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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The daytime mixing layer observed by radiosonde, profiler, and lidar during MILAGRO" *by* W. J. Shaw et al.

Anonymous Referee #2

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This paper discusses a comparison exercise conducted on ABL mixing height as derived from several data source (namely, lidar, balloon soundings a profiler) in the vicinity of Mexico City in the framework of the MILAGRO campaign. An ancillary objective of the paper is to discuss the diurnal evolution of the ABL structure, moisture and winds over the Mexican Plateau from multiple observation sites.

General Comments

Generally speaking the paper is well written, and the overall presentation well structured and clear. However, I found it to be very descriptive and not very insightful. As it is, the paper does not add much to the existing body of literature on the comparison of ABL mixing height retrievals from multiple data source, nor on the ABL structure

and evolution in the region of Mexico. In many occasions, the authors highlight what appear to be interesting dynamical features, but do not attempt to draw any conclusion. This paper may not even be considered a good introduction to ABL mixing depth retrieval methodologies, for the following reasons: First, the discussion on the interpretation of lidar data contains many inaccuracies. Second: there is a large bias towards the relevant US literature, and relevant European literature (even though published in American journals) is largely, not to say completely, ignored.

Based on this, I cannot recommend publication in ACP. The paper needs substantial revision for its content to comply with ACP standards. I suggest that the paper be published in ACPD after some corrections highlighted below.

Specific Comments

Section 3.1.2

P15035: Generally speaking, it helps to show some reflectivity profiles to evidence "the sharp reduction in signal generally delineating the boundary between the mixing layr and the free troposphere" (line 22). This is not so obvious from Fig. 3.

P 15035, Line 27: "This may be material that remained in the layer from the previous day, or it could be new aerosol particles created by photochemical processes". This is very doubtful, as photochemical processes are not very likely to produce particles of a size sufficiently large to "produce" the enhanced backscattered signal discussed here. In my opinion, the signature seen here is related to aerosols in the residual boundary layer (the remains of the convective ABL from the previous day) either produced local (the day before) or advected.

P15036, lines 5-8 : "Although the tabulation of Fast et al. (2007) does not indicate deep convection on this day, we speculate that the upper boundary layer may have nevertheless been disturbed by smaller convective clouds that were common in the afternoons on most days." There again this is very doubtful, for clouds would be visible

ACPD

7, S7521–S7524, 2007

in Fig. 3 as a distinct highly enhanced reflectivity feature.

Section 3.1.3

P15037, lines 16-17: "It is possible that these are gravity waves on the inversion, perhaps initiated by convection in the boundary layer". Yes this has been shown by Fochessato et al., 2001 (BLM)!!

Section 6

In this section, many highlighted phenomena are likely to trigger the interest of the reader, such as the impact of the Norte events on the wind diurnal cycle, or the link between the observations and the known/referred "southerly gap flows" or "coastal plain to plateau circulation". However, the authors do not attempt to draw any conclusion, which leaves the reader guessing which process is most likely to explain the observations.

Technical Comments

Abstract: 1. PNNL, ANL, UAH need not be defined in the abstract, as they are not used, 2. MILAGRO and IMADA-AVER should be defined

Section 2: 3. line 11: use Hz instead of s-1 4. line 15: "Radiation measurements at a delay time corresponding to a range of 45 to 55 km were used to evaluate the background radiation." How relevant is this to the paper??

Section 3.1 5. The work conducted during the ECLAP and ESCOMPTE experiments in France is not even mentioned. Also see the recent overview paper by Hennemuth and Lammert (2006) in BLM.

Section 3.1.2 6. p15036, line 4: "approximately 2 r". Please correct, i.e. 2 hr

Section 3.1.4 7. P15038: "rms" must be defined. 8. Generally speaking it would be interesting to discuss both bias and rms. Note that neither bias nor rms are discussed in the comparison of the ABL mixing height derived from lidar and radiosondes.

ACPD
7, S7521–S7524, 2007

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7, S7521–S7524, 2007

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