

Interactive comment on “First carbon dioxide atmospheric vertical profiles retrieved from space observation using ACE-FTS solar occultation instrument” by P. Y. Foucher et al.

Anonymous Referee #1

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General comments

The manuscript "First carbon dioxide atmospheric vertical profiles retrieved from space observation using ACE-FTS solar occultation instrument" by P. Y. Foucher et al., submitted to Atmos. Chem. Phys., presents carbon dioxide vertical profiles in the upper troposphere and the lower stratosphere retrieved from five years solar occultation observations by ACT-FTS, and comparisons with aircraft data (CONTRAIL, CARIBIC, and SPURT) and simulation data by the Flexpart Lagrangian particulate dispersion model and the CarbonTrakcer. The topic is basically appropriate for Atmos. Chem. Phys.

Generally plots and descriptions in axis in figures are somewhat unfriendly for readers.

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I would like to ask authors to consider modifications, which are described in Technical comments.

I recommend it to be published after the comments given below are addressed by the authors.

Specific comments

Page 26476, line 21: There are some studies published for CO₂ retrieval from observation by ACE-FTS instruments. For example, “Rinsland, C. P., L. S. Chiou, C. Boone, and P. Bernath (2010), Carbon dioxide retrievals from Atmospheric Chemistry Experiment solar occultation measurements, *J. Geophys. Res.*, 115, D03105, doi:10.1029/2009JD012081,” and “Beagley, S. R., Boone, C. D., Fomichev, V. I., Jin, J. J., Semeniuk, K., McConnell, J. C., and Bernath, P. F.: First multi-year occultation observations of CO₂ in the MLT by ACE satellite: observations and analysis using the extended CMAM, *Atmos. Chem. Phys.*, 10, 1133-1153, doi:10.5194/acp-10-1133-2010, 2010.” It is helpful for readers to describe their characteristic and/or difference.

Page 26477, line 20: Tangent height, tangent altitude, and altitude. Are there differences in meaning? Please clarify.

Page 26477, line 24: “six optimized microwindows has been selected in the 2400–2500 cm⁻¹”, but I understand that in the paper of Fal2009 five optimized microwindows has been selected. If it is right, what is the difference? If you have re-selected in this paper, please describe more detail.

Page 26481, line 14-16: “At present, five years (2004–2008) of ACE-FTS observations have been processed using the method briefly described above and provide, for the first time, CO₂ vertical profiles on a near global scale.” If possible, could you show global plots or explain main features of CO₂ vertical profiles on a near global scale?

Page 26483, line 19: How much latitude does the CARIBIC cover in this comparison? It should be described.

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Page 26484, line 2: Why did you compare the 50 deg. N – 60 deg. N latitude band of ACE-FTS with the CONTRAIL and SPURT data? It should be described as in the case of the comparison with the CARBIC data.

Page 26484, line 11: Authors described “Figure 6 (top) can also be directly compared to results from SPURT (see Fig. 9 of Hoor et al., 2004 and Fig. 5 of Gurk et al., 2008).” however, periods of the SPURT data (Jan 2002-Jul 2003 and Nov 2001-Apr 2003) don’t cover a period of ACE-FTS data (2004-2008) and they are NOT direct comparison. Of course, authors can compare with them in terms of seasonal variations, but have to describe correctly.

Page 264849, lines 17 and 18: A paper by Sawa et al., 2008 for the CONTRAIL is more suitable than Machida et al., 2008, and a paper by Gurk et al., 2008 should be added for the SPURT.

Technical comments

Page 26483, line 24: Please simplify the description “The slopes of the best fit lines also agree and correspond to a mean tropospheric annual growth rate of about 1.9 ppm yr⁻¹ from 2005 to 2008, in agreement with the mean annual growth rate observed at the surface for this time period (. . .”.

Page 26489, line 18: “in situ aircraft measurements” is unnecessary, because “in situ aircraft measurements” is already described in line16-17. Please delete it

Page 26493, line 17: The doi is not complete. “3” is missing. It should be “10.1029/2001JD001443”. Please check it and others.

Page 26497, Fig. 1: Please move an explanation for the color bar near the color bar.

Page 26498, Fig. 2: (Top) Please add Latitude (deg.) in the vertical axis and Longitude (deg.) in the horizontal axis. (Bottom) Please add (deg.) after latitude in the vertical axis. Page 26499, Fig. 3: Some plots are incomplete and please modify. In x-axis please add unit “km”.

Page 26501, Fig. 4b: “8” is missing on right side in the horizontal axis. Please add “Averaging kernels” before ppm/ppm.

Page 26502, Fig. 5: (Top) in the vertical axis please add CO₂ VMR before ppm. In the horizontal axis MM/YY is congested. Please modify.

Page 26503, Fig. 6: (Top) MM/YY in the horizontal axis are partially missing. Please add CO₂ VMR (ppm) in the vertical axis. (Bottom) Please provide an approximate relationship between delta theta (potential temperature) and altitude.

Page 26504, Fig. 7, Page 26505, Fig. 8, Page 26506, Fig. 9, Page 26507, Fig. 10, Page 26508, Fig. 11, and Page 26509, Fig. 12: Please replace P with Pressure in the vertical axis, and add CO₂ VMR before ppm. A difference between bold and fine lines for ACE data should be explained.

Page 26510, Fig. A1, Page 26511, Fig. A2, Page 26512, Fig. A3: An explanation of bars in plots should be described. A difference between bold and fine lines for ACE data should be explained.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 26473, 2010.

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