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Inverse modeling of global CH4 emissions 2003-2010 using SCIAMACHY satellite retrievals and surface observations

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A reanalysis of global CH_4 emissions over the period 2003-2010 has been performed based on the TM5-4DVAR inverse modeling system. We use CH_4 satellite retrievals from the Scanning Imaging Absorption Spectrometer for Atmospheric Cartography (SCIAMACHY) instrument onboard Envisat, together with high-accuracy surface observations from the NOAA Earth System Research Laboratory global cooperative air sampling network.

Using climatological OH fields, derived global total emissions for the period 2007-2010 are $\sim$20 Tg CH_4/yr higher than 2003-2005. Most of this increase is attributed to the tropics ($\sim$10-15 Tg CH_4/yr) and mid-latitudes of the northern hemisphere ($\sim$5-10 Tg CH_4/yr). No significant trend and only small inter-annual variability is attributed to the Arctic latitudes. Various sensitivity experiments have been performed investigating the impact of the SCIAMACHY observations (compared to inversions using only surface observations), satellite bias correction, OH fields, and a priori emission inventories on the derived trends and inter-annual variability of CH_4 emissions.