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The impact of SCIAMACHY near-infrared instrument calibration on CH_4 and CO total columns

A. M. S. Gloudemans[1], H. Schrijver[1], Q. Kleipool[1,*], M. M. P. van den Broek[1], A. G. Straume[1,**], G. Lichtenberg[1], R. M. van Hees[1], I. Aben[1], and J. F. Meirink[2]

[1]SRON National Institute for Space Research, Utrecht, The Netherlands
[2]Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands
[*]now at: Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands
[**]now at: the European Space Agency, European Space Research & Technology Centre (ESA-ESTEC), Noordwijk, The Netherlands

Abstract. The near-infrared spectra measured with the SCIAMACHY instrument on board the ENVISAT satellite suffer from several instrument calibration problems. The effects of three important instrument calibration issues on the retrieved methane (CH_4) and carbon monoxide (CO) total columns have been investigated: the effects of the growing ice layer on the near-infrared detectors, the effects of the orbital variation of the instrument dark signal, and the effects of the dead/bad detector pixels. Corrections for each of these instrument calibration issues have been defined. The retrieved CH_4 and CO total columns including these corrections show good agreement with CO measurements from the MOPITT satellite instrument and with CH_4 model calculations by the chemistry transport model TM3. Using a systematic approach, it is shown that all three instrument calibration issues have a significant effect on the retrieved CH_4 and CO total columns. However, the impact on the CH_4 total columns is more pronounced than for CO, because of its smaller variability. Results for three different wavelength ranges are compared and show good agreement. The growing ice layer and the orbital variation of the dark signal show a systematic, but time-dependent effect on the retrieved CH_4 and CO total columns, whereas the effect of the dead/bad pixels is rather unpredictable: some dead pixels show a random effect, some more systematic, and others no effect at all. The importance of accurate corrections for each of these instrument calibration issues is illustrated using examples where inaccurate corrections lead to a wrong interpretation of the results.

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