Characterization of a chemical modulation reactor (CMR) for the measurement of atmospheric concentrations of hydroxyl radicals with a laser-induced fluorescence instrument

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Supporting information

Table S1: Operational conditions of the CMR for JULIAC campaigns

	Winter (I)	**Spring (II)**	**Summer (III) and Autumn (IV)**
Period	14 Jan. – 11 Feb.	9 Apr. – 6 May	4 Aug. – 2 Sep. 28 Oct. – 24 Nov.
Injector type	1/8” injectors	1/16” injectors	1/8” injectors
Carrier flow	500 sccm	200 - 300 sccm	500 sccm
Propane concentration	15 ppmv	15 - 25 ppmv	19 ppmv
Scavenging efficiency[a,b]	91%	> 85%	96%
Transmission[a,c]	64 %	75 %	64 %
Limit of detection[d]	0.7×10^6 cm^{-3}	0.8×10^6 cm^{-3}	0.6×10^6 cm^{-3}

a Determined in clean synthetic air ($k_{OH} = 0$).

b OH scavenging efficiency = $(1 - \alpha) \times 100\%$.

c OH transmission (β_{N2}) of the complete CMR.

d Signal-to-noise ratio = 1.

* From 01.02.2019 to 11.02.2019 the CMR was not mounted.

Table S2: Summary of meteorological conditions and trace gases concentrations during JULIAC given as nighttime median values with 1σ standard deviations of ambient variabilities

	OH / 10^6 cm^{-3}	NO / ppbv	O_3 / ppbv	H_2O / %[a]	k_{OH} / s^{-1}	k_{VOC}[b] / s^{-1}	T / °C
			22.8	0.6	6.3	2.5	2.4
14 Jan. – 11 Feb.			(±10.3)	(±0.2)	(±5.2)	(±2.0)	(±3.8)
			40.1	0.7	5.8	3.2	10.0
9 Apr. – 6 May			(±14.4)	(±0.2)	(±1.9)	(±1.3)	(±4.5)
	N/A[c]	N/A[c]	31.4	1.4	6.0	3.8	17.7
4 Aug. – 2 Sep.			(±14.5)	(±0.3)	(±2.8)	(±2.2)	(±3.8)
			15.0	0.7	6.5	2.4	4.6
28 Oct. – 24 Nov.			(±9.3)	(±0.2)	(±3.8)	(±1.5)	(±4.4)

a Volume mixing ratio

b OH reactivity of non-methane VOCs, calculated as the difference between measured total k_{OH} and the sum of calculated reactivities of CH_4, CO, O_3, NO, and NO_2.

c Below the limit of the detection.

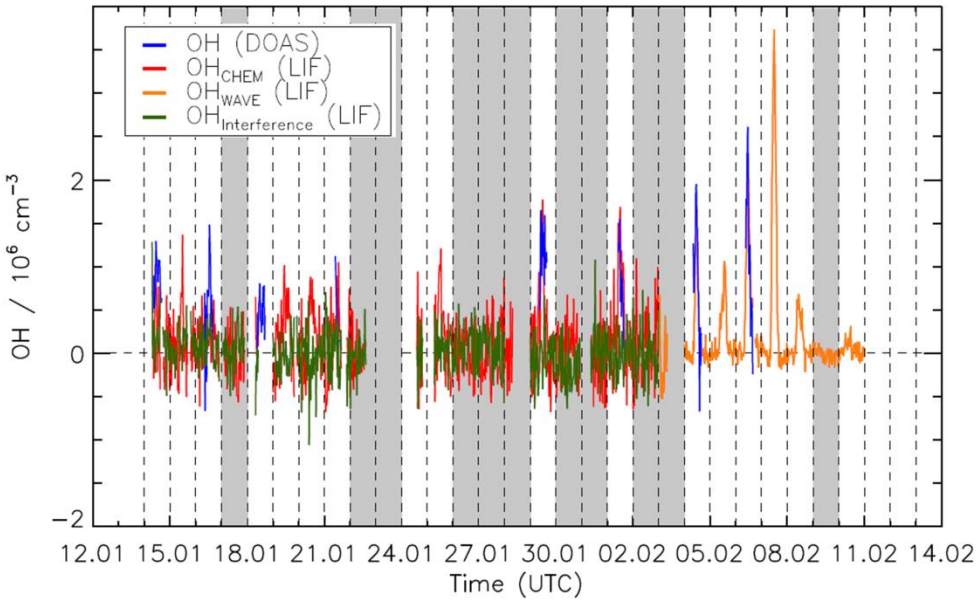

Figure S1: Measured OH concentration and OH interference by LIF with the CMR and DOAS during winter (I) intensive. All data sets are 30 min average. Dashed lines denote midnights. Grey boxes indicate when the roof was closed.

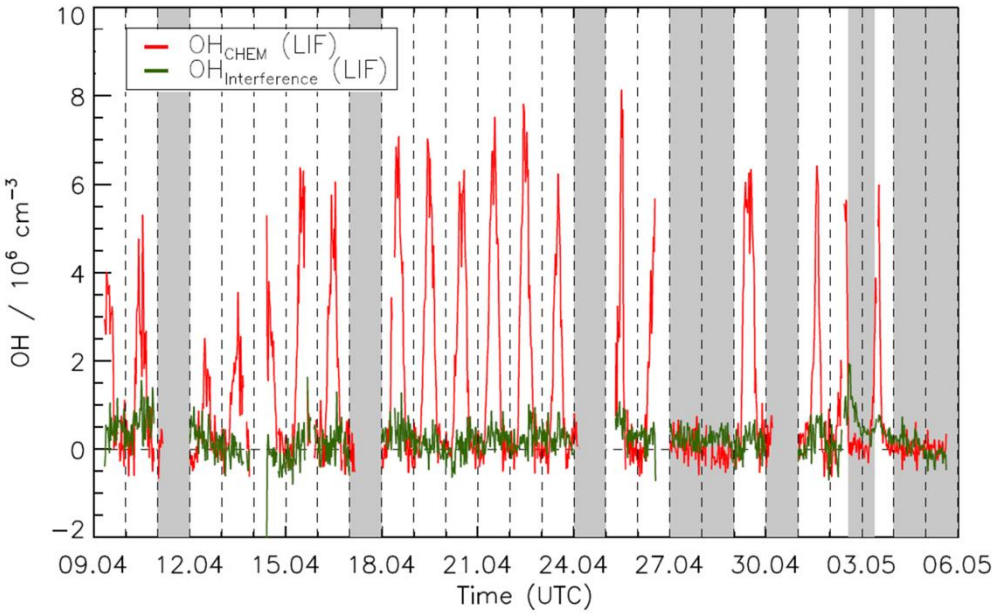

Figure S2: Measured OH concentration and OH interference by LIF with the CMR and DOAS during spring (II) intensive. All data sets are 30 min average. Dashed lines denote midnights. Grey boxes indicate when the roof was closed.

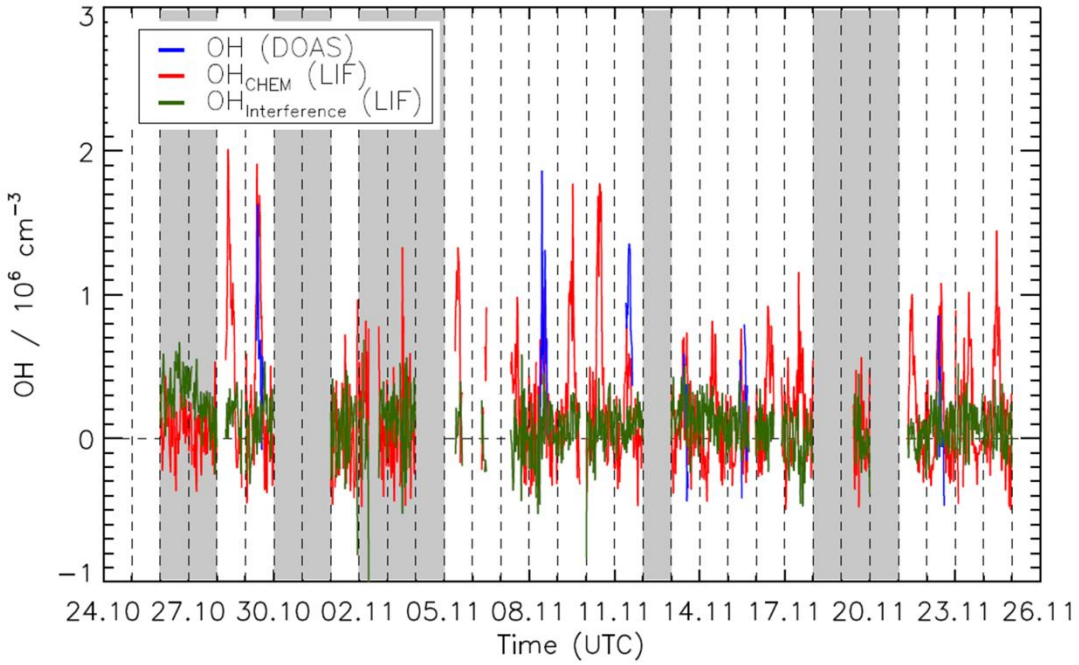

Figure S3: Measured OH concentration and OH interference by LIF with the CMR and DOAS during autumn (IV) intensive. All data sets are 30 min average. Dashed lines denote midnights. Grey boxes indicate when the roof was closed.