Atmos. Meas. Tech. Discuss., 4, C1370–C1372, 2011
www.atmos-meas-tech-discuss.net/4/C1370/2011/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Tropospheric and total ozone columns over Paris (France) measured using medium-resolution ground-based solar-absorption Fourier-transform infrared spectroscopy" *by* C. Viatte et al.

Anonymous Referee #2

Received and published: 13 August 2011

General comments:

This paper is an interesting and valuable study which convincingly demonstrates that total tropospheric ozone can be monitored with a simple ground-based spectrometer. The method of analyzing the ground-based spectra is one which has been advocated by a small number of investigators for many years (Pougatchev et al., Geophys. Res. Lett., 23, 1637-1640, 1996, and J. Geophys. Res., 100, 16,689-16,698, 1995.). However it's value has not, to my knowledge, been previously demonstrated using a rela-

tively inexpensive medium-resolution spectrometer.

The methodology of the paper is sound, presenting comparisons to other techniques and to model calculations after describing the measurements themselves.

Specific comments:

There are, however, two closely related minor points I feel should be addressed before the paper is accepted. First, I believe the authors overstate the 'independence' of the retrieved tropospheric and stratospheric columns. Second, the comparison to IASI is inherently somewhat qualitative, because the differing averaging kernels of the 2 instruments are not accounted for.

On the first point, on p 3343, lines 23-25, the authors state "ground-based FTIR measurements. . .are. . .capable of monitoring tropospheric ozone, with little or no interference from stratospheric ozone." There is no doubt in my mind that stratospheric and tropospheric ozone can be usefully separated by these measurements, but this is too strong a statement. In the same paragraph they discuss time series of tropospheric and stratospheric ozone (75 measurements), which have a correlation coefficient of "only" 0.46. In fact, the probability of 75 samples of 2 independent random variables having such a correlation coefficient is vanishingly small. Further, it is not only extreme events which reveal the correlation of retrieved stratospheric and tropospheric values. The averaging kernels in Fig. 2 show clearly that the retrieved tropospheric amounts have a stratospheric contribution, and vice-versa.

On the subject of the averaging kernels, may I suggest that the authors show the kernels which apply to the tropospheric and stratospheric partial columns, instead of those applying to every altitude in the profile? These are simply the sums of the individual kernels (normalized so the units come out right) over the relevant altitudes, and would give a good visual guide to how cleanly troposphere and stratosphere can be separated.

The second point is simply that the averaging kernels are ignored in the comparison to IASI. This is a reasonable first step in making such a comparison, and arguably is all that is required here. However it must be acknowledged that the different kernels (which reflect differing physics, geometry, and analysis methods) make it impossible to draw quantitative conclusions from the comparison without further analysis, employing for example the techniques described in Rodgers & Connor, 2003. (J. of Geophys. Res., 108, 4116, 14 pp., doi:10.1029/2002JD002299).

In summary, I believe my concerns can be effectively addressed by: 1. A modified averaging kernels plot in Fig 2. 2. Changes in the text in the last paragraph of section 2.2 to recognize the correlation of retrieved troposphere and stratosphere. 3. Changes in the text of 3.1 to acknowledge the qualitative nature of the comparison, and potential value of further quantitative analysis.

Technical corrections: p 3340, line 21: should say 'vertical resolution and accuracy' p 3341, line 5: correction needed to 'present theshow'

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 3337, 2011.