will be the new points of the new article. I speculate that you (the authors) did not read the final version of the Mamouri et al. paper with all the findings concerning mass loadings, dust height distributions, optical depths... because there are so many useful observations and findings that corroborate your statements and findings..... The submitted ACPD version of Mamouri et al. is very different from the final one. By the way, in that paper, also the limits of MODIS concerning max AOT retrievals are discussed, and the quality of MODIS data at such high AOT conditions is discussed.

P2, L31: This final sentence of the paragraph has to be 'updated' because there is this Solomos et al. (2017) paper. .... or what do you mean with ... a detailed analysis of the driving atmospheric system ... has not been published so far.... ? A mentuoned, the final version of the Solomos paper is now published.

P6, L10-11: just a short question: Why do you distinguish (always) sedimentation and dry deposition? I am not so familar with the terminology but to my opinion dry deposition includes gravitational settling. But maybe I am wrong.

Page 9, Figure 3 is very nice, but needs to be improved.... It is almost impossible to identify Turkey, Cyprus, Israel etc....

Page 15, Figure 6, color scales are missing, but needed. The MODIS analysis stops when the observations indicate: AOD > 5.0 (as written in Mamouri et al, ACP, 2016). In the MODIS figure (Figure 6, bottom, left) all dust regions, where the surface (over

the dark Med sea for example) is not visible anymore, are regions with AOD of 5.0 and more. You may check the MODIS data basis (links are given in the Mamouri et al, 2016 paper). And this in contradictions with the MODIS results in Fig.6... Did you compute these AOD values (map), instead of taking the AOD values from official MODIS data sources?

What does the map (Figure 6, bottom, right) show? We need a color scale. And what about the region just east of Cyprus. The AOD is obviously very high (bottom, left, because the dark Mediterranean Sea is no longer visible, the AOD was rather high, probably 5.0 or even more), but no values in the MODIS AOD map (bottom, right). Impossible, to my opinion! Something is wrong with these MODIS products. Please check!

Figure 7 (right panel): CALIOP obs, 34-36 N, …. The CALIOP retrieval gets lost at these conditions, the algorithm fails and cannot handle such situations. The dust extinction coefficients exceeded already 500 Mm-1at 3 km height…. and must be about 2000 Mm-1 or more at heights below 2 km to match the MODIS scence (Figure 6,bottom, left , AOD certainly larger than 5).

Page 17: I personally would like to see comparisons of ICON-ART results for the Cyprus region, for the 7-10 September period. But I am sure that huge deviations from our findings (presented in Mamouri et al., 2016) would become visible.

Page 19, Figure 8: Please check the Weizmann Institute AERONET station (a bit east of Tel Aviv) for 9 September (This station measured AOD of 2.4-2.7). What did you find for 9 September for Israel? On 8 September, the dust load was even higher, but there are no AERONET observations, because of too high AOD, which the AERONET algorithm misinterpreted as clouds, I am speculating.

That means, the modeled Jerusalem DOD values are much too low (by a factor 4...)