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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The vertical distribution of aerosols, Saharan dust and cirrus clouds at Rome (Italy) in the year 2001" *by* G. P. Gobbi and F. Barnaba

Anonymous Referee #1

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GENERAL COMMENTS

This paper presents analyses of one year of lidar measurements of tropospheric aerosols and cirrus clouds from a site near Rome, Italy, with particular emphasis on the influence of Saharan dust aerosols. The paper gives a clear description of the instrumentation and the data analysis procedures and is potentially a very useful contribution to our knowledge of atmospheric radiative forcing by aerosols and clouds. However, I don't understand the authors' choice of data groups (no cirrus, no dust, and Saharan dust), since there is some overlap between groups. I also question the usefulness and meaning of the "total" data grouping and the presentation of yearly averages of optical properties. The results would be more useful if restricted to physically

meaningful groups and seasonally averaged quantities.

SPECIFIC COMMENTS

1. To more closely match the discussion in the paper, perhaps the word "aerosols" in the title should be changed to the phrase "planetary boundary layer aerosols."

2. Why was the lidar calibration done against a monthly standard atmosphere and not individual radiosondes more closely matched in time with the observations?

3. I found the data groupings used in the tables and plots to be confusing. I had to continually refer back to the part of the text where the various categories (NC, ND, SD) were defined. Can the categories be redefined to match those in the title, namely (PBL) aerosols, Saharan dust, and cirrus clouds?

4. The profiles in Figures 2 and 3 labeled "total" are not very meaningful to me. At first sight, it is confusing that the total can be smaller than one or more of the components making up the total. I think the "total" profiles are actually averages of the individual components weighted by occurrence frequency.

5. I also don't think the yearly average statistics and profiles are very useful, and it seems to me they can be misleading. For example, a big point is made in the paper about the increase in cirrus cloud extinction and R between 6-10 km in the yearly average Saharan dust (SD) profiles in Figure 2. However, Figure 3(d) shows that the extinction enhancement between 6-10 km occurs only in the fall (SON), when the influence of Saharan dust at altitudes a few km above the PBL is smaller than in spring (MAM) and summer (JJA). Can the authors explain this, or is this an example of a misleading average? Could the enhanced extinction between 6 and 10 km in SON be a result of biomass smoke being transported from Africa or even South America? Can the authors differentiate between aerosols and optically thin cirrus if the two exist in the same altitude range?

TECHNICAL CORRECTIONS

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Abstract, line 1: Extinction is not observed by lidar; it is derived from backscatter.

Section 1, line 4: It is not certain that indirect aerosol forcing is larger than direct aerosol forcing, only that the range of estimated values is larger.

Section 1, second line from bottom (and elsewhere): The lidar depolarization ratio does not indicate aerosol thermodynamic phase, only whether the aerosols are spherical or non-spherical.

Page 3, line 15: Change the word "individuated" to "selected."

Page 4, line 10: Change the word "weighed" to "weighted."

Section 3.1, first sentence: should read "Figures 2a, 2b, 2c, and 2d, respectively."

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 5755, 2003.