**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Retrieval of CO from SCIAMACHY onboard ENVISAT: detection of strongly polluted areas and seasonal patterns in global CO abundances" *by* C. Frankenberg et al.

C. Frankenberg et al.

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We thank the anonymous referee for his positive review and helpful comments. We implemented the reviewer's suggestions for improvements as good as we could and will explain this in detail in the following.

Reply on specific comments

General remarks

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RC: It would be helpful to add a reference to the optimization of the fitting window (section 2.3) if available; the paper necessarily states the selected fitting window, but provides no description of the optimization.

AC: We agree that this would be helpful. However, there is (unfortunately) not much choice about the fitting window. In principle, there are only two different regions where several CO lines can be detected where we took the one at lower wavelengths due to the better signal to noise ratio. We now included this explanation about the choice of the fitting window.

RC: Section 2.4, entitled "Aims" actually describes the approach to treatment of clouds. The authors include cloud "contaminated" pixels and use a graphical mapping approach to present the results. The graphical approach tends to exhibit data for cloud-free pixels wherever such are available (because the total column abundance is greater), and to not distinguish between cloud-free and cloudy data. Thus, interpretation of Figure 3 is somewhat ambiguous. The representation of cloudy data is a challenge to the entire research community.

AC: Appropriate cloud filtering is definitely needed for further more quantitative studies. In this study we tried to lay emphasis on the qualitative changes in global CO distributions without focussing on a very quantitative discussion. In future studies we will include sophisticated cloud detection algorithms that have already been proven succesful for the predecessor instrument GOME.

RC: While the paper's title appropriately refers to a capability for detection of strongly polluted areas and patterns, line 10 of Section 3 claims "low column abundances can be measured by SCIAMACHY". This statement would be more accurate if it claimed column abundances can be "detected", as in the title. To claim measurement, the paper should compare the numerical values from SCIAMACHY to surface observations

as well as to other, well-validated satellite observations (e.g., MOPITT). Section 2.3 line 13 indicates that the column abundance statistical error for the reported retrievals of SCIAMCHY CO is "below 30%". Such errors are acceptable when presenting patterns and maxima, but need improvements before reporting quantitative data. The calibration and instrument interpretation efforts described at the end of the conclusions are encouraged, and should result in data which are more quantitative, rather than the mostly qualitative results reported here.

AC: We agree that we must not claim *quantification* or *measured* here but should instead write *detection*. Currently, a proper quantitative analysis is still difficult since the impact of the ice layer has a strong effect on the methane retrieval. A biasing effect on the CO retrieval can also be expected but is not well quantified yet. The major problem arises when the ice layer on the detector thickens, resulting in broader slit functions (without knowing the exact shape) which subsequently hampers the fit quality. Many groups are currently putting enourmous effort in these issues which hopefully results in more qualitative CO retrievals in the near future.

RC: Under Conclusions, line 14 states that SCIAMCHY is able to detect CO globally "with sufficient accuracy". This statement should be made more accurate and informative. The authors can clearly state that "SCIAMCHY is able to detect CO globally with suf- ficient accuracy to detect maxima and seasonal patterns." Or, the statement might substitute the numeric value and avoid vague adjectives by stating "SCIAMCHY is able to detect CO globally with a column averaged accuracy of 30%", although this is less supported by the discussion in the paper itself.

AC: As proposed, we will change the sentence to "SCIAMACHY is able to detect CO globally with suf- ficient accuracy to detect maxima and seasonal patterns."

Technical remarks

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RC: Technical changes For the busy reader who is not immersed in SCIAMACHY, it would be helpful to add the wavelength range of Channel 8 to the first reference to Channel 8. The authors have already provided the specific sub-region of Channel 8 used in this retrieval.

AC: We added these numbers

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 8425, 2004.

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