

P1-05 HCHO DETECTION BY HIGH-RESOLUTION LASER DOAS

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Measurements of HCHO are needed for most experiments at the Jülich atmosphere simulation chamber SAPHIR. It is routinely provided using a calibrated fluorescence detector based on the Hantzsch reaction. Additionally a low resolution LP-DOAS setup ($\lambda/\Delta\lambda=1,600$) using a broadband Xenon short arc lamp has been installed at the chamber parallel to the existing high-resolution LP-DOAS instrument ($\lambda/\Delta\lambda=112,000$). The laser-DOAS uses a UV-laser light source and a White-cell and has been optimised to detect hydroxyl radicals at 308 nm. Simultaneously this instrument detects HCHO and a few other trace gases (SO₂, naphthalene) during standard operation. Our instrument has a linear dispersion of 0.24 pm·pixel⁻¹ and a spectral resolution of 112,000 which corresponds to a resolution limit of 2.7 pm (0.28 cm⁻¹). The HCHO absorption cross section within the spectral region chosen for the OH detection is small ($< 1 \cdot 10^{-20}$ cm²) in order to minimize interferences.

We present our measured differential absorption spectra and compare them with those presently available. The high resolution differential HCHO reference spectrum used for the laser-DOAS evaluation cannot be derived from independent measurements of the absorption cross section near 308 nm since no sufficiently high resolved spectra were available until recently.

Pope et al. [1] report a new work on absolute HCHO measurements near 308 nm using a scanned dye laser with an emission bandwidth of 0.1 to 0.15 cm⁻¹. The spectral resolution would be suitable for preparing useful differential spectra for our laser-DOAS instrument. However, we will show that the spectra published do not reproduce the rovibrational structure observed by the laser-DOAS instrument. Therefore the laser-DOAS measurement continues to be dependent on the calibration of the HCHO monitor (Hantzsch).

Finally, we compare chamber measurements of HCHO taken with the high-resolution laser-DOAS measurements to other simultaneous measurements of the broadband-DOAS and the Hantzsch HCHO monitor.

[1] Atmospheric Chemistry, Faraday Discussions 130, 2005: 128 (Fig.1), 133 (comm.. Brauers), 134f (comm.. Orr-Ewing, Fig.2)