



Effect of Horizontal Gradients in Limb Measurements of scattered Sunlight

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Limb measurements provided by the SCanning Imaging Absorption spectrometer for Atmospheric CHartographY (SCIAMACHY) on the ENVISAT satellite allow retrieving stratospheric profiles of various trace gases on a global scale.

We use a two step method for the retrieval in the UV/VIS spectral region: First, Differential Optical Absorption Spectroscopy (DOAS) is applied on the spectra, yielding slant column densities (SCDs) of the respective trace gases. Second, the SCDs are converted into vertical concentration profiles applying radiative transfer modeling.

An important point is the effect of horizontal gradients of the considered species on the retrieved profiles. This is of special interest in Polar Regions, where photochemistry can highly vary along the long absorption paths. We investigate the influence of horizontal gradients by applying 3-dimensional radiative transfer modeling. We introduce a method to correct for the effect of horizontal gradients by combining consecutive limb scanning sequences and utilizing the overlap in their measurement sensitivity regions.

It is found that if horizontal inhomogeneity is not properly accounted for, typical errors of 20% for NO₂ and up to 50% for OCIO around the altitude of the profile peak can arise for measurements close to the Arctic polar vortex boundary in boreal winter.