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# Variability and long-term trends of carbon dioxide and methane column-averaged mole fractions retrieved from SCIAMACHY onboard ENVISAT

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Carbon dioxide ($CO_2$) and methane ($CH_4$) are the two most important anthropogenic greenhouse gases contributing to global climate change. Despite their importance our knowledge about their variable sources and sinks has significant gaps. However, satellite data, if accurate and precise enough, have the potential to significantly reduce surface flux uncertainties. High reduction of regional flux uncertainties additionally requires high sensitivity to the lowest atmospheric layers where the variability is largest. Sensitivity to all altitude levels, including the boundary layer, can be achieved using reflected solar radiation in the near-infrared/shortwave-infrared (NIR/SWIR) spectral region. SCIAMACHY onboard ENVISAT (launch 2002) was the first and is now with TANSO onboard GOSAT (launch 2009) one of only two satellite instruments currently in space covering important absorption bands of both gases in this spectral range.

Global SCIAMACHY nadir observations from the time period 2003-2009 have been used to retrieve carbon dioxide and methane column-averaged mole fractions (which are the quantities needed for inverse modelling to get information on the sources and sinks) constituting seven years of greenhouse gas information derived from European EO data. These multi-year global data sets will be presented and discussed focusing on the variability due to land-atmosphere interactions and long-term trends. The analysis includes an investigation of the boreal forest carbon uptake during the growing season and the renewed growth of atmospheric methane in recent years.