



Long-term measurements of glyoxal (CHOCHO) and formaldehyde (HCHO) from space.

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The chemistry of Volatile Organic Compounds (VOCs) in the atmosphere is of great importance as it is related to photochemical smog formation, to changes of ozone levels as well as to secondary organic aerosols (SOA) formation due to the low volatility of the VOC oxidized products. All the above mentioned processes have a direct impact to human health. As a result, the study of the spatial and temporal distribution of VOCs is a requisite in order to evaluate this impact.

It is well known that VOC are released into the atmosphere by both anthropogenic and natural sources (e.g. fossil fuel combustion, biomass burning and biogenic emissions). Nevertheless the discrimination of these sources is difficult due to the overall great uncertainty of their emissions. In order to better characterize these sources, tracers of the oxidation of the VOCs such as HCHO and CHOCHO are used as proxies. Formaldehyde, the smallest aldehyde in the atmosphere is primarily formed through the oxidation of VOC by OH but is also directly emitted. Glyoxal, the smallest dicarbonyl, is a mutagenic product formed mainly under the chemical reactions of VOC with OH radicals.

This work presents for the first time concurrent results of both species measured on a global scale for a period of 4 years covering the period of 2003–2006. The results were obtained by applying the differential optical absorption technique (DOAS) to spectra measured by the satellite instrument SCIAMACHY. HCHO has been measured at the spectral region of 334.3–348.5 nm to avoid any correlation with an instrument grating polarisation structure around 360 nm. CHOCHO was retrieved at the blue spectral range at 436.0–457.0 nm.

The annual and seasonal variation of these species is examined above some photochemical hot spots induced by anthropogenic and biogenic activities. Some of these areas of interest are the Central Africa, South America (mainly Brazil), India, China and Indonesia as well as some major cities of Europe and the United States. During the period 2003-2006 and on an annual basis the vertical column (VC) values of formaldehyde ranged from DL ($4 \cdot 10^{15}$) – $2.5 \cdot 10^{16}$ molecules·cm⁻² while the respective glyoxal values ranged from DL ($2 \cdot 10^{14}$) – $2.0 \cdot 10^{15}$ molecules·cm⁻². A typical ratio of these species for biogenic emissions was $VC_{CHOCHO}/VC_{HCHO} = 0.06 \pm 0.02$. This ratio was somewhat higher (0.09 ± 0.02) when the area of study was anthropogenically influenced.