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Comment

## ***Interactive comment on* “Method for evaluating trends in greenhouse gases from ground-based remote FTIR measurements over Europe” by T. Gardiner et al.**

**T. Gardiner et al.**

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In response to the General Comments; it is the intention that the trend analysis tools are available to other groups for research purposes. Any enquiries should be direct to the corresponding author.

Specific comments 1 to 3 all refer to the need for a clearer definition of the partial and total columns used in the analysis. The following text will be added to Section 2 to address this issue -

The vertical profiles of the gases are determined from an optimal estimation method which generates a model atmosphere that best reproduces the observed solar absorption. The model atmosphere consists of a series of layers typically 1 to 2 km thick. The

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temperature and pressure in each layer is estimated and an a priori partial column of target gas in the layer (in units of molecules per  $\text{m}^2$ , i.e. the number of molecules in a one square metre vertical column through the layer) assumed. The a priori gas distribution is adjusted to give the best match between measured and modelled absorption given the covariance characteristics of the various parameters. The result is an optimal estimate of the vertical profile of the gas made up of the partial column amounts in each layer. The total column amount (also in units for molecules per  $\text{m}^2$ ) is the summation of the partial columns. The exact details of the layer heights vary between species and sites. In this work the total column is taken as the summation of the partial columns up to 50 km (or nearest available layer boundary) in order to give consistency between all sites and species. More details of the FTIR analysis methods are given by De Maziere et al (2005) and the references therein.

Specific comment 4. The following text will be added to Section 2.1 to clarify this issue

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The weighting function acts to give values of  $\sim 1$  well below the tropopause and  $\sim 0$  well above, with a transition from 1 to 0 around the tropopause with a vertical extent governed by the variability of the tropopause height at that site.

Specific comment 5. The data periods should have been included in the site information in Table 1, and this oversight will be corrected. The main issue is that the Izana data covers a shorter period (1999 to 2004) and it is certainly possible that this may be part of the reason for the differences between the Izana results and the other sites. It is beyond the scope of this paper to address this effect in detail, but it is an aspect that should be considered in the species-specific companion papers in preparation.

Specific comment 6. There is considerable year-to-year variability of the seasonal cycles in the various data series and the intra-annual model captures the general seasonal behaviour over the entire measurement period. Therefore, although it may appear that the model does not capture the full extent of the cycle in some cases (and in

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some years) it still represents the best estimate of the typical seasonal behaviour.

Technical correction 1 - this change will be made.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 15781, 2007.

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