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Observing the global distribution of atmospheric CH4 from space

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Atmospheric methane (CH4) plays a significant role in global warming despite being present in the atmosphere in smaller quantities than carbon dioxide (CO2) and has a radiative forcing efficiency or 'global warming potential' of 21 times greater than that of CO2. The annual global source strength of CH4 is fairly well constrained to 550 ($\pm$50) Tg from the study of tropospheric OH which is the dominant sink for atmospheric CH4. However there is a distinct lack of knowledge surrounding the temporal and spatial variability of individual methane sources and sinks, leaving a number of scientific questions unanswered. For example, it is unclear why the atmospheric growth rate of CH4 has recently begun to rise again, following a 20 year decline, despite no obvious change in global emissions. It is clear that an accurate and comprehensive dataset of CH4 retrievals is required in order to properly quantify CH4 sources and sinks and hence allow problems such as this to be better understood.

The Scanning Imaging Absorption Spectrometer for Atmospheric Chartography instrument (SCIAMACHY) is a nadir/limb viewing spectrometer of moderate resolution which observes in the UV, visible and NIR. SCIAMACHY detects sunlight reflected from the Earth's surface and as such has high sensitivity to the lowest atmospheric layers where anthropogenic trace gas emissions peak. Out of 8 spectral channels, CH4 is retrieved from channel 6 (971-1773nm) which has high spatial but low spectral resolution.

The FSI WFM-DOAS retrieval algorithm, previously applied to CO2 data from SCIAMACHY (Barkley et al., 2006) has been adapted to perform retrievals of CH4. We will present results of a series of sensitivity tests that have been carried out to characterize the FSI algorithm for various aerosol, surface and temperature scenarios. Furthermore, first results and their validation will be shown. The next step will be to generate a global multi-year CH4 dataset to monitor CH4 variability on a global scale and, more locally, to address regions where particularly anomalous emissions are expected such as the tropics and the permafrost plains of Siberia.