

***Interactive comment on “Near infrared nadir sounding of vertical column densities: methodology and application to SCIAMACHY” by S. Gimeno García et al.***

**Anonymous Referee #1**

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The manuscript "Near infrared nadir sounding of vertical column densities: methodology and application to SCIAMACHY" of Gimeno Garcia et al., submitted for publication in Atmos. Meas. Tech., covers an interesting topic appropriate for Atmos. Meas. Tech. Overall the paper is well written. I recommend its publication in Atmos. Meas. Tech. after the comments listed below have been considered by the authors.

Section 2.1, page 3688, lines 12-13: Please add a reference and/or more details concerning the statement that scattering can be neglected in the NIR and shortly discuss to what extent this is valid for the applications presented in this manuscript including

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CO and methane (where the accuracy requirements are much more demanding) and CO<sub>2</sub>, as the authors claim that the algorithm can be used for all three gases.

Section 2.3.1, page 3694, line 18: The approach to use methane to improve the SCIAMACHY CO column retrieval was first published in Buchwitz et al., 2006, not in Buchwitz et al., 2000. The reference needs to be modified.

Section 2.3.1, eqs. (19) and (20): The notation "xGas" or "XGas" for satellite retrievals is typically used to indicate that the retrieved quantity is a "column-averaged mole fraction" or "column-averaged mixing ratio" (see, e.g., Schneising et al., 2009) ("X" stems from the chemistry notation for mole fraction). In this publication this notation is also used for methane (eq. (20)) but not for CO (eq. (19)), as xCO denotes a (corrected) vertical column density (in molecules/area). This is a bit unfortunate and may lead to confusion. Fortunately, the authors have clearly defined the meaning of the terms as used in their publication.

Section 3.1, page 3697, line 1: Please change 1671 - 1629 nm to 1629 - 1671 nm.

Section 3.4, page 3700, line 9: Please add a reference for the statement that the effect of the ice layer leads to a broadening of the spectrum.

Section 4.2.2, page 3709, line 4: The statement that the CO retrievals are column mixing ratios is in contradiction to eq. (19). Please clarify.

Section 5, 2nd paragraph: This section gives the wrong impression that BIRRA overcomes problems of DOAS algorithms, e.g., by analyzing radiances rather than optical thickness. This is not true for DOAS algorithms such as, e.g., IMAP (Frankenberg et al., 2005b). Please rephrase this paragraph.

Section 5, page 3711, line 17: Please explain SMR (for readers only reading the Summary section).

Figures: General: The annotation of nearly all figures (essentially all text items) needs to be significantly enlarged as otherwise it is hardly possible to read the annotations in

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a printout.

Figure 2: Please carefully check the figure caption. For example (b) not only shows year 2004 data and "left" needs to be replaced by "top".

Figure 6: What is the reason for the large scatter of the values ?

Figures 11, 12, 16: The x-axis needs to be modified such that it is easier to see where one year starts and the next begins. Alternatively, this could also be done by adding vertical lines.

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 3685, 2011.

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