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Error characterization of SCIAMACHY WFM-DOAS XCO_2: Impact of aerosols and cirrus clouds

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Carbon Dioxide (CO_2) is the most important anthropogenic greenhouse gas. Column-averaged dry air mole fractions of CO_2 (XCO_2) as retrieved from SCIAMACHY on-board ENVISAT have the potential to provide important missing global information on regional CO_2 surface fluxes. This however requires to satisfy challenging accuracy requirements. An important error source is scattering by aerosols and undetected clouds, especially subvisual cirrus clouds. We have analyzed three years (2003 - 2005) of SCIAMACHY XCO_2 retrievals obtained with version 1.0 of the WFM-DOAS retrieval algorithm (WFMDv1.0) with respect to errors caused by aerosols and cirrus clouds. As reference, we use output of NOAA's global CO_2 assimilation and modeling system CarbonTracker. In a first analysis step, it has been investigated to what extent SCIAMACHY minus CarbonTracker XCO_2 differences are spatially and temporally correlated with global aerosol and cirrus clouds data sets. For this purpose, we have used a global aerosol data set (2003 - 2005) generated within the European GEMS project, which is based on assimilated MODIS satellite data. For cirrus clouds, we used a one year data set (2007) derived from CALIPSO/CALIOP. We found significant temporal correlations with cirrus clouds but also with aerosols. In a second step, we generated simulated spectra using GEMS aerosol and CALIPSO cloud data as input parameters for radiative transfer simulations and performed retrievals to study to what extent the observed differences with respect to CarbonTracker can be reproduced. We found that unaccounted variability of aerosols and cirrus clouds can explain a significant fraction of the difference between SCIAMACHY and CarbonTracker XCO_2, in particular over the Southern Hemisphere. In addition, we present first results of the application of a WFM-DOAS scattering correction algorithm.