Geophysical Research Abstracts, Vol. 8, 06978, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06978


# Atmospheric Methane from SCIAMACHY - Comparison with Inverse Model Simulations

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Considerable improvements have recently been achieved for retrievals of atmospheric $CH_4$ from the spaceborne spectrometer SCIAMACHY onboard the European environmental satellite ENVISAT [Frankenberg et al., Assessing Methane Emissions from Global Space-Borne Observations, Science, 308, 2005].

Here we present a detailed comparison of the $CH_4$ retrievals for year 2003 with inverse model simulations, based on the TM5 model. Using high accuracy surface measurements from the NOAA/CMDL network 3D model fields are created with an optimal degree of consistency with the surface observations. The comparison over remote continental and oceanic regions shows that major features of the atmospheric $CH_4$ distribution are consistent between observations and model simulations. However, the analysis suggests that SCIAMACHY $CH_4$ retrievals may have a small bias depending on latitude and season, which might be related to systematic errors of the retrievals depending on solar zenith angle.

Over source regions large enhancements of column averaged $CH_4$ mixing ratios are observed and modelled ($\sim$50 – 100 ppb enhancement over large scale tropical sources), but model simulations strongly depend on the spatio-temporal distribution of applied emission inventories. Therefore, global satellite observations are very valu-

able for a comprehensive global validation of assumed emission inventories.

Furthermore, we present a first coupled inversion, using simultaneously both the surface and satellite observations and allowing the inverse system to compensate for the potential systematic bias. The results suggest significantly higher tropical emissions compared to the a priori estimate and compared to the inversion based on the surface measurements only. Emissions from rice paddies in India and South East Asian are relatively well constrained by the SCIAMACHY data and are slightly reduced by the inversion.