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Water Vapour Profiles from SCIAMACHY Solar Occultation Measurements derived with Onion Peeling DOAS

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Water vapour is the most important greenhouse gas and plays a key role in atmospheric chemistry and transport. Most of the water vapour is located in the troposphere where it significantly contributes to weather and climate. Because the tropopause acts as a cold trap, the water vapour density in the stratosphere is significantly lower and decreases rapidly with increasing altitude. However, the amount of stratospheric water vapour plays an important role in the generation of Polar Stratospheric Clouds (PSCs), which in turn influence strongly the amount of ozone in polar regions.

Trends in stratospheric water vapour are determined by methane oxidation, transport through the tropopause and by the Brewer-Dobson circulation. To seperate the various effects there is a clear need for global long term measurements of lower stratospheric water vapour, which can be provided by satellite measurements.

A new retrieval method (called "Onion Peeling DOAS") has been developed to derive water vapour number density profiles from solar occultation measurements of the SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY). This method is intentionally kept simple and based on a combination of an onion peeling approach with a modified DOAS (Differential Optical Absorption Spectroscopy) fit in the wavelength region around 940 nm. The resulting water vapour profiles currently cover the altitude range 15–50 km.

Here, first retrieval results and comparisons of the SCIAMACHY profiles with water vapour data provided by the Atmospheric Chemistry Explorer Fourier Transform Spectrometer (ACE-FTS) and model data of the European Centre for Medium Range Weather Forecasts (ECMWF) are shown.