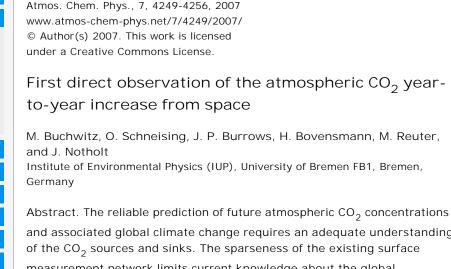
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and associated global climate change requires an adequate understanding of the CO<sub>2</sub> sources and sinks. The sparseness of the existing surface measurement network limits current knowledge about the global distribution of CO<sub>2</sub> surface fluxes. The retrieval of CO<sub>2</sub> total vertical columns from satellite observations is predicted to improve this situation. Such an application however requires very high accuracy and precision. We report on retrievals of the column-averaged CO<sub>2</sub> dry air mole fraction, denoted XCO<sub>2</sub>, from the near-infrared nadir spectral radiance and solar irradiance measurements of the SCIAMACHY satellite instrument between 2003 and 2005. We focus on northern hemispheric large scale CO<sub>2</sub> features such as the CO<sub>2</sub> seasonal cycle and show - for the first time - that the atmospheric annual increase of CO2 can be directly observed using satellite measurements of the CO2 total column. The satellite retrievals are compared with global XCO<sub>2</sub> obtained from NOAA's CO<sub>2</sub> assimilation system CarbonTracker taking into account the spatio-temporal sampling and altitude sensitivity of the satellite data. We show that the measured CO<sub>2</sub> year-to-year increase agrees within about 1 ppm/year with CarbonTracker. We also show that the latitude dependent amplitude of the northern hemispheric CO<sub>2</sub> seasonal cycle agrees with CarbonTracker within about 2 ppm with the retrieved amplitude being systematically larger. The analysis demonstrates that it is possible using satellite measurements of the CO<sub>2</sub> total column to retrieve information on the atmospheric CO2 on the level of

Final Revised Paper (PDF, 710 KB) Discussion Paper (ACPD) Corrigendum

a few parts per million.

Citation: Buchwitz, M., Schneising, O., Burrows, J. P., Bovensmann, H., Reuter, M., and Notholt, J.: First direct observation of the atmospheric CO<sub>2</sub> year-to-year increase from space, Atmos. Chem. Phys., 7, 4249-4256, 2007. <u>Bibtex</u> <u>EndNote</u> <u>Reference Manager</u> | EGU Journals | Contact

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