

## ***Interactive comment on “Aerosol plume transport and transformation in high spectral resolution lidar measurements and WRF-Flexpart simulations during the MILAGRO Field Campaign” by B. de Foy et al.***

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Thank you for your careful review of the manuscript.

1. The present work is a collaboration between modelers and experimentalists. Clearly, the greatest substance of the paper is from the HSRL measurements carried out during the MILAGRO field campaign. Nevertheless, the simulation results were instrumental in interpreting the measurements and carrying out the present study.

2. There is a fundamental problem in creating an equivalence between different Flex-

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part particles due to the great variation in source types in this study. Because the CO inventories are better constrained than PM<sub>2.5</sub>, it was decided to relate particle numbers to CO emissions. This poses a problem for dust, which were heuristically scaled to enable the analysis. We justify this by noting that the present study is focused on identifying emission sources and plume transport using a Lagrangian model. For an alternative approach using Eulerian models, please see for example Fast et al., 2009 and Hodzic et al., 2009.

3. Yes, one of the advantage of using a Lagrangian model is that we have particle ages for each particle. In this way, we can calculate both the mean age and the distribution of ages. In calculating the mean age, the number of particles were scaled using the same weights as for the Flexpart Particle Index.

4. UTM is the Universal Transverse Mercator coordinate system, which is in units of kilometers.

5. The ellipses were added to make the discussion easier to follow. They identify features in the HSRL data that were deemed relevant when analyzing the HSRL properties and the model results.

6. Correct, the left-most transect in the curtain plot is the northernmost one. However the aircraft moved from south to north which is why the text refers to the southern one as the first transect. This will be clarified in the text, we apologize for the confusion.

7. Analyzing the vast amounts of data from a field campaign is a large undertaking that can take many forms. For this paper, we have found that using models to identify features in the data was a valuable analysis tool. After this is done, some of the conclusions could be re-arrived at without the model entirely. In this respect, using models is a bit like browsing at your local book store: having found the book you want, you are still free to walk out empty handed and order it on-line. This does not mean however that the book store was useless in your choice of books. On the other hand, other conclusions still require the model, for example the particle ages. With regard to model

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performance, it should be kept in mind that Mexico City is a very complicated case of atmospheric transport. In addition, the ubiquitous presence of dust posed a challenge for analyzing the data.

8. Einstein once said: "A theory is something nobody believes except the person proposing the theory, whereas an experiment is something everybody believes except the person doing the experiment." In the world of atmospheric science, this is usually heard with "theory" replaced by "modeling." It is hoped that by acknowledging the model imperfections the present paper can promote a fruitful symbiosis of experiments and simulations. The model imperfections are treated in greater detail in previous papers, especially de Foy et al., 2009b.

NB: References are the same as the ones in the paper.

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