

***Interactive comment on “ACE-FTS observation of a young biomass burning plume: first reported measurements of C<sub>2</sub>H<sub>4</sub>, C<sub>3</sub>H<sub>6</sub>O, H<sub>2</sub>CO and PAN by infrared occultation from space” by P.-F. Coheur et al.***

**P.-F. Coheur et al.**

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General Comments

This paper describes the space-based detection of several trace gases from a fire in Africa. These represent the first measurements of these species from space. While this is essentially a single observation and is limited in that sense, the data presented provide some important information about how biomass plumes can develop, and give some insight into their potential effect on the chemistry of the lower atmosphere.

Reply

We thank the referee for his positive review. Below are our point-by-point responses to his specific comments

### Specific Comments

I think this is the first detection from space of these species, and if so, the qualifiers such as "infrared", "solar-occultation", and "simultaneous" need not be included.

### Reply

There have been previous measurements of PAN, NH<sub>3</sub> and acetone from MIPAS, which are referenced in the text. As for H<sub>2</sub>CO, it is measured from UV nadir sounders. The detection of C<sub>2</sub>H<sub>4</sub> has never been reported before. To include all species while highlighting the novelty of the results, the qualifiers "infrared" and "solar occultation" are therefore mandatory.

### Comment

I note the absence of any CO<sub>2</sub> retrievals. They are probably not reliable to an extent that would be useful, but this should be explained.

### Reply

CO<sub>2</sub> is not an ACE-FTS product. In fact, the CO<sub>2</sub> vmr is kept constant such as to enable the retrievals of pressure and temperature.

### Comment

How long was the transport model run? Did you start the model far enough back in time? The difference between Fig 3a and 3b shows that a large amount of CO is not from biomass burning. What are the other sources of CO and how do you include them in your model?

### Reply

The model distributions in figure 3 correspond to a three days period between 7 and

9 October 2005 (see first paragraph of section 3.1. and caption of Figure 3). As for the additional sources of CO, they include anthropogenic emissions (biofuel and fossil fuel) as well as the oxidation of hydrocarbons. More details on the model can be found in Turquety et al. (2007), referenced in the paper.

Comment

In Sec 2.2 you say the V2.2 vmrs are systematically readjusted. How big are these adjustments? This would be useful information for those using ACE-FTSV2.2.

Reply

The vmrs of the interferers have been readjusted only to improve the spectral fits in the window of interest to detect new species. These windows are not suitable for the accurate retrieval of these "interferers" and the retrieved values have therefore little meaning.

Comment

In Sec 3.2 you describe the top panel of Fig 5 as coming from previously reported results. It's not completely clear that you are talking about the same occultation, ss11607. This should be clarified.

Reply

We agree with the referee that this sentence was unclear. It has been modified in the revised manuscript.

Comment

Sec 3.3 you mention the likelihood of strong vertical uplift to explain the relatively high altitude for such a young plume. If possible, this should be corroborated with the ECMEF data or some other source.

Reply

The model does not suggest particularly strong convection to occur at that location, which may be one of the reason why the simulated CO does not reproduce the observed enhancement in the upper troposphere (see the new Figure 4). This point to the fact that the situation studied here is unusual.

Comment

Fig 1. You should mention the range of dates that the data were collected in the figure caption.

Reply

This information has been added.

Comment

Fig 5. I'm confused about the scales. For example, the top left panel shows an HCOOH absorption feature with transmittance of 0.8. Wouldn't neglecting molecule this give a residual much bigger than 0.05?

Reply

The figure has been changed to be compliant between the transmittance and residual scales.

Comment

Fig 6. The retrieved vmrs do not indicate any type of uncertainties, nor is this addressed in the text. These needs to be discussed.

Reply

Errors estimation were indeed missing in the text. In the revised manuscript, the statistical errors from the retrievals are shown for the CO profile (Figure 4) and included in Table 2 for all species.

Technical Corrections

Fig 2 belongs in Fig 1.

Reply

The figures have been separated such as to keep the individual panel large enough. Unless the referee objects, we would prefer keeping the structure as such.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 7907, 2007.

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