

High resolution HCHO absorption cross section datasets

HCHO absorption cross-section	Range (Resolution)	T (K)	Pressure
Cantrell et al. (1990) (C90)	300.30-385.80 nm (0.006 nm)	296	Vacuum
Meller and Moortgat (2000) (MM00)	224.56-376.00 nm (0.01 nm)	298	Air
Gratien et al. (2007) (G07)	240 - 364.55 nm (0.15 nm)	298	Air

In the wavelength range of interest for the HCHO retrieval with the DOAS technique (320-360 nm), the HCHO absorption cross sections convolved with the SCIAMACHY slit function in channel 2 are shown in Fig.1.

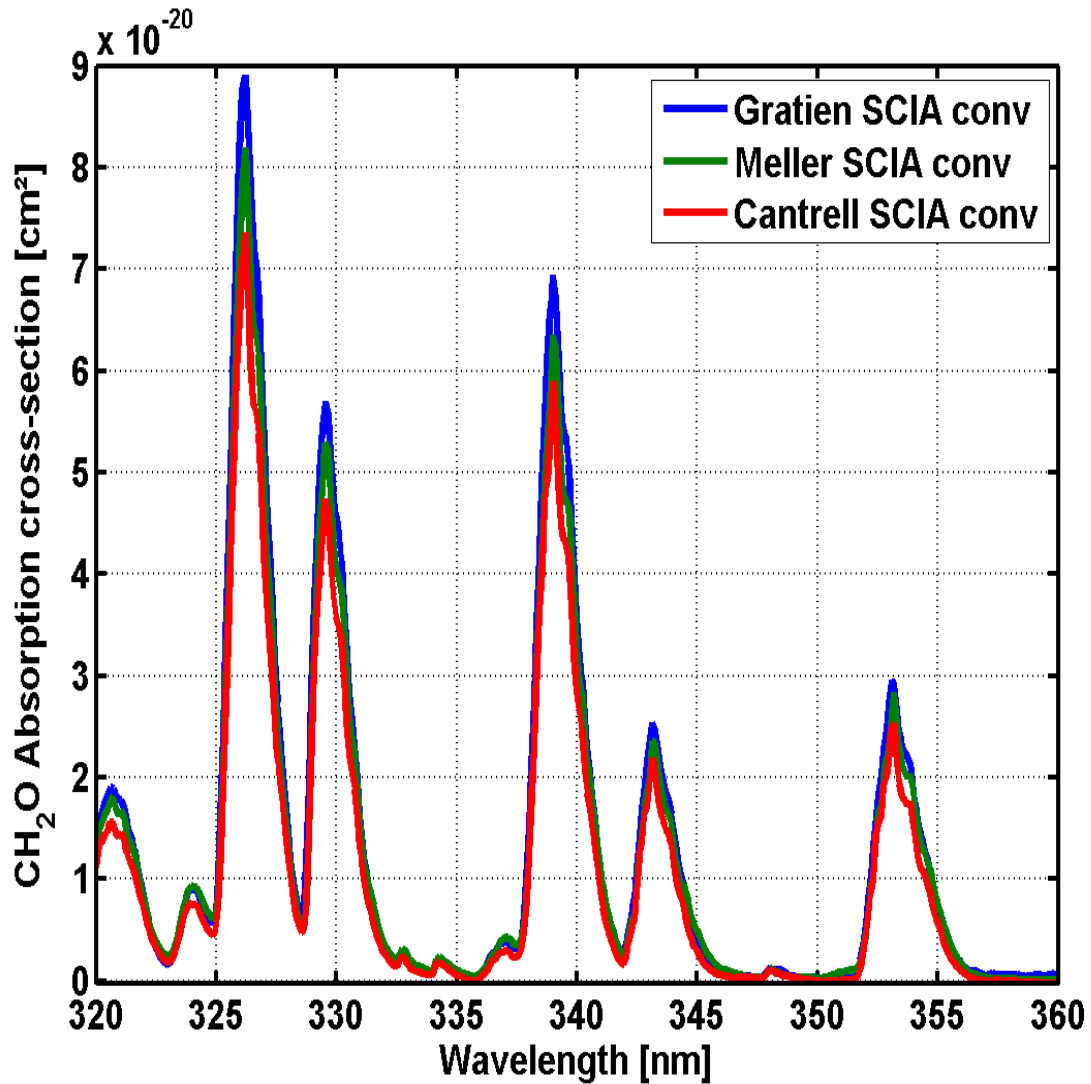


Fig.1.

In this spectral range, the C90 dataset is found to be by 9% lower in magnitude than MM00, whereas the G07 dataset is by 12% higher than MM00, as displayed in Fig.2. However, the discrepancy between MM00 and G07 becomes larger in a larger wavelength range (G07).

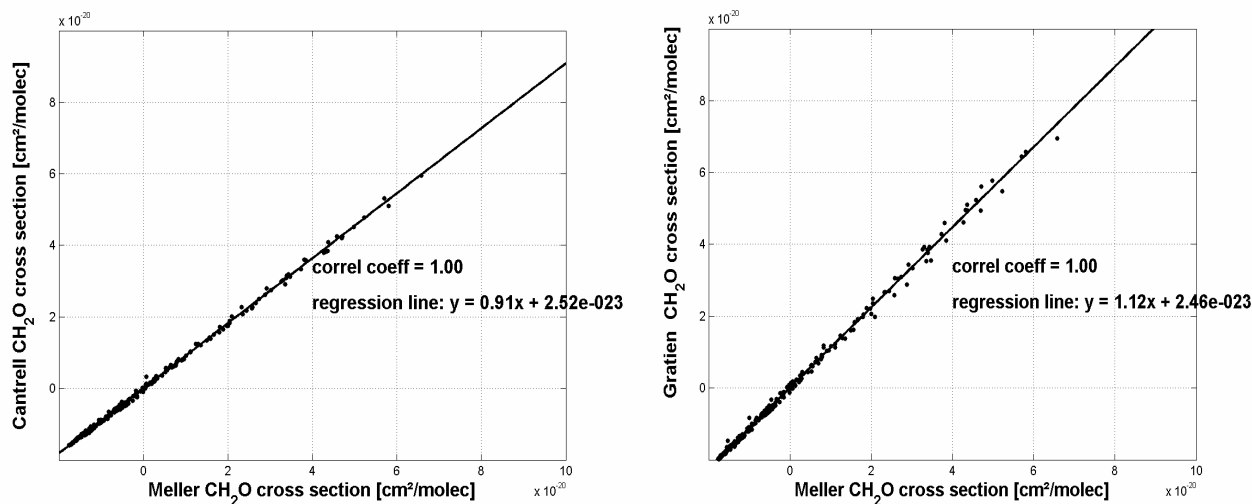


Fig. 2.

The use of the C90 values would lead to an overestimation by 8% of the HCHO slant columns compared to the derived columns using the MM00 dataset, as shown on Fig.3.

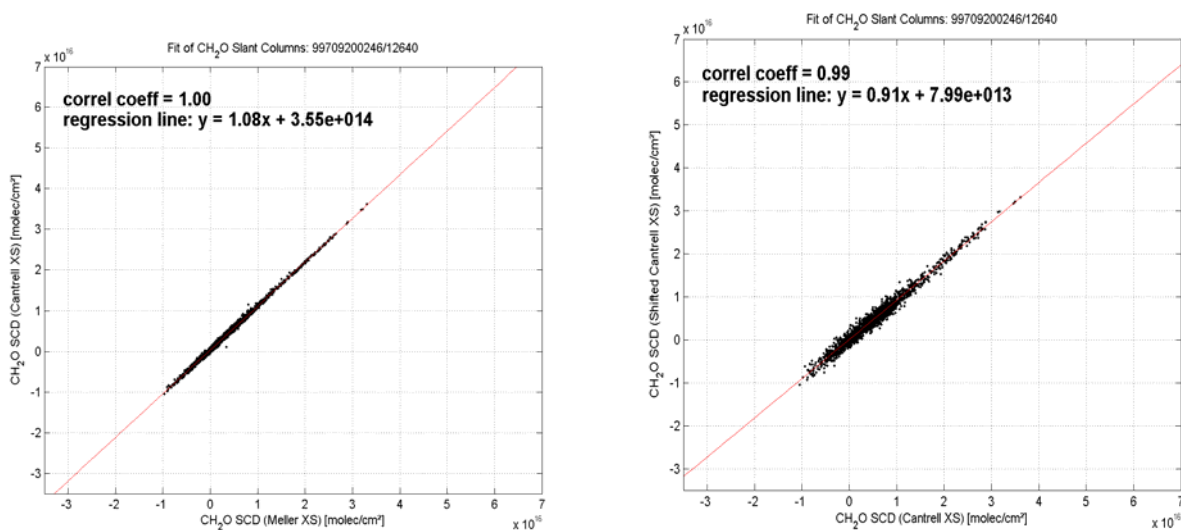


Fig.3.

However, in the current version of the SCIAMACHY HCHO product, the C90 cross-section has been shifted by 0.08 nm. The implication of this shift is a reduction of the retrieved HCHO columns by 9% (Fig.3) compared to the derived column using the C90 cross sections. Therefore, the HCHO slant columns obtained with the shifted C90 cross section are equivalent within 2% of columns obtained with the MM00 cross section (Fig.4). Note that the residuals of the fit are equivalent for both cases, while the differences in RMS are smaller than 0.1%.

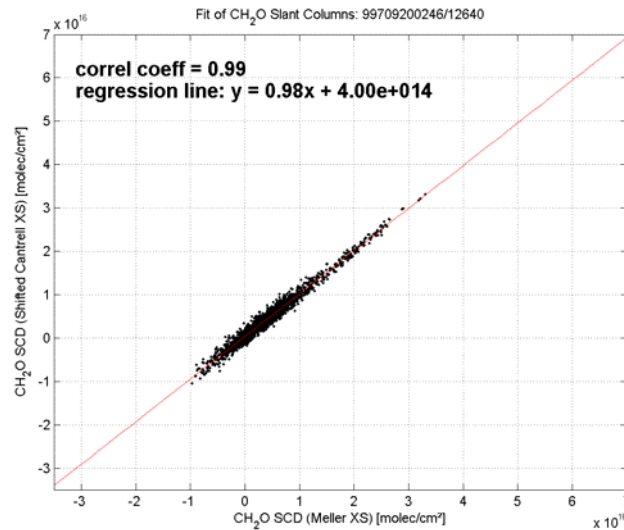


Fig.4. The HCHO slant columns obtained using the MM00 database and the C90 shifted by 0.08 nm.

References:

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Gratien, A., B. Picquet-Varrault, J. Orphal, E. Perraudin, J.-F. Doussin, and J.-M. Flaud: Laboratory intercomparison of the formaldehyde absorption cross sections in the infrared (1660–1820 cm⁻¹) and ultraviolet (300–360 nm) spectral regions, *J. Geophys. Res.*, 112, D05305, doi:10.1029/2006JD007201, 2007.

Meller, R. and Moortgat, G. K.: Temperature dependence of the absorption cross sections of formaldehyde between 223 and 323 K in the wavelength range 225–375 nm, *J. Geophys. Res.*, 201(D6), 7089-7101, 2000.