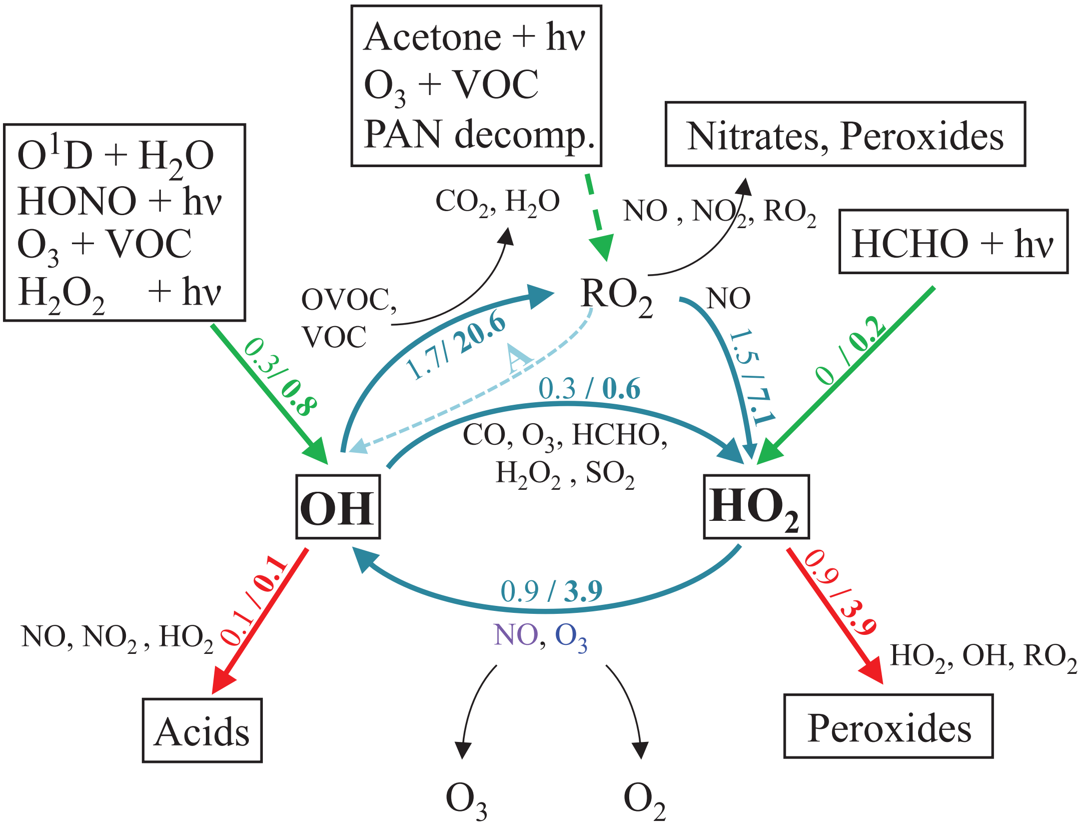
HO_x recycling pathways under different conditions of observed radiation and total OH reactivity during HUMPPA-COPEC 2010

This document is part of the electronic supplement to our article "Observation and modelling of HO_x radicals in a boreal forest" in ACP (2014), available at:
http://www.atmospheric-chemistry-and-physics.net

Table S1: HO_x budget under different conditions of observed total OH reactivity (moderate/**high**) at low radiation ($J_{O(^1D)} \leq 3 \times 10^{-6}\,s^{-1}$). Radical production (green), recycling (blue), and loss (red) pathways are indicated by bold arrows. All rates are given in 10^6 molec cm^{-3} s^{-1}.



$k'_{OH} \leq 15\,s^{-1}$	$k'_{OH} > 15\,s^{-1}$
• $P_{OH}^{total} = (2.1 \pm 0.8) \times 10^6$ molec cm^{-3} s^{-1} • $HO_2 + NO/O_3$ is inhibited ($P_{OH,\,HO_2+NO/O_3} \approx 1 \times 10^6$ molec cm^{-3} s^{-1}) • ~40 % of P_{OH}^{total} is unknown ($P_{OH}^{missing} \approx 1 \times 10^6$ molec cm^{-3} s^{-1}) • Potential OH sources: - Ozonolysis of unmeasured VOCs - could be related to NO_3 ($P_{NO_3} \approx 1 \times 10^6$ molec cm^{-3} s^{-1})	• $P_{OH}^{total} = (21.3 \pm 7.2) \times 10^6$ molec cm^{-3} s^{-1} • ~ 80 % of P_{OH}^{total} is unknown ($P_{OH}^{missing} \approx 17 \times 10^6$ molec cm^{-3} s^{-1}) • about 16 % of P_{OH}^{total} by $HO_2 + NO/O_3$ ($P_{OH,\,HO_2+NO/O_3} \approx 4 \times 10^6$ molec cm^{-3} s^{-1}) • ~60 % of the RO_2 production rate imply unknown loss processes that could lead to direct OH recycling • RO_2 sink is missing → potential OH source ⇒ alkylperoxy radicals +HO_2 (Thornton et al., 2002; Hasson et al., 2004; Jenkin et al., 2007; Dillon and Crowley, 2008) and H-shifts (Peeters et al., 2009) are likely

Table S2: Median levels and variability of relevant trace gases under different conditions of observed radiation and total OH reactivity.

	$J_{O(^1D)} > 3 \times 10^{-6}\,s^{-1}$	$J_{O(^1D)} \leq 3 \times 10^{-6}\,s^{-1}$
$k'_{OH} \leq 15\,s^{-1}$	OH $\approx$ $(1.0 \pm 0.8) \times 10^6$ molec. cm^{-3}	OH $\approx$ $(3.8 \pm 3.0) \times 10^5$ molec. cm^{-3}
	HO_2 $\approx$ (10 ± 1) ppt$_V$	HO_2 $\approx$ (10 ± 6) ppt$_V$
	O_3 $\approx$ (33 ± 2) ppb$_V$	O_3 $\approx$ (35 ± 7) ppb$_V$
	NO $\approx$ (46 ± 16) ppt$_V$	NO $\approx$ (3 ± 39) ppt$_V$
	NO_2 $\approx$ (280 ± 40) ppt$_V$	NO_2 $\approx$ (570 ± 210) ppt$_V$
	CO $\approx$ (85 ± 1) ppb$_V$	CO $\approx$ (96 ± 5) ppb$_V$
	C_5H_8 $\approx$ (145 ± 30) ppt$_V$	C_5H_8 $\approx$ (62 ± 65) ppt$_V$
	$\alpha-$pinene $\approx$ (63 ± 15) ppt$_V$	$\alpha-$pinene $\approx$ (68 ± 67) ppt$_V$
	$\beta-$pinene $\approx$ (16 ± 4) ppt$_V$	$\beta-$pinene $\approx$ (20 ± 17) ppt$_V$
	$\beta-$myrcene $\approx$ (5 ± 1) ppt$_V$	$\beta-$myrcene $\approx$ (5 ± 4) ppt$_V$
	Δ^3-carene $\approx$ (30 ± 8) ppt$_V$	Δ^3-carene $\approx$ (44 ± 44) ppt$_V$
$k'_{OH} > 15\,s^{-1}$	OH $\approx$ $(6.4 \pm 5.6) \times 10^5$ molec. cm^{-3}	OH $\approx$ $(6.3 \pm 2.0) \times 10^5$ molec. cm^{-3}
	HO_2 $\approx$ (27 ± 2) ppt$_V$	HO_2 $\approx$ (22 ± 4) ppt$_V$
	O_3 $\approx$ (51 ± 1) ppb$_V$	O_3 $\approx$ (51.0 ± 0.3) ppb$_V$
	NO $\approx$ (28 ± 7) ppt$_V$	NO $\approx$ (17 ± 5) ppt$_V$
	NO_2 $\approx$ (320 ± 20) ppt$_V$	NO_2 $\approx$ (290 ± 30) ppt$_V$
	CO $\approx$ (93 ± 1) ppb$_V$	CO $\approx$ (92 ± 1) ppb$_V$
	C_5H_8 $\approx$ (112 ± 13) ppt$_V$	C_5H_8 $\approx$ (110 ± 5) ppt$_V$
	$\alpha-$pinene $\approx$ (80 ± 4) ppt$_V$	$\alpha-$pinene $\approx$ (61 ± 8) ppt$_V$
	$\beta-$pinene $\approx$ (17 ± 1) ppt$_V$	$\beta-$pinene $\approx$ (14 ± 1) ppt$_V$
	$\beta-$myrcene $\approx$ (5.0 ± 0.3) ppt$_V$	$\beta-$myrcene $\approx$ (4.0 ± 0.5) ppt$_V$
	Δ^3-carene $\approx$ (38 ± 2) ppt$_V$	Δ^3-carene $\approx$ (27 ± 5) ppt$_V$