

Interactive comment on “Trends, interannual and seasonal variations of tropospheric CO, C₂H₆ and HCN columns measured from ground-based FTIR at Lauder and Arrival Heights” by G. Zeng et al.

G. Zeng et al.

guang.zeng@niwa.co.nz

Received and published: 5 June 2012

Reply to Referee#1

thanks very much for the reviewer's very helpful comments. We have revised the paper substantially, in response to both reviewers concerns and suggestions. Our specific response to the concerns raised by the Reviewer#1 are detailed as below.

"P6193L14-20. I don't accept the argument that you do not need to take averaging kernels into account because you are interested in "characterizing the seasonal and

C3241

interannual variations rather than improving the comparison between the modelled data and the observed data." Without properly accounting for the averaging kernels and a priori profiles of the measurements, you can draw the wrong conclusions about where your model is (or is not) wrong. For example, if there is a significant difference in your averaging kernels at different times of the year, this may affect the measured seasonal cycle amplitude. Only if you apply the same kernels and a priori to the model can you properly assess whether the model is able to capture the measured seasonal cycle amplitude. At the very least, a sensitivity study should be undertaken to assess the magnitude of the effect of the averaging kernel and a priori profile on the model. P6194 Items (1) and (2) are not discussed further, so a quantification of their maximum effects is important."

We appreciate the very useful comments from the reviewer. We have substantially revised the manuscript (see the reply to the Reviewer#2). In particular, we have applied corresponding averaging kernels (AVKs) and a-priori data to each set of model data and compare them with the observed column data of CO, C₂H₆ and HCN (we have added HCN simulation results). The comparison between modelled data without AVKs applied and with the AVKs applied shows that there are no visible discrepancies for CO data and the correlations between the convolved and original data are close to unity. Indeed, there are some discrepancies for C₂H₆ and HCN data in magnitude but the correlations between the original model data and convolved model data are very high ($r=0.98-0.99$). These changes are shown in a set of new figures. Morgenstern et al. (2012) find the same.

"P6194 Items (1) and (2) are not discussed further, so a quantification of their maximum effects is important."

We have now revised the text to state the importance of non-biomass burning C₂H₆ sources (mainly fossil fuels and bio-fuels from the NH) for SH C₂H₆ through inter-hemispheric transport. We have performed a few sensitivity tests to assess the effect. As for possible long-term changes in OH, we are not able to carry out a more mean-

C3242

ingful assessment at this stage; we aim to carry out a future study to infer OH trends using available measurement data at Lauder and Arrival Heights

"Technical comments"

Thanks very much for pointing these out and we have made corrections accordingly. Please note that some texts/statements no longer exist due to the substantial revision of the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 6185, 2012.

C3243