

## ***Interactive comment on “Evidence of tropospheric layering: interleaved stratospheric and planetary boundary layer intrusions” by J. Brioude et al.***

### **Anonymous Referee #2**

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#### General Comments

The paper entitled 'Evidence of tropospheric layering: interleaved stratospheric and planetary boundary layer intrusions' by J. Brioude et al. focuses on a single vertical profile of ozone, carbon monoxide and relative humidity as measured by one of the participating airlines in the MOZAIC programme. Although the profile clearly supports the ubiquity of laminar structures in the troposphere, I think that the case study in itself does not offer anything new to the scientific literature. There is nothing new about these observations, nothing novel in the method of analysis, and no new insight into the formation and lifetime of such layers. Analysis on the most prominent fold from the measured profile has already been published and the analysis on the remaining features from the profile is weak, insufficient and superficial. The balance between

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introduction, methods, and data far outweighs that of the analysis. Furthermore, the authors claim that the combination of forward and backward simulations allows the time period of the layers to be assessed. It is not evident to me how any information from the forward trajectories was used in the analysis. They also state that it is a valuable case study for the validation of global chemistry transport models - I feel that there is no shortage of case studies and the resolution of existing global models makes simulating such a profile beyond current capabilities anyway. As the paper stands, I feel that it is not acceptable for publication.

The authors make use of the reverse domain filling technique to reconstruct the observed profile and attribute the observed folds to stratospheric air. They state that validation of the proposed method lies on its ability to reconstruct the ozone profile. I feel that a single case study is not sufficient to validate a methodology and would prefer to see a number of cases. What are the strengths and weaknesses of the method? When does it and when does it not work well? How sensitive are the results to the representation of sub-grid scale processes in FLEXPART? Given that ozone is being treated as an inert tracer, what impact will chemistry have on the results? Can you be quantitative in your assessment of the method?

Specific Comments 1. Introduction - line 1 of pg 1121 - A source region of these layers is

2. Introduction - pg 1125 - the reconstruction method is not clearly explained.

3. MOZAIC observations - line 3 pg 1123 - a commercial airliner participating in the MOZAIC programme

4. Lagrangian Calculations - line 23 pg 1123 - over 1 h time intervals

5. Conclusions - line 20 pg 1131 - carbon monoxide

6. Conclusions - line 21 pg 1131 - by one of the commercial airliners participating in the MOZAIC programme

Generally, the figures should be made bigger and more clear

7. Figures - axis label of Fig 1a - put RH(

8. Figures - Figure 3 is particularly difficult to understand. Also, are the contour intervals of 0.01, 0.015 ppbv correct?

9. Figures - Figure 5 - RDF-ozone reconstructed vertical profile

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 1119, 2007.

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