Table S1. Summary of regression statistics for the "inverse" plots and sampling conditions for field samples studied with more than one BA concentration.

Expt #	n*	R^2	Slope		y-intercept		Weather Conditions	
			(hr)	SE	(hr μM^{-1})	SE	Morning	Afternoon
207	2	-	1400	-	1800	-	Cold, foggy	Sunny, no wind
225	3	0.95	320	34	95	6.1	Slight overcast	Very sunny, no wind
254	3	0.99	370	31	60	6.7	Slight overcast	Warm, no wind
263	4	0.77	640	250	180	71	Bit overcast, windy	Very overcast, fog, light snow

* Number of data points in inverse plot regression.

Table S2. Results for samples studied in the laboratory to determine P_{OH} in quartz tubes with silicon caps.

Sample	Name	[HOOH] (μM)	Temp (K)	$P_{p\text{-HBA}}$ (μM min^{-1})	SE	P_{OH} (μM hr^{-1})	SE
Summit	0526	9.26	274	3.61E-04	5.08E-05	1.14E-01	1.60E-02
	0526	9.26	274	2.85E-04	3.88E-05	9.00E-02	1.22E-02
	0762	14.5	274	5.32E-04	7.95E-05	1.68E-01	2.51E-02
	0762	14.5	274	5.89E-04	8.65E-05	1.86E-01	2.73E-02
	0763	12.1	274	4.56E-04	6.84E-05	1.44E-01	2.16E-02
Dome C	0608		274	2.09E-04	3.12E-05	6.60E-02	9.85E-03
Blanks	Summit		274	7.06E-05	9.13E-06	2.23E-02	2.88E-03
	Dome C		274	6.20E-05	7.21E-06	1.96E-02	2.28E-03
	Milli-Q		274	5.24E-05	6.94E-06	1.65E-02	2.19E-03
Summit	0526	9.26	263	1.21E-04	2.28E-05	8.96E-02	1.69E-02
	0762	14.5	263	1.60E-04	1.13E-05	1.18E-01	8.38E-03
	0763	14.5	263	1.31E-04	1.90E-05	9.71E-02	1.41E-02
Dome C	0608		263	9.12E-05	1.35E-05	6.76E-02	1.00E-02
Blanks	Summit		263	4.18E-05	6.16E-06	3.10E-02	4.56E-03
	Dome C		263	3.98E-05	5.53E-06	2.95E-02	4.10E-03
	Milli-Q		263	2.61E-05	4.12E-06	1.93E-02	3.05E-03

Table S3. Data from inverse plots for samples studied in the laboratory in quartz tubes with silicon caps.

Sample	Name	Temp (K)	y-int		slope		P_{OH}		$k'_{OH} \times 10^{-4}$		τ_{OH}	
			(hr μM^{-1})	SE	(hr)	SE	(μM hr^{-1})	SE	(s^{-1})	SE	(μs)	SE
Summit	0526	293	8.2	0.55	110	6.2	0.64	0.05	8.3	0.72	12	1.1
		274	11	0.9	120	27	0.48	0.05	5.2	1.2	19	4.4
		263	9.5	0.5	160	17	1.3	0.10	6.6	0.75	15	1.7
	0762	274	10.	0.9	120	11	1.2	0.12	7.3	0.90	14	12
		263	13	1.1	120	15	0.96	0.10	3.7	0.54	27	12
	0763	274	9.7	0.7	100	8.7	1.3	0.12	6.5	0.73	16	1.8
		263	15	0.8	130	100	0.84	0.06	3.5	0.32	29	2.7
Dome C	0608	293	8.2	0.20	110	26	0.64	0.04	8.3	1.9	12	8.7
		274	12	0.6	100	19	0.44	0.03	4.0	0.76	25	4.8
		263	11	1.0	100	32	1.1	0.12	4.1	1.3	24	7.8
Blanks	Summit	274	13	0.6	66	17	0.39	0.03	2.2	0.57	45	12
		263	26	0.8	220	36	0.48	0.03	3.3	0.54	30.	4.9
	Dome C	274	15	0.4	53	11	0.35	0.02	1.6	0.34	62	13
		263	9.6	0.4	60	12	1.3	0.08	2.4	0.48	42	8.6
	Milli-Q	293	14	1.4	20	1.2	0.37	0.04	0.83	0.01	120	14
		274	6.0	0.8	34	9.8	0.88	0.13	2.6	0.83	39	12
		263	11	0.9	82	4.5	0.50	0.05	3.0	0.30	34	3.4

Table S4. Summary of measured [•OH] and estimated [DOC] for samples studied in the laboratory.

Sample	Name	Temp (K)	[•OH] (10^{-15} M)	SE	[DOC] (μmol-C L^{-1})	SE
Summit	0526	274	0.60	0.17	140	75
		263	0.98	0.19	170	89
	0762	274	0.66	0.13	190	98
		263	0.35	0.09	97	51
	0763	274	0.47	0.10	170	87
		263	0.92	0.16	91	46
Dome C	0608	274	0.76	0.13	110	56
		263	0.46	0.18	110	65

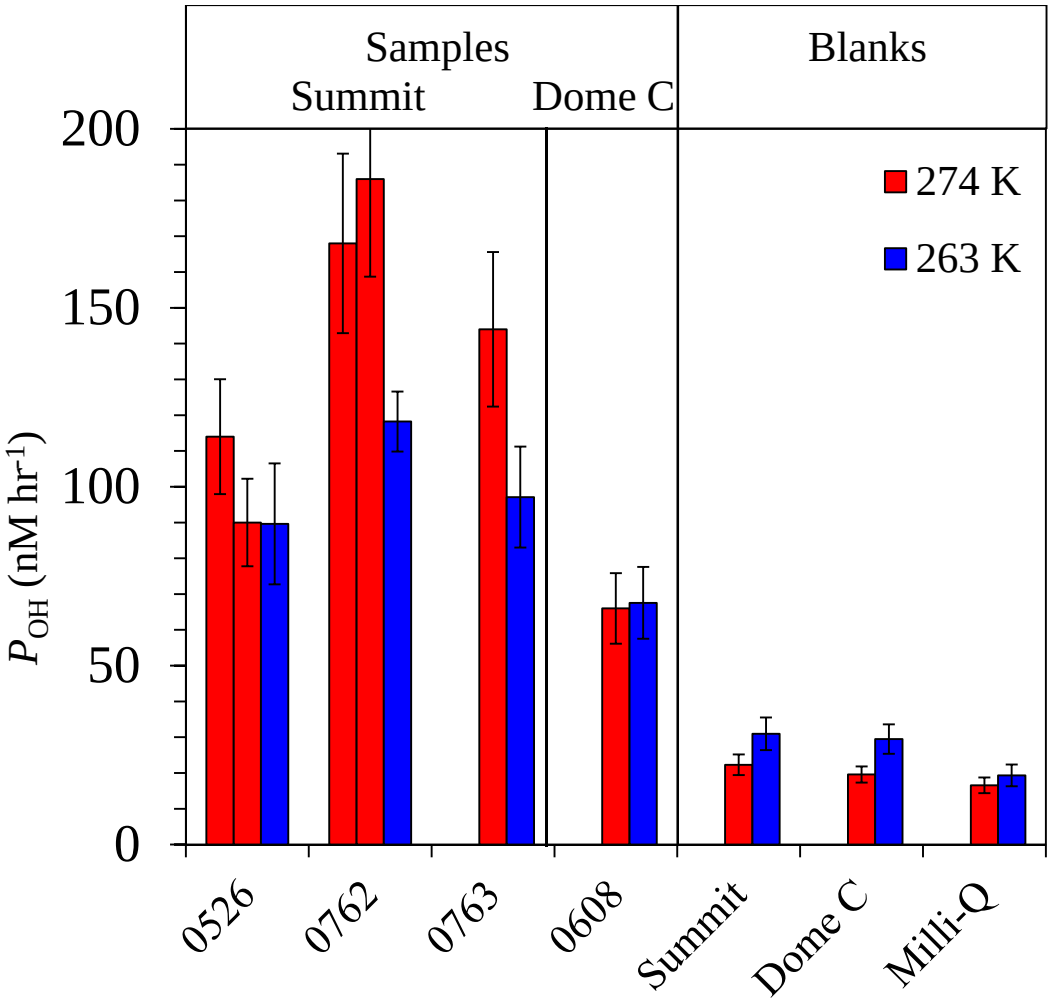

Fig. S1. Experimentally measured rate of ˙OH formation in Summit and Dome C snow samples ($P_{OH,exp}$) in samples studied as solution (274 K, red) and as ice (263 K, blue). Error bars represent ± 1 standard error, based on propagated errors in the rate of *p*-HBA formation ($P_{p\text{-HBA}}$) and $Y_{p\text{-HBA}}$. Sample values are not adjusted for ˙OH formation in the blanks.

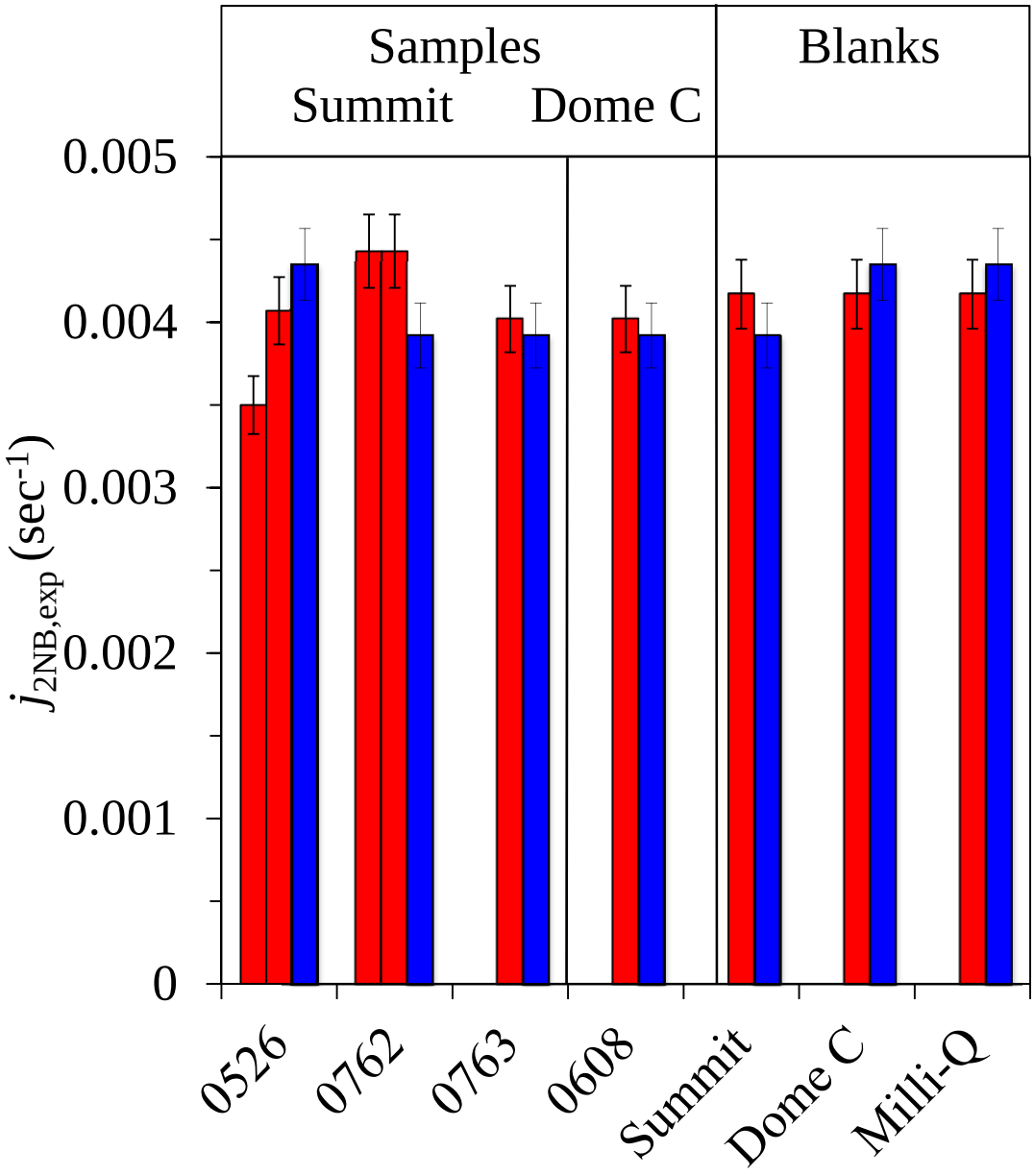

Fig. S2. Direct photodegradation of measured 2-nitrobenzaldehyde (j_{2NB}) corresponding to each experiment in Figure S1. Red bars are j_{2NB} at 274 K and blue bars are j_{2NB} at 263 K. Error bars represent ± 5% error.