Inverse modelling of methane emissions from sciamachy satellite observations

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In the past two centuries, atmospheric methane concentrations have more than doubled, and now constitute 20% of the anthropogenic climate forcing by greenhouse gases. Our understanding of atmospheric methane is largely limited by knowledge on its sources. Space-based observations constitute a promising means to reduce uncertainties in present source strength estimates.

Within the EC 5th FP project EVERGREEN we have developed a four-dimensional variational (4D-Var) assimilation system for the optimization of both atmospheric CH4 concentrations and CH4 emissions on the basis of satellite observations.

With this 4D-Var system sensitivity studies have been performed, which allow to assess the impact of various aspects on the reduction in CH4 source strength uncertainty that can be achieved. Aspects investigated are the observation error, the presence of clouds, the spatial and temporal resolution of the retrieved emission field, and others.

We also plan to present first results of application of the method to real data from the SCIAMACHY instrument aboard ENVISAT.