Atmos. Chem. Phys. Discuss., 13, C8999–C9001, 2013
www.atmos-chem-phys-discuss.net/13/C8999/2013/

Atmospheric Chemistry and Physics Discussions
Open Access

Interactive comment on "Comparison of mixed layer heights from airborne high spectral resolution lidar, ground-based measurements, and the WRF-Chem model during CalNex and CARES" *by* A. J. Scarino et al.

A. J. Scarino et al.

amy.jo.scarino@gmail.com

Received and published: 12 November 2013

Thank you for the valuable comments and suggestions on our efforts here. We have accommodated most of the suggestions and we think that it has helped us in improving the presentation of our paper. We hope that we have succeeded in answering your concerns.

Response to general comments:

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

Reviewer: An important reference to lidar mixing height work has been missed: S.C. Tucker et al., 2009: Doppler Lidar Estimation of Mixing Height Using Turbulence, Shear, and Aerosol Profiles. J. Atmos. Oceanic Technol., 26, 673–688. doi: http://dx.doi.org/10.1175/2008JTECHA1157.1 The Tucker paper particularly addresses the difference between aerosol layer height and turbulent mixing height, an important issue in the discussion paper.

Another important reference to the determination of PBL height: M. LeMone et al., 2012: Objectively determined Fair-Weather CBL Depths in the ARW-WRF Model and Their Comparison to CASES-97 Observations. Monthly Weather Review, vol. 141, pp.30-54.

Response: Thanks for pointing out these two references. I have added them to the list of references and cited them in the paper where relevant.

Reviewer: The authors attempt to redefine commonly used terms (around line 10 of p.13728). This cannot be allowed. While the existing terms are loosely defined and inconsistently used, these authors should not further contribute to the confusion. The mixed layer height and the PBL height are semantically similar properties of the atmosphere. For properties of the measured profiles, I recommend choosing terms from the references above. One possible choice would be to refer to what the lidar measures as "aerosol layer height" and what the sonde measures as "sonde BL height" or "thermodynamic BL height."

Response: Thank you for this suggestion. In the revised paper, we use the term mixed layer height, as in Tucker et al. This term will be used for both lidar/ceilometer and radiosonde measurements. In areas where it might be necessary to denote which ML height we refer to, we will add “aerosol” when discussing the lidar/ceilometer-derived heights and “thermodynamic” when referring to heights derived from potential temperature. These terms will also work for WRF-Chem as well when we discuss modeled thermodynamic profiles and modeled backscatter.

Reviewer: Fig. 9 and discussion pertaining to it: The RMS difference is about 50mean. On what basis is this considered "reasonable agreement?" In cases like this where both axes have large uncertainties, it is important to use an orthgonal fit (see C.A. Cantrell, 2008: Technical note: Review of methods for linear least-squares fitting of data and application to atmospheric chemistry problems. Atmos. Chem. Phys., 8, 5477-5487), since a simple one-sided fit will produce misleading results. Was this done? Should some obvious outliers be removed?

Fig. 15 and its discussion: See previous comment. In addition, what about the proportionally very large bias?

Fig. 17 and its discussion: See comments 4 and 5 above.

Response: Yes, we are using an orthogonal fit. We used the least-squares bisector regression algorithms found here: http://www.mbari.org/staff/etp3/regress/results.htm. Regarding the language used to describe the statistics; we will not use "reasonable agreement" for Figure 9. While there is some agreement in this comparison, there is a large scatter/noise, which results in the large RMS difference. For Figure 15 and 17, the large bias is telling us that the model tends to over predict the ML heights.

Reviewer: p. 13740, line 20: In what way were the model settings adjusted?

Response: For the "adjustments", it means that a few different parameterizations were used than in a prior process of the model. They were minor and the mention of "adjustments" has been removed in the revised paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 13721, 2013.

ACPD

13, C8999–C9001, 2013

Interactive Comment