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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long range transport and mixing of aerosol sources during the 2013 North American biomass burning episode: analysis of multiple lidar observations in the Western Mediterranean basin" *by* G. Ancellet et al.

G. Ancellet et al.

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Anonymous Referee #2 Received and published: 18 December 2015

In the presented work gives an extensive examination of the aerosol situation in summer 2013 in the Western Mediterranean area. The paper is well written and interesting to read, and I have only minor comments which should be considered before publication in ACP. Introduction: You define BER as extinction to backscatter ratio. In Section 3.1 you define the lidar ratio (LR) as BER-1. To my knowledge the general definition of

the LR is extinction-to-backscatter ratio.

Yes the reviewer is right. It was a mistake we meant backscatter to extinction ratio. The word BER has now been removed from the paper as the most popular parameter is the lidar ratio.

Section 2.1: Please give references for this information.

done

Section 3.1: Can you give a reference for the forward Klett inversion? Please give more information on the exponent k (order, differences depending on aerosol type).

In fact for a forward inversion scheme it is known as the Fernald forward inversion. The name has been corrected and a refrence to Fernald (1984) is added p. 6 L 147. The range for the k value goes from 0 to 2 according to the contribution of the fine mode. This has been added p. 6 L 158.

Section 3.3: What do you mean by 'Atlantic dust sources'?

Yes we agree the word is misleading. There is of course no dust source over the Atlantic. It has been replaced by the dust aerosol layers over the Atlantic ocean used for the initialization of the FLEXPART Lagrangian model.

Figure 1: Please give the time of the CALIOP tracks and the FALCON 20 flight in the figure caption.

The legend in Figure 1 has been changed and date and time of the aircraft flight is given in the caption.

Figure 2: Panels are not top and bottom. Would it be possible to use the same scale for both panels ?

Done.

Figure 3: How do you explain the very inhomogeneous structure in Depol and CR

(especially on 21 June) which seems not really to correspond with the layering shown in R532-plot? Also on 22 June the intensive optical properties seem to be very variable within the aerosol plume. I would not expect such large differences.

The CALIOP figures (3 and 7) have been reprocessed to remove the noisy data in the depolarization and color ratio vertical cross sections. Data are not provided for backscatter ratio less than 2 because the ratio of two noisy values is not reliable. Some inhomogeneity remains because the aerosol mixing and composition change near the boundaries of the layers. Data provided in the paper are averages over the aerosol layers identified in the backscatter ratio vertical cross sections.

Figure 8: Please indicate the source of these plots (FLEXPART?) in the figure caption.

Done

List of author's changes in the manuscript

See attached pdf to identify in red the modifications of the text.

Although it was not requested by the reviewers, a new table (Table 4) is added in section 4.3 to summarize the aerosol optical properties of the 4 different aerosol types described in the paper.

Fig. 1, 2, 3 and 7 have been updated. Error bars are given for depolarization ratios in Table 3.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/15/C11847/2016/acpd-15-C11847-2016-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 32323, 2015.