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Carbon monoxide, methane and carbon dioxide columns retrieved from SCIAMACHY by WFM-DOAS: year 2003 initial data set

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Abstract. The near-infrared nadir spectra measured by SCIAMACHY on-board ENVISAT contain information on the vertical columns of important atmospheric trace gases such as carbon monoxide (CO), methane (CH₄), and carbon dioxide (CO₂). The scientific algorithm WFM-DOAS has been used to retrieve this information. For CH₄ and CO₂ also column averaged mixing ratios (XCH₄ and XCO₂) have been determined by simultaneous measurements of the dry air mass. All available spectra of the year 2003 have been processed. We describe the algorithm versions used to generate the data (v0.4; for methane also v0.41) and show comparisons of monthly averaged data over land with global measurements (CO from MOPITT) and models (for CH₄ and CO₂). We show that elevated concentrations of CO resulting from biomass burning have been detected in reasonable agreement with MOPITT. The measured XCH₄ is enhanced over India, south-east Asia, and central Africa in September/October 2003 in line with model simulations, where they result from surface sources of methane such as rice fields and wetlands. The CO₂ measurements over the Northern Hemisphere show the lowest mixing ratios around July in qualitative agreement with model simulations indicating that the large scale pattern of CO₂ uptake by the growing vegetation can be detected with SCIAMACHY. We also identified potential problems such as a too low inter-hemispheric gradient for CO, a time dependent bias of the methane columns on the order of a few percent, and a few percent too high CO₂ over parts of the Sahara.

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