DEMONSTRATION OF INFRARED-LASER OCCULTATION FOR TRACE GAS MEASUREMENTS BY A LONG-RANGE LINK EXPERIMENT

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The infrared-laser occulation technique (LIO) is a powerful, active occultation method for the measurement of various atmospheric trace gases. This technique exploits narrowband laser signals in the short-wave infrared spectral range (SWIR, 2 μm to 2.5 μm) to derive the concentrations of several gases via differential absorption spectroscopy. Recent studies showed that the accuracy of trace gas profiles measured using LIO will be very high. In particular, using the signals which are foreseen for the so-called ACCURATE (Atmospheric Climate and Chemistry in the UTLS Region and Climate Trend Explorer) mission, the volume mixing ratios of ten trace gases can be determined accurate to < 1–4 % RMS error throughout the upper troposphere/lower stratosphere (UTLS) region. Together with the high vertical resolution, unbiasedness and good global coverage of the data, which is intrinsic to the occultation method, the LIO technique is highly complementary to currently operated measurement methods.

This presentation will introduce to and provide insight into an experiment which will demonstrate the LIO technique for the first time. The experiment will be ground based and be performed at an altitude of about 2.4 km between two observatories at this altitude at the Canary Islands which are about 144 km apart. The instrumentation needed, i.e. transmitter and receiver, is currently constructed and tested at the Univ. of York, UK, together with the Univ. of Manchester, UK, with scientific support from the Univ. of Graz, AT. The measurement campaign, together with related in-situ trace species measurements for validation, is foreseen in April 2011. This experiment, focusing in terms of parameters on the key species CO2 (12CO2, 13CO2, C18OO), CH4, and H2O, will deliver important insight into the LIO technique and be an essential step towards operation of the LIO technique in space.