

Interactive comment on “First space-borne measurements of methanol inside aged tropical biomass burning plumes using the ACE-FTS instrument” by G. Dufour et al.

Anonymous Referee #2

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The paper "First space-borne measurements of methanol inside aged tropical biomass burning plumes using the ACE-FTS instrument" by G. Dufour et al. reports on ACE-FTS measurements of methanol in biomass burning plumes. To my knowledge, these are the first space borne measurements of methanol, and in combination with the CO profiles retrieved simultaneously from the same measurements, they can provide information on the importance on secondary methanol formation in aging biomass burning plumes. In the case presented in this paper, there is no evidence for such a production.

The paper is clearly written and well organised. It reports on important advances in our ability to probe the troposphere from space, includes results from a detailed error

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analysis and uses the data to contribute to the ongoing discussion on the possibility of secondary methanol formation in aging plumes. The only weakness of the paper is the sometimes (in my opinion) too vague use of terms which the authors should improve. I therefore recommend publication of the paper after minor corrections as suggested below.

Abstract and page 3951, l 18: I'm not quite sure about the use of the term "reliable profiles". From the text, it seems as if profile points with more than 100% relative error are considered as unreliable. While this makes some sense for an individual profile, random errors could be reduced by averaging and thus the useful measurement range be extended. Also, application of this criterion to all measurements would leave very few points in particular for background situations but also at the lower end of Figure 5. Please clarify what has been done.

p 3948, l 10: A vertical resolution of 3 - 4 km is given in the text. It is not clear to me how this relates to the steps in tangent altitude. Also, when pointing out the advantages of ACE-FTS profiles over in-situ measurements which so far are limited to up to 12 km altitude, the FWHM of 4 km has also to be acknowledged.

p 3949, l 14: For the comparison with in-situ measurements, it would be good to give some details on how aged the plume was even though this might repeat information from the Rinsland et al., 2005a paper.

p 3951, l 15: is a minimum => has a minimum

p 3952, l 14: How can a sampling effect change the relative altitudes of the CO and CH₃OH profiles in the same measurement? Is this the effect of differences in vertical resolution or just uncertainty from the individual errors?

p 3952, l 22: How were biomass burning plume data selected? Is the selection based on CO? I assume that the entire profiles were used even if only part of the profile was affected by biomass burning?

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p 3952, l 25: Shouldn't the correlation coefficients for the background cases always be smaller as some error contributions are absolute errors which will increase the scatter of the data points at lower mixing ratios?

p 3953, l 2 and following: If I understand the discussion correctly, two implicit assumptions are made in the analysis: 1) the CO and methanol background as well as the enhancement ratio are independent of altitude and 2) all plumes and data sampled have the same enhancement ratio. While these assumptions might be reasonable, they need to be mentioned and briefly discussed.

p 3952, l 9: Here it is stated that secondary production of methanol is unlikely. As this is one of the main conclusions of the paper, some more details should be given to the reader, e.g. on which primary emission ratio is expected under which conditions, how much the ratio should change per day according to model calculations if secondary production takes place and how this relates to the age of the plume(s) sampled and the uncertainty in the enhancement ratio determined.

p 3952, l 12: No indication is given where the tropopause height is in Fig. 2, 4 or 5. If the ability of ACE-FTS to take methanol measurements in the lower stratosphere is relevant here, tropopause height should be mentioned as well as the relative errors of the measurements for the biomass burning and background case.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 3945, 2006.

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