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Supplement of

Atmospheric photooxidation and ozonolysis of Δ^3-carene and 3-caronaldehyde: rate constants and product yields

Luisa Hantschke et al.

Correspondence to: Hendrik Fuchs (h.fuchs@fz-juelich.de)

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Table S1 . Instrumentation for radical and trace gas detection in the experiments.

measured quantity	**measurement technique**	**time resolution**	**accuracy ($1\,\sigma$)**	**LoD ($1\,\sigma$)**
OH	laser-induced fluoresence (LIF)	47 s	13 %	$0.7\times10^{6}\,\mathrm{cm}^{-3}$
HO_2, RO_2	laser-induced fluoresence (LIF)	47 s	16 %	$0.8\times10^{7}\,\mathrm{cm}^{-3}$
k_{OH}	laser photolysis + LIF	180 s	10 %	$0.3\,\mathrm{s}^{-1}$
Δ^3-carene	proton-transfer-reaction mass-spectrometer	40 s	7 %	2 pptv
CO	cavity ring-down spectroscopy	60 s	1 ppbv	80 ppbv
NO	chemiluminescence	180 s	5 %	4 pptv
NO_2	chemiluminescence	180 s	5 %	2 pptv
HONO	long-path absorption photometry	300 s	20 %	5 pptv
O_3	UV-absorption	10 s	5 %	1 ppbv
HCHO	Hantzsch monitor	90 s	8.5 %	0.1 ppbv
HCHO	cavity ring-down spectroscopy	300 s	1.5 ppbv	0.1 ppbv
photolysis freq.	spectroradiometer	60 s	10 %	[a]

[a] several orders of magnitude lower than the maximum value at noon

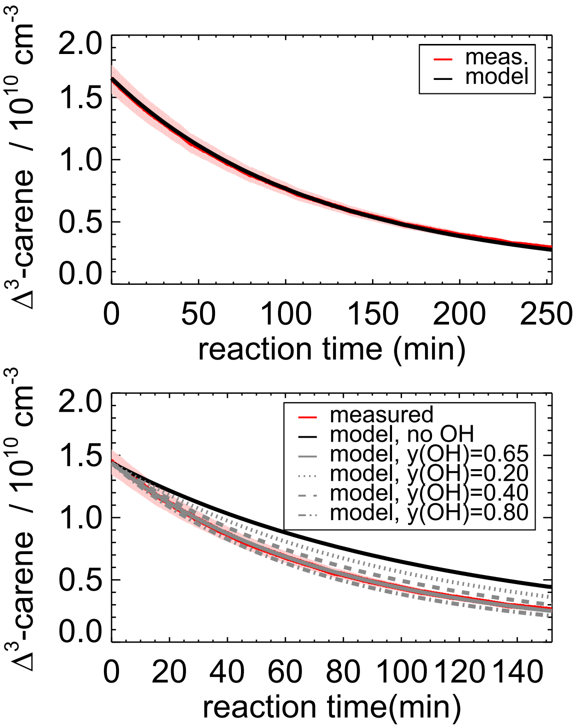

Figure S1 . Measured and modeled Δ^3-carene concentrations for the ozonolysis experiment E4. During the second part of the experiment (upper panel), $90\,\mathrm{ppmv}$ of an OH scavenger (CO) were injected to suppress OH, so that Δ^3-carene reacted only with ozone. The modeled decay is fitted with a rate constant of $(4.4 \pm 0.2) \times 10^{-17}\,\mathrm{cm}^3\ \mathrm{s}^{-1}$. During the first part of the experiment (lower panel), when no CO was present, the measured decay of Δ^3-carene is signficantly faster than expected from ozonolysis alone. The measured time series of Δ^3-carene can be best matched, if an OH yield of 0.65 ± 0.10 from its ozonolysis reaction is assumed. OH yields of 0.20, 0.40 and 0.80 are also presented in the lower panel to demonstrate the sensitivity of the system to changes in the OH yield.

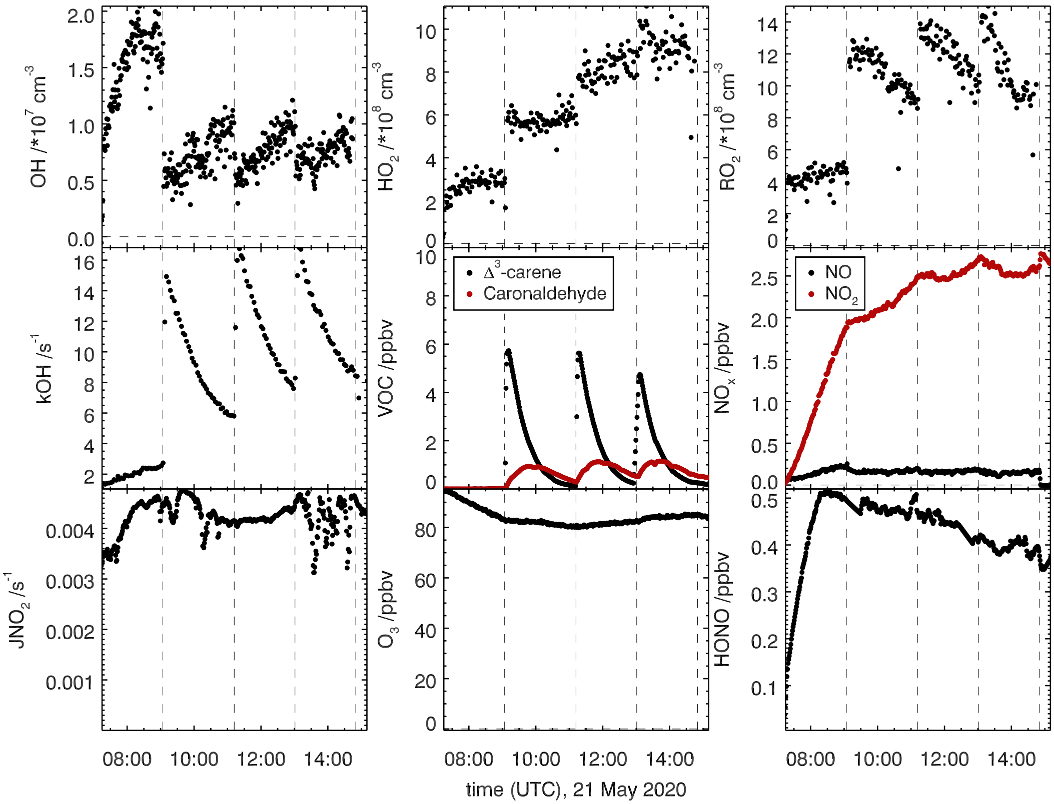

Figure S2 . Overview of measured concentrations for selected species in the SAPHIR chamber for the Δ^3-carene + OH oxidation experiment with low NOx conditions on E2. Dashed lines indicate times when Δ^3-carene was injected into the chamber.

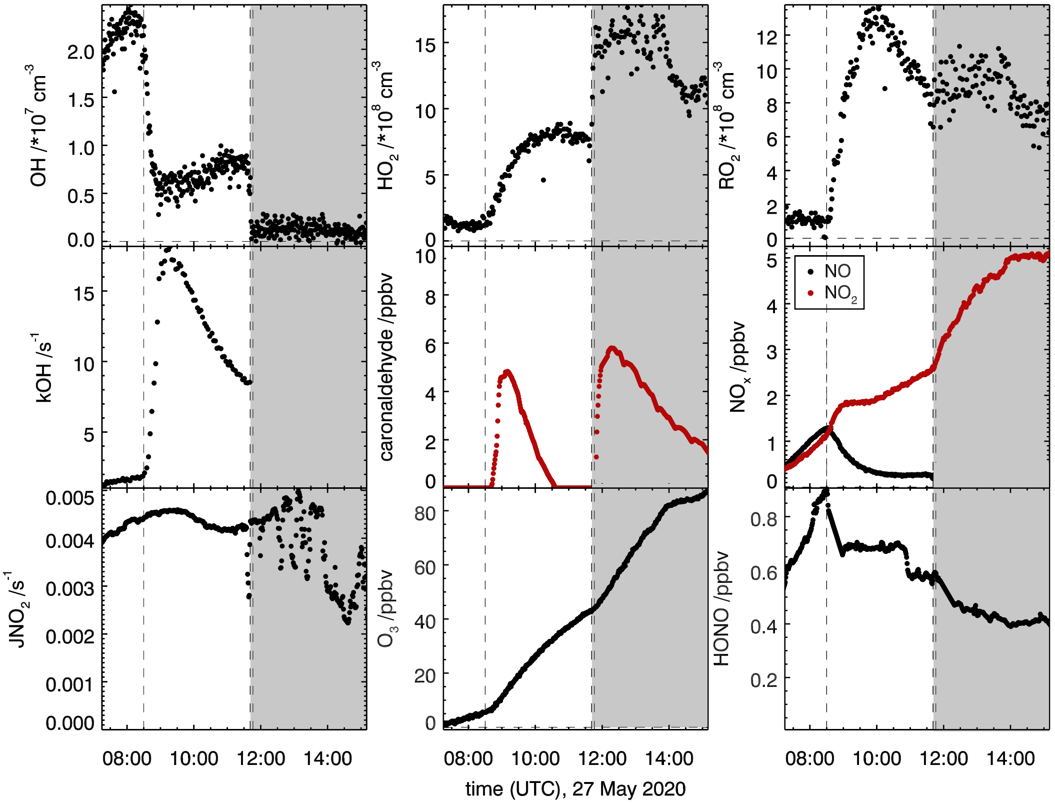

Figure S3 . Overview of measured concentrations for selected species in the SAPHIR chamber for the caronaldehyde photooxidation experiments E5. The shaded area indicates the time where CO was injected as an OH scaveger (experiment E6). Dashed lines indicate times when caronaldehyde was injected into the chamber.

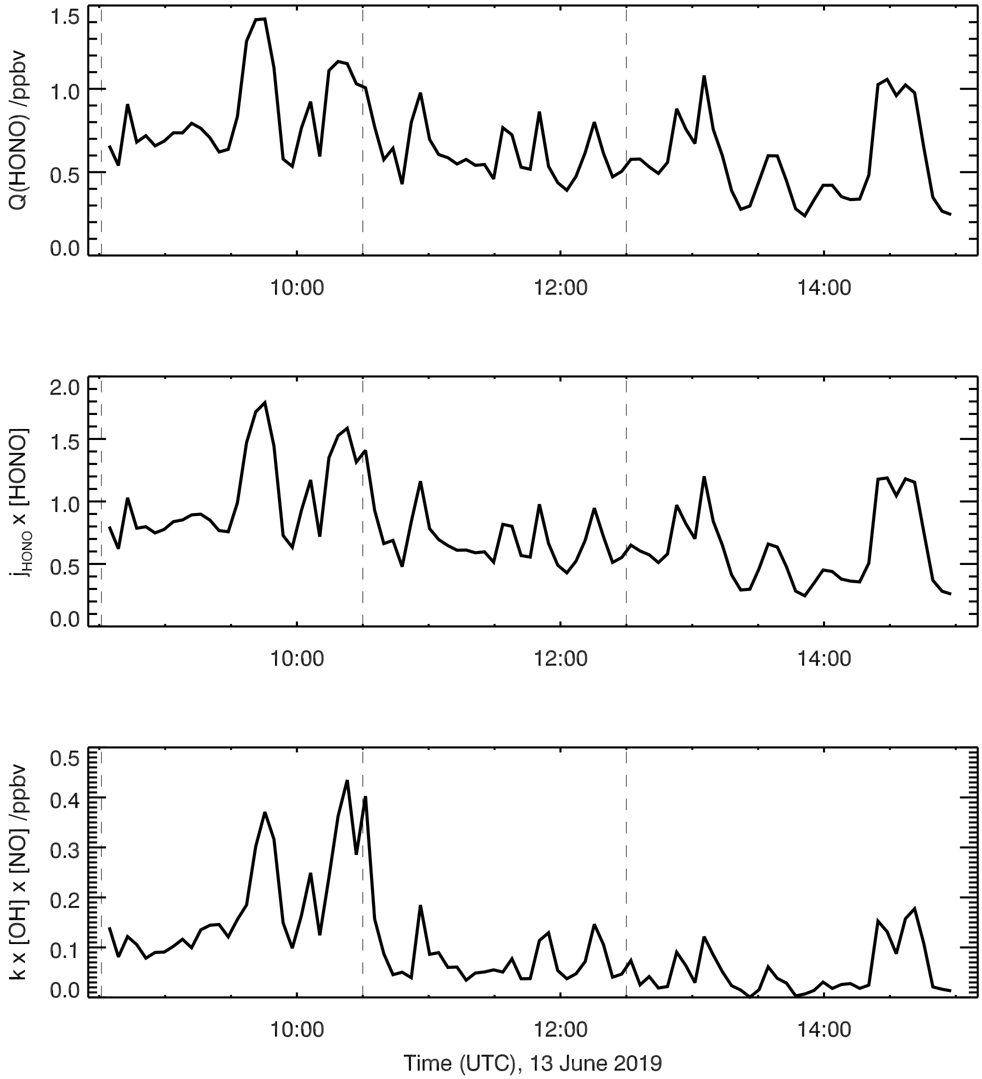

Figure S4 . Timeseries of Q(HONO), $k_{OH+NO} \times OH \times NO$ and $j_{HONO} \times HONO$ used to calculate the organic nitrate yield of the OH + Δ^3-carene in the main text (see Section 2.5).