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Atmos. Chem. Phys., 9, 7131-7142, 2009

[www.atmos-chem-phys.net/9/7131/2009/](http://www.atmos-chem-phys.net/9/7131/2009/)

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## Long-term tropospheric formaldehyde concentrations deduced from ground-based fourier transform solar infrared measurements

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**Abstract.** We report a 13-year (1992–2005) dataset of total column measurements of formaldehyde (HCHO) over Lauder, New Zealand, inferred from solar infrared spectra measured using a high-resolution Fourier Transform Spectrometer (FTS). Ambient HCHO concentrations at this rural location are often close to levels typical of remote marine environments (<250 ppt), which are close to the detection limit using standard techniques. Consequently we develop a new method that successfully produces HCHO columns with sufficient sensitivity throughout the whole season. HCHO columns over Lauder have a strong seasonal cycle ( $\pm 50\%$ ), with a mean column of  $4.9 \times 10^{15}$  molecules  $\text{cm}^{-2}$ , peaking during summer months. A simple box model of  $\text{CH}_4$  oxidation reproduces the observed broad-scale seasonal cycle, but significantly underestimates the seasonal peak HCHO ground concentrations during summer. This suggests the existence of an additional significant source of HCHO, possibly isoprene that cannot be explained by oxidation of  $\text{CH}_4$  alone. The ground-based FTS column data compare well with collocated HCHO column measurements from the Global Ozone Monitoring Experiment (GOME) satellite instrument during the operational period of GOME (1996–2001,  $r^2=0.65$ , mean bias=10%,  $n=48$ ).

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Citation: Jones, N. B., Riedel, K., Allan, W., Wood, S., Palmer, P. I., Chance, K., and Notholt, J.: Long-term tropospheric formaldehyde concentrations deduced from ground-based fourier transform solar infrared measurements, Atmos. Chem. Phys., 9, 7131-7142, 2009. [Bibtex](#) [EndNote](#) [Reference Manager](#)

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