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## Averaging kernels for DOAS total-column satellite retrievals

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**Abstract.** The Differential Optical Absorption Spectroscopy (DOAS) method is used extensively to retrieve total column amounts of trace gases based on UV-visible measurements of satellite spectrometers, such as ERS-2 GOME. In practice the sensitivity of the instrument to the tracer density is strongly height dependent, especially in the troposphere. The resulting tracer profile dependence may introduce large systematic errors in the retrieved columns that are difficult to quantify without proper additional information, as provided by the averaging kernel (AK). In this paper we discuss the DOAS retrieval method in the context of the general retrieval theory as developed by Rodgers. An expression is derived for the DOAS AK for optically thin absorbers. It is shown that the comparison with 3D chemistry-transport models and independent profile measurements, based on averaging kernels, is no longer influenced by errors resulting from a priori profile assumptions. The availability of averaging kernel information as part of the total column retrieval product is important for the interpretation of the observations, and for applications like chemical data assimilation and detailed satellite validation studies.

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