

Table S1. Detailed budgets of BC from individual sources for the period of 2007–2011.

BC tracer ^a	Emission ^b , Gg yr ⁻¹	Poleward flux across 66°N ($v>0$), Gg yr ⁻¹	Burden in the Arctic (66°– 90°N), Gg	Deposition to the Arctic, Gg yr ⁻¹		Lifetime, days
				Wet	Dry	
EUR-AN	353.7 (2.6)	76.1	0.9	18.2	4.8	6.4
RUS-AN	196.8 (22.2)	103.0	1.5	26.7	15.2	9.1
JPN-AN	21.0 (0.0)	2.2	0.02	0.1	0.02	4.6
KOR-AN	38.9 (0.0)	3.1	0.04	0.2	0.04	4.6
NCH-AN	946.6 (0.0)	114.0	1.3	8.2	1.6	6.8
SCH-AN	838.5 (0.0)	56.1	0.6	1.8	0.3	6.0
SEA-AN	355.7 (0.0)	8.9	0.1	0.1	0.01	7.1
IND-AN	1196.7 (0.0)	58.2	0.6	0.9	0.1	7.4
MEC-AN	129.7 (0.0)	17.6	0.2	2.2	0.5	9.2
AFR-AN	1005.5 (0.0)	20.7	0.2	0.5	0.05	8.1
ALC-AN	20.6 (0.6)	5.2	0.07	1.1	0.3	6.2
NAM-AN	321.6 (0.0)	40.3	0.4	3.4	0.4	5.7
CAM-AN	78.8 (0.0)	2.5	0.03	0.06	0.006	6.3
SAM-AN	151.1 (0.0)	0.7	0.009	0.01	0.001	6.6
AUN-AN	13.7 (0.0)	0.02	0.0002	0.0001	0.00001	5.6
ROW-AN	15.7 (0.1)	1.7	0.02	0.2	0.06	4.7
EUR-BB	4.1 (0.0)	0.3	0.003	0.09	0.006	8.7
WRU-BB	8.6 (0.0)	2.0	0.02	0.9	0.007	7.6
S1-BB	0.7 (0.7)	0.5	0.007	0.3	0.1	8.0
S2-BB	5.8 (0.0)	2.1	0.02	0.7	0.07	7.8
S3-BB	5.9 (0.0)	1.9	0.02	0.5	0.05	8.2
S4-BB	24.3 (0.0)	8.0	0.09	1.5	0.1	9.1
S5-BB	46.6 (0.0)	16.3	0.2	5.2	0.4	8.0
S6-BB	22.1 (4.2)	11.8	0.1	6.5	1.4	6.5
JPK-BB	0.3 (0.0)	0.04	0.0004	0.004	0.0005	5.2
C1-BB	5.8 (0.0)	1.5	0.02	0.2	0.003	8.3
C2-BB	0.2 (0.0)	0.04	0.0004	0.003	0.0002	8.0
C3-BB	19.8 (0.0)	1.7	0.02	0.05	0.006	7.7
INC-BB	90.3 (0.0)	3.0	0.03	0.08	0.008	5.7
EQA-BB	39.5 (0.0)	0.7	0.01	0.004	0.001	8.2
IND-BB	42.8 (0.0)	2.4	0.02	0.07	0.006	8.0
MEC-BB	8.1 (0.0)	1.2	0.01	0.3	0.02	8.6

NAF-BB	402.5 (0.0)	7.3	0.07	0.2	0.03	7.6
SAF-BB	578.2 (0.0)	0.3	0.004	0.004	0.003	8.9
ALS-BB	10.1 (4.5)	6.2	0.1	3.6	1.0	6.9
WCA-BB	46.8 (1.1)	19.1	0.2	8.5	1.1	6.3
ECA-BB	7.1 (0.0)	1.6	0.02	0.5	0.04	5.6
NAM-BB	16.3 (0.0)	2.0	0.02	0.2	0.01	7.1
CAM-BB	18.5 (0.0)	0.5	0.005	0.02	0.002	6.1
NSA-BB	345.6 (0.0)	0.7	0.009	0.01	0.001	8.2
SSA-BB	36.7 (0.0)	0.1	0.001	0.0004	0.00005	8.4
AUN-BB	108.9 (0.0)	0.2	0.002	0.001	0.0002	6.5
ROW-BB	0.4 (0.0)	0.004	0.00005	0.0004	0.0001	4.8
Total	7580.9 (35.9)	601.8	7.1	93.1	27.9	7.3

^aAN and BB indicate anthropogenic and biomass burning sources, respectively.

^bValues in brackets denote emissions from north of 66°N.

Table S2. Detailed of the relative contributions from individual sources to the annual mean BC concentrations at the surface and 5 km altitude levels, annual deposition and burden in the Arctic (%).

Tracer ^a	Surface	5 km	Burden	Deposition
EUR-AN	13.4	12.2	12.6	19.0
RUS-AN	61.8	9.8	21.0	34.7
JPN-AN	0.1	0.5	0.3	0.1
KOR-AN	0.2	0.8	0.5	0.2
NCH-AN	6.6	29.4	18.7	8.0
SCH-AN	1.1	9.8	7.9	1.7
SEA-AN	< 0.1	0.5	1.5	0.1
IND-AN	0.4	4.5	8.7	0.8
MEC-AN	2.0	3.2	2.8	2.2
AFR-AN	0.2	2.0	3.2	0.5
ALC-AN	1.4	0.9	1.0	1.2
NAM-AN	1.7	9.5	6.0	3.1
CAM-AN	<0.1	0.3	0.4	0.1
SAM-AN	<0.1	<0.1	0.1	<0.1
AUN-AN	<0.1	<0.1	<0.1	<0.1
ROW-AN	0.2	0.4	0.3	0.2
EUR-BB	<0.1	0.1	<0.1	0.1
WRU-BB	0.1	0.3	0.3	0.8
S1-BB	0.2	0.1	0.1	0.3
S2-BB	0.2	0.4	0.3	0.6
S3-BB	0.1	0.4	0.3	0.4
S4-BB	0.3	2.4	1.3	1.3
S5-BB	1.2	3.6	2.6	4.7
S6-BB	3.0	1.2	2.1	6.5
JPB-BB	<0.1	<0.1	<0.1	<0.1
C1-BB	0.1	0.5	0.3	0.2
C2-BB	<0.1	<0.1	<0.1	<0.1
C3-BB	<0.1	0.3	0.2	<0.1
INC-BB	<0.1	0.4	0.4	0.1
EQA-BB	<0.1	<0.1	0.2	<0.1
IND-BB	<0.1	0.3	0.3	<0.1
MEC-BB	<0.1	0.2	0.2	0.3

NAF-BB	<0.1	1.0	1.0	0.2
SAF-BB	<0.1	<0.1	<0.1	<0.1
ALS-BB	2.4	1.0	1.4	3.8
WCA-BB	2.7	3.0	3.3	7.9
ECA-BB	0.1	0.4	0.2	0.4
NAM-BB	<0.1	0.4	0.3	0.2
CAM-BB	<0.1	0.1	<0.1	<0.1
NSA-BB	<0.1	<0.1	0.1	<0.1
SSA-BB	<0.1	<0.1	<0.1	<0.1
AUZ-BB	<0.1	<0.1	<0.1	<0.1
ROW-BB	<0.1	<0.1	<0.1	<0.1

^aAN and BB indicate anthropogenic and biomass burning sources, respectively.