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Error analysis for CO and CH_4 total column retrievals from SCIAMACHY 2.3 µm spectra

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Abstract. A detailed sensitivity analysis of the Iterative Maximum Likelihood Method (IMLM) algorithm and its application to the SCIAMACHY 2.3 µm spectra is presented. The sensitivity analysis includes a detailed assessment of the impact of aerosols in the 2.3 µm range. Results show that near strong aerosol sources mineral dust and biomass aerosols can have an effect of ~7–10% on the CH_4 total columns retrieved from this wavelength range if aerosol scattering is neglected in the retrieval algorithm. Similar but somewhat larger effects are found for CO, but due to the larger variability of CO these errors are less important. Away from strong sources much smaller effects of a few percent are found. Using CH_4 as a proxy for CO and/or including aerosol information in the retrieval algorithm significantly reduces these errors for both CO and CH_4. Spectroscopic uncertainties are mostly negligible except for uncertainties in the CH_4 intrinsic line intensities, which can be important. Application of the IMLM algorithm to the SCIAMACHY 2.3 µm spectra shows that the quality of the retrieved CO and CH_4 total columns is good, except for a bias for large instrument-noise errors which is partly due to remaining calibration issues. Polarization sensitivity of the SCIAMACHY instrument has a negligible effect on the retrieved CO and CH_4 total columns. The H_2O total columns, which have to be retrieved simultaneously with CO and CH_4 due to overlapping absorption lines, agree well with H_2O total columns from ECMWF data. This ensures that the fit to the H_2O absorptions is of sufficient quality not to hamper the retrieved CO and CH_4 total columns from SCIAMACHY spectra.

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