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Twelve years of global observations of formaldehyde in the troposphere using GOME and SCIAMACHY sensors

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Abstract. This work presents global tropospheric formaldehyde columns retrieved from near-UV radiance measurements performed by the GOME instrument onboard ERS-2 since 1995, and by SCIAMACHY, in operation on ENVISAT since the end of 2002. A special effort has been made to ensure the coherence and quality of the CH₂O dataset covering the period 1996–2007. Optimised DOAS settings are proposed in order to reduce the impact of two important sources of error in the derivation of slant columns, namely, the polarisation anomaly affecting the SCIAMACHY spectra around 350 nm, and a major absorption band of the O₄ collision complex centred near 360 nm. The air mass factors are determined from scattering weights generated using radiative transfer calculations taking into account the cloud fraction, the cloud height and the ground albedo. Vertical profile shapes of CH₂O are provided by the global CTM IMAGES based on an up-to-date representation of emissions, atmospheric transport and photochemistry. A comprehensive error analysis is presented. This includes errors on the slant columns retrieval and errors on the air mass factors which are mainly due to uncertainties in the a priori profile and in the cloud properties. The major features of the retrieved formaldehyde column distribution are discussed and compared with previous CH₂O datasets over the major emission regions.

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