VALIDATION OF METHANE AND NITROUS OXIDE DATA PRODUCTS FROM THE MIPAS INSTRUMENT ON ENVISAT

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Methane (CH₄) and nitrous oxide (N₂O) are important trace constituents of the atmosphere because they are strong absorbers and emitters of infrared radiation and consequently play a vital role in the Earth’s energy budget. By using limb infrared sounding, spectrally resolving, instruments such as a Fourier Transform Spectrometer (FTS) it is possible to measure the infrared emission of radiation from these gases and hence obtain their concentrations by inversion of the measured spectra. A recent development has been the launch of the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) onboard the ENVISAT satellite. Methane and nitrous oxide vertical profile mixing ratios are two of the operational data products from MIPAS. This study focuses on their current quality.

Extensive validation with comparable datasets is required to characterise the quality of retrieved atmospheric quantities from the MIPAS. A preliminary validation study of CH₄ and N₂O retrievals from MIPAS data will be presented with respect to global mean behaviour. In particular, comparisons will be made with historical data sources such as the UARS reference atmosphere project datasets which are based on measurements by the HALOE and CLAES satellite instruments.

Global behaviour of MIPAS CH₄ and N₂O can also be examined by correlation. Both N₂O and CH₄ are released at ground level with no significant sources in the stratosphere. The major sink of both gases is by oxidation, thus, their relative lifetimes will vary with abundances of OH, O(¹D) and Cl. Where timescales of atmospheric mixing are much shorter than these photochemical lifetimes, CH₄ and N₂O distributions should be homogeneous, and there should be a compact correlation between the
two. Furthermore, where horizontal mixing is rapid compared to vertical mixing, as in the stratosphere, correlations should vary only with altitude [Michelsen et. al, 1998]. Preliminary correlations between the two species, over a range of altitudes, will be presented.

References: