

Interactive comment on “Aerosol lidar observations and model calculations of the planetary boundary layer evolution over Greece, during the March 2006 total solar eclipse” by V. Amiridis et al.

V. Amiridis et al.

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We would like to thank the two anonymous referees for their constructive and helpful comments and suggestions on our paper. The answers to all referee comments are presented below.

Anonymous referee 1:

The manuscript is very interesting and deserves publication after a few details are clarified. In particular, it is mentioned that there is previous work on the PBL development during solar eclipses, and that even lidar measurements were made before. The ma-

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terial available in the literature is named important. However, there is no discussion or conclusion on what is even more important or new in the work presented. This could be that more experimental material is available, that modelling was performed in addition to the measurements, that the measurement sites are different from a meteorological point of view or that two stations were intercompared (which could deserve a few more words). I did not have the time to read the publications cited for a more specific recommendation.

The innovative points of the paper according to our opinion are: - Lidar measurements for the study of the evolution of the PBL during solar eclipses were used in few studies in the past. However, these measurements are rare and non representative of the phenomena. PBL evolution is different for different sites and meteorological conditions. It is also critical that the solar eclipse in our case happened during the time of the PBL development and not during sunset such in other studies. - For the first time, model estimations are used in conjunction with lidar measurements as a qualitative index of the evolution of the boundary layer. The above points are mentioned in our paper, however are more emphasized at the introduction of the new version of the manuscript, following the reviewer suggestion.

A few minor details should be considered or corrected: 1. Abstract, line 4: Delete "(Lidars)"; lidar is already mentioned. 2. Abstract, line 5: change to "mixing layer". 3. Abstract, line 6: change to "northern" and "southern". 4. Abstract, line 11: change to "above the ground". 5. Abstract, line 16: Change to "Model-diagnosed". 6. P. 13541, line 6: Remove the second: "simultaneously". 7. P. 13544, line 8: Change to "can be found in (Gerasopoulos et al., 2007)".

The text has been corrected according to reviewer suggestions. All minor details mentioned by the reviewer were included.

Figure captions: The numbers in Figs. 5 and 6 are very small indeed and cannot be properly read in the printed version. What does (e.g.) 12Z mean?

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Figures have been corrected according to reviewer suggestions. Numbers are larger now and Z time abbreviation (for “Zulu time”) was substituted by UTC.

Anonymous referee 2:

The paper is entitled -Aerosol Lidar observations and model calculations of..- and more comments about agreements and disagreements between them it will be expected. In particular, the PBL evolution, that is the central point of the paper, is studied starting from: RSCS lidar profiles, radiosondes profiles and CAMx process analysis. However, RSCS lidar profiles allow the determination of the mixed layer and of the entrainment zone thickness, while PBL height determined by radiosonde and CAMx are discussed. I suggest to explain why the PBL is not analysed starting from lidar: complete overlap region higher than PBL height itself at least for Athens, for Thessaloniki no information about it are present in the current version of the paper. Please add it. Furthermore some comments about the mixed layer height could be obtained also from radiosonde and CAMx and therefore compared to lidar ones. Simply looking to figure 5 and figure 1, it seems to me that there is a reasonable agreement between the ML lidar derived and the PM10 vertical distribution. But why for Athens the PM10 seems to be confined in a layer lower than 250 m while lidar sees a ML of about 1000m decreasing to 500m?

The following answer to the reviewer comment has also been added in the manuscript: We have to mention that PM10 vertical distribution is used in this paper only as a qualitative index of the evolution of the boundary layer therefore Fig. 5 cannot be used as a quantitative index of the ML height and thus cannot be directly compared to Lidar ML height measurements. The diagnostic calculation of PBL height by CAMx on the other hand (Fig. 4), yields indeed a PBL height which is generally lower than what is measured. According to our findings, a good agreement between lidar measurements and model estimations was found in the overall behavior of the PBL but not in absolute numbers. Possible reason for this discrepancy is that the lidar measures on a spot while the model averages in an area of 4 km². Additionally, the model produces only hourly average data while measurements have a sampling time of few minutes.

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Information about the complete overlap height were given in the text for both lidars (250m for Athens lidar and 400m for Thessaloniki s lidar). Corresponding references for further details were also included (Balis et al., 2002; Chourdakis et al., 2002)

Technical corrections: Page 1, line 20: remove "although astronomical events", it is not necessary and obvious Page 3, line 14: ML is not defined, explain the acronym Page 7, line 18: insert FOV overlap limitation information also for Thessaloniki

The text has been corrected according to reviewer suggestions. All technical corrections mentioned by the reviewer were included.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 13537, 2007.

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