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## ***Interactive comment on “Ground-based FTIR measurements of CO from the Jungfraujoch: characterisation and comparison with in situ surface and MOPITT data” by B. Barret et al.***

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### General comments

The paper describes the CO routine measurements performed at the ground-based Jungfraujoch station using solar absorption FTIR spectra, and provides a full characterization in terms of vertical information and error budget. It also discusses the agreement with correlative data obtained from coincident surface measurements and from the spaceborne Mopitt instrument.

I found the paper well-written, and interesting. I recommend its publication in ACP. This paper should help the users of ground-based FTIR measurements and the satellite

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community as it clearly describes the different errors that may impact the measurements, and the vertical accuracy achievable. The averaging kernel correction treatment for comparison with Mopitt data is properly done and the description should help to interpret other tropospheric satellite measurements.

It is worth noting that recent validation results obtained for Mopitt using aircraft in-situ profiles (see paper from Emmons et al. 2003, available from <http://www.eos.ucar.edu/mopitt/pubs/index.html>) for Phase 1 (the one used in the paper which extends from Mars 2000 to May 2001) show a positive bias of 5%, in agreement with the results provided in this paper.

#### Specific comments

Section 2.2, 1stl: Define averaging kernels or explain how the calculation was performed or provide a reference. I think the reference to Rodgers [1990, 2000] comes to late in this section.

Section 2.3 and Table 1: A comparison between the measured variabilities (instead of the one computed from the covariance matrix) and total random errors would be more useful. The variability as measured above a fixed point as Jungfraujoch station (CO temporal variability only) should be lower than that measured by a polar-orbiting instrument as Mopitt (temporal and spatial variability). Is then the choice of using the Mopitt a priori covariance matrix valuable to compute the smoothing error ? I would find more useful to report on the CO variability as measured at Jungfrau for comparison with errors.

Section 2.3 and Table 1: I guess uncertainty on the H<sub>2</sub>O content also impact on accuracy, although less than the other reported contributions?

Section 2.2 and Figure 2: The text says 'The second component has a narrow peak at the ground': I do not see a peak at the ground. Section 2.3 and Figure 2: I don't understand the sentence 'In agreement with the information content analysis, this error

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is therefore the smallest in the first layer (3.58-6.5 km) where the 2 leading...': on the plot it seems that the second eigenvector component is only contributing above that layer?

Section 4: About 'the very low relative sensitivity to the lower troposphere' of Mopitt: replace by "boundary layer" as Mopitt has its maximum sensitivity in the free troposphere.

The two sentences related to FTIR instruments at sea level may seem contradictory (We therefore expect that...uncertainties + Comparison between ...this case).

Technical corrections

- Section 1, 4th l: add 'of the atmosphere' after radiative forcing
  - Section 2.2: 3 leading eigenvectors >> three
  - Table 1: Error source is read as the label for the first column > replace by 'CO measurement'?
  - Section 4, 7th l after Equ.3: corresponding (s missing)
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Interactive comment on Atmos. Chem. Phys. Discuss., 3, 4857, 2003.

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