Atmospheric Chemistry and Physics Discussions

Interactive comment on "Weekly cycle of NO$_2$ by GOME measurements: A signature of anthropogenic sources" by S. Beirle et al.

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General comments

The paper is well structured and well written. It presents a very relevant and important contribution to atmospheric chemistry research, because it demonstrates the capabilities of current satellite instruments to obtain quantitative information on tropospheric trace gases. I highly recommend its publication in ACP after the authors have addressed a couple of specific issues noted below.

Specific issues and technical corrections

Abstract:

* delete "artificial"

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Discussion Paper

* avoid unnecessary phrases, such as "Applying sophisticated algorithms ..."

Introduction:

* reword to "is generally expected for all countries with a Christian tradition..."

* "... and *on* features of its weekly cycle."

Retrieval:

* repetition: size of GOME pixel mentioned already in Introduction

* contradiction: you find "no indication of a weekly cycle in cloud cover", yet the cloud cover spand a range of 5% (i.e. 10% of its maximum value). Please insert uncertainty limits or signficance.

* move the paragraph beginning "The GOME data curretly ..." into next section. This is already a description of the results.

Week cycle:

* please provide some error estimates for the "weekend" reduction effect. For example: is it significant that the reduction is stronger in Europe compared to North America? The paper discusses some of the cultural differences but leaves out a few major ones. E.g.: stores are opened on Sunday in the US, but generally not in Europe. What about Japan or e.g. South Africa? Another interesting "proof of concept" would be the addition of a few major holidays, e.g. Thanksgiving in the US, where everybody visits their grandmother, or e.g. Easter Monday and Ascension in Germany, where work activity is reduced, but travel increased.

* Are there important places where the change from overlap to full coverage of a GOME pixel occurs on the weekend ?

* Why does "the presence of a weekly cycle" underline the significance of trop. VCD? Do you mean, "the observation of a weekly cycle adds credibility to the retrieval of

tropospheric VCD"?

Lifetime estimation

* This part clearly weakens the otherwise strong paper. The lifetime of NO2 in the boundary layer varies over at least one order of magnitude with location and season. This should at least be discussed properly (don't forget deposition), and the analysis should perhaps be restricted to summer months only.

* the point would be stronger if you invert the problem and use your own data to estimate the weekly cycle of emissions based on different lifetime assumptions. The Wickert data could then be used independently for comparison

* another assumption implicitely made for the retrieval is that the shape of the vertical profile remains constant

Conclusions:

* you can safely remove the "Furthermore" (1st line page 3460)

* here you mention that "further information (on the lifetime) can be gained by analyzing the weekly cycle of summer and winter data seperately." Then, why don't you do it?

Figure 2:

contains a lot of redundant information. In order to make your point, it would be better to average over all weekdays and contrast the weekend in a 2-panel plot for each region. Only in the near east region, three panels may be more appropriate. Alternatively, you may wish to show deviations from the mean rather than absolute values.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 3451, 2003.