REMOTE SENSING OF ATMOSPHERIC CO_2 USING THE SCIAMACHY INSTRUMENT

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ABSTRACT

The remote sensing of CO_2 from satellites is an exciting new and rapidly developing field in carbon cycle research. Satellite sensors have the potential to provide a wealth of information on atmospheric CO_2, covering many regions that are scarsely monitored the ground based observational networks. Satellite measurements could significantly strengthen the power of inverse modelling computations in tracing sources and sinks of CO_2. The main challenge, however, is to reach the measurement accuracy needed to resolve the important CO_2 concentration gradients. The current generation of satellite instruments from which CO_2 can be retrieved is expected to meet the requirements only partly, as the instruments were not originally designed to measure CO_2. Nevertheless interesting results come out as we will show for the Sciamachy instrument. A particularly difficult aspect is the determination of the airmass factor, which is needed to translate the observed optical thickness into a column averaged dry air mixing ratio. The airmass factor is influenced by e.g. clouds, aerosols, air pressure, and orography. So far the uncertainty assessments have mainly relied on theoretical investigations and ground-based measurements. The measurements from Sciamachy allow us to verify these studies, and some of the methods that have been proposed to reduce or eliminate the errors. We will demonstrate this with the main focus on aerosols. Error assessments using in-flight data will be indispensable for improving future instruments.