

Supplement

Table S1. Observation list of BC, OC and sulfate mass concentrations at the surface

Code	Site	Country	Network^{#1}	LON	LAT	BC	OC	Sulfate
ACAD1	Acadia NP	US	I	-68.26	44.38	○	○	○
ADPI1	Addison Pinnacle	US	I	-77.21	42.09	○	○	○
AGTH1	Agua Tibia	US	I	-116.97	33.46	○	○	○
AREN1	Arendtsville	US	I	-77.31	39.92	○	○	○
ATLA1	South Dekalb	US	I	-84.29	33.69	○	○	○
BADL1	Badlands NP	US	I	-101.94	43.74	○	○	○
BALD1	Mount Baldy	US	I	-109.44	34.06	○	○	○
BAND1	Bandelier NM	US	I	-106.27	35.78	○	○	○
BIBE1	Big Bend NP	US	I	-103.18	29.30	○	○	○
BIRM1	North Birmingham	US	I	-86.81	33.55	○	○	○
BLIS1	Bliss SP (TRPA)	US	I	-120.10	38.98	○	○	○
BLMO1	Blue Mounds	US	I	-96.19	43.72	○	○	○
BOAP1	Bosque del Apache	US	I	-106.85	33.87	○	○	○
BOLA1	Boulder Lake	US	I	-109.64	42.85	○	○	○
BOND1	Bondville	US	I	-88.37	40.05	○	○	○
BOWA1	Boundary Waters Canoe Area	US	I	-91.50	47.95	○	○	○
BRCA1	Bryce Canyon NP	US	I	-112.17	37.62	○	○	○
BRID1	Bridger Wilderness	US	I	-109.76	42.97	○	○	○
BRIG1	Brigantine NWR	US	I	-74.45	39.47	○	○	○
BRIS1	Breton Island	US	I	-89.76	30.11	○	○	○
BRMA1	Bridgton	US	I	-70.73	44.11	○	○	○
CABA1	Casco Bay	US	I	-70.06	43.83	○	○	○
CABI1	Cabinet Mountains	US	I	-115.67	47.95	○	○	○
CACO1	Cape Cod	US	I	-70.02	41.98	○	○	○
CACR1	Caney Creek	US	I	-94.14	34.45	○	○	○
CADI1	Cadiz	US	I	-87.85	36.78	○	○	○
CANY1	Canyonlands NP	US	I	-109.82	38.46	○	○	○
CAPI1	Capitol Reef NP	US	I	-111.29	38.30	○	○	○
CEBL1	Cedar Bluff	US	I	-99.76	38.77	○	○	○
CHAS1	Chassahowitzka NWR	US	I	-82.55	28.75	○	○	○
CHER1	Cherokee Nation	US	I	-97.03	36.96	○	○	○
CHIR1	Chiricahua NM	US	I	-109.39	32.01	○	○	○
CLPE1	Cloud Peak	US	I	-106.96	44.33	○	○	○
COGO1	Columbia Gorge #1	US	I	-122.21	45.57	○	○	○
COHU1	Cohutta	US	I	-84.63	34.79	○	○	○
CORH1	Columbia River Gorge	US	I	-121.00	45.66	○	○	○
CRES1	Crescent Lake	US	I	-102.43	41.76	○	○	○
CRMO1	Craters of the Moon NM	US	I	-113.56	43.46	○	○	○

DENA1	Denali NP	US	I	-148.97	63.72	○	○	○
DETR1	Detroit	US	I	-83.21	42.23	○	○	○
DEVA1	Death Valley NP	US	I	-116.85	36.51	○	○	○
DOME1	Dome Lands Wilderness	US	I	-118.14	35.73	○	○	○
DOSO1	Dolly Sods Wilderness	US	I	-79.43	39.11	○	○	○
DOUG1	Douglas	US	I	-109.54	31.35	○	○	○
EGBE1	Egbert	US	I	-79.78	44.23	○	○	○
ELDO1	El Dorado Springs	US	I	-94.03	37.70	○	○	○
ELLI1	Ellis	US	I	-99.94	36.09	○	○	○
EVER1	Everglades NP	US	I	-80.68	25.39	○	○	○
FLAT1	Flathead	US	I	-114.27	47.77	○	○	○
FOPE1	Fort Peck	US	I	-105.10	48.31	○	○	○
FRES1	Fresno	US	I	-119.77	36.78	○	○	○
FRRE1	Frostberg Reservoir (Big Piney Run)	US	I	-79.01	39.71	○	○	○
GAAR1	Gates of the Arctic NP	US	I	-151.52	66.90	○	○	○
GAMO1	Gates of the Mountains	US	I	-111.71	46.83	○	○	○
GICL1	Gila Wilderness	US	I	-108.24	33.22	○	○	○
GLAC1	Glacier NP	US	I	-114.00	48.51	○	○	○
GRBA1	Great Basin NP	US	I	-114.22	39.01	○	○	○
GRCA2	Hance Camp at Grand Canyon NP	US	I	-111.98	35.97	○	○	○
GRGU1	Great Gulf Wilderness	US	I	-71.22	44.31	○	○	○
GRR11	Great River Bluffs	US	I	-91.41	43.94	○	○	○
GRSA1	Great Sand Dunes NM	US	I	-105.52	37.72	○	○	○
GRSM1	Great Smoky Mountains NP	US	I	-83.94	35.63	○	○	○
GUMO1	Guadalupe Mountains NP	US	I	-104.81	31.83	○	○	○
HACR1	Haleakala Crater	US	I	-156.25	20.76	○	○	○
HALE1	Haleakala NP	US	I	-156.28	20.81	○	○	○
HAVO1	Hawaii Volcanoes NP	US	I	-155.26	19.43	○	○	○
HECA1	Hells Canyon	US	I	-116.84	44.97	○	○	○
HEGL1	Hercules-Glades	US	I	-92.92	36.61	○	○	○
HOOV1	Hoover	US	I	-119.18	38.09	○	○	○
IKBA1	Ike's Backbone	US	I	-111.68	34.34	○	○	○
INGA1	Indian Gardens	US	I	-112.13	36.08	○	○	○
ISLE1	Isle Royale NP	US	I	-88.15	47.46	○	○	○
JARB1	Jarbidge Wilderness	US	I	-115.43	41.89	○	○	○
JARI1	James River Face Wilderness	US	I	-79.51	37.63	○	○	○
JOSH1	Joshua Tree NP	US	I	-116.39	34.07	○	○	○
KAIS1	Kaiser	US	I	-119.15	37.22	○	○	○
KALM1	Kalmiopsis	US	I	-124.06	42.55	○	○	○
LABE1	Lava Beds NM	US	I	-121.51	41.71	○	○	○
LASU2	Lake Sugema	US	I	-92.01	40.69	○	○	○
LAVO1	Lassen Volcanic NP	US	I	-121.58	40.54	○	○	○

LIGO1	Linville Gorge	US	I	-81.93	35.97	○	○	○
LIVO1	Livonia	US	I	-86.26	38.53	○	○	○
LOST1	Lostwood	US	I	-102.40	48.64	○	○	○
LYBR1	Lye Brook Wilderness	US	I	-73.13	43.15	○	○	○
MACA1	Mammoth Cave NP	US	I	-86.15	37.13	○	○	○
MAKA1	Makah Tribe	US	I	-124.60	48.37	○	○	○
MAVH1	Martha's Vineyard	US	I	-70.78	41.33	○	○	○
MEAD1	Meadview	US	I	-114.07	36.02	○	○	○
MELA1	Medicine Lake	US	I	-104.48	48.49	○	○	○
MEVE1	Mesa Verde NP	US	I	-108.49	37.20	○	○	○
MING1	Mingo	US	I	-90.14	36.97	○	○	○
MKGO1	M.K. Goddard	US	I	-80.15	41.43	○	○	○
MOHO1	Mount Hood	US	I	-121.78	45.29	○	○	○
MOMO1	Mohawk Mt.	US	I	-73.30	41.82	○	○	○
MONT1	Monture	US	I	-113.15	47.12	○	○	○
MOOS1	Moosehorn NWR	US	I	-67.27	45.13	○	○	○
MORA1	Mount Rainier NP	US	I	-122.12	46.76	○	○	○
MOZI1	Mount Zirkel Wilderness	US	I	-106.68	40.54	○	○	○
NEBR1	Nebraska NF	US	I	-100.34	41.89	○	○	○
NEYO1	Is 52	US	I	-73.90	40.82	○	○	○
NOAB1	North Absaroka	US	I	-109.38	44.74	○	○	○
NOCA1	North Cascades	US	I	-121.06	48.73	○	○	○
NOCH1	Northern Cheyenne	US	I	-106.56	45.65	○	○	○
OKEF1	Okefenokee NWR	US	I	-82.13	30.74	○	○	○
OLYM1	Olympic	US	I	-122.97	48.01	○	○	○
ORPH1	Organ Pipe	US	I	-112.80	31.95	○	○	○
PACK1	Pack Monadnock Summit	US	I	-71.88	42.86	○	○	○
PASA1	Pasayten	US	I	-119.93	48.39	○	○	○
PEFO1	Petrified Forest NP	US	I	-109.77	35.08	○	○	○
PENO1	Penobscot	US	I	-68.65	44.95	○	○	○
PHOE1	Phoenix	US	I	-112.10	33.50	○	○	○
PINN1	Pinnacles NM	US	I	-121.16	36.48	○	○	○
PITT1	Lawrenceville	US	I	-79.96	40.47	○	○	○
PMRF1	Proctor Maple R. F.	US	I	-72.87	44.53	○	○	○
PORE1	Point Reyes National Seashore	US	I	-122.91	38.12	○	○	○
PRIS1	Presque Isle	US	I	-68.03	46.70	○	○	○
PUSO1	Puget Sound	US	I	-122.31	47.57	○	○	○
QUCH1	Quaker City	US	I	-81.34	39.94	○	○	○
QURE1	Quabbin Summit	US	I	-72.33	42.30	○	○	○
QUVA1	Queen Valley	US	I	-111.29	33.29	○	○	○
RAFA1	San Rafael	US	I	-120.01	34.73	○	○	○
REDW1	Redwood NP	US	I	-124.08	41.56	○	○	○

ROMA1	Cape Romain NWR	US	I	-79.66	32.94	○	○	○
ROMO1	Rocky Mountain NP	US	I	-105.55	40.28	○	○	○
SACR1	Salt Creek	US	I	-104.40	33.46	○	○	○
SAFO1	Sac and Fox	US	I	-95.57	39.98	○	○	○
SAGO1	San Gorgonio Wilderness	US	I	-116.91	34.19	○	○	○
SAGU1	Saguaro NM	US	I	-110.74	32.17	○	○	○
SAMA1	St. Marks	US	I	-84.16	30.09	○	○	○
SAPE1	San Pedro Parks	US	I	-106.84	36.01	○	○	○
SAWE1	Saguaro West	US	I	-111.22	32.25	○	○	○
SAWT1	Sawtooth NF	US	I	-114.93	44.17	○	○	○
SENE1	Seney	US	I	-85.95	46.29	○	○	○
SEQU1	Sequoia NP	US	I	-118.83	36.49	○	○	○
SHEN1	Shenandoah NP	US	I	-78.43	38.52	○	○	○
SHMI1	Shamrock Mine	US	I	-107.48	37.30	○	○	○
SHRO1	Shining Rock Wilderness	US	I	-82.77	35.39	○	○	○
SIAN1	Sierra Ancha	US	I	-110.94	34.09	○	○	○
SIKE1	Sikes	US	I	-92.44	32.06	○	○	○
SIME1	Simeonof	US	I	-160.51	55.33	○	○	○
SIPS1	Sipsey Wilderness	US	I	-87.34	34.34	○	○	○
SNPA1	Snoqualmie Pass	US	I	-121.43	47.42	○	○	○
STAR1	Starkey	US	I	-118.51	45.22	○	○	○
SULA1	Sula Peak	US	I	-114.00	45.86	○	○	○
SWAN1	Swanquarter	US	I	-76.21	35.45	○	○	○
SYCA1	Sycamore Canyon	US	I	-111.97	35.14	○	○	○
TALL1	Tallgrass	US	I	-96.56	38.43	○	○	○
THBA1	Thunder Basin	US	I	-105.29	44.66	○	○	○
THRO1	Theodore Roosevelt	US	I	-103.38	46.89	○	○	○
THSI1	Three Sisters Wilderness	US	I	-122.04	44.29	○	○	○
TONT1	Tonto NM	US	I	-111.11	33.65	○	○	○
TRCR1	Trapper Creek	US	I	-150.32	62.32	○	○	○
TRIN1	Trinity	US	I	-122.80	40.79	○	○	○
TUXE1	Tuxedni	US	I	-152.67	59.99	○	○	○
ULBE1	UL Bend	US	I	-108.72	47.58	○	○	○
UPBU1	Upper Buffalo Wilderness	US	I	-93.20	35.83	○	○	○
VIIS1	Virgin Islands NP	US	I	-64.80	18.34	○	○	○
VILA1	Viking Lake	US	I	-95.05	40.97	○	○	○
VOYA2	Voyageurs NP #2	US	I	-92.83	48.41	○	○	○
WASH1	Washington D.C.	US	I	-77.03	38.88	○	○	○
WEMI1	Weminuche Wilderness	US	I	-107.80	37.66	○	○	○
WHIT1	White Mountain	US	I	-105.53	33.47	○	○	○
WHPA1	White Pass	US	I	-121.39	46.62	○	○	○
WHPE1	Wheeler Peak	US	I	-105.45	36.59	○	○	○

WHR1I	White River NF	US	I	-106.82	39.15	○	○	○
WICA1	Wind Cave	US	I	-103.48	43.56	○	○	○
WIMO1	Wichita Mountains	US	I	-98.71	34.73	○	○	○
WRIG1	Wrightwood	US	I	-117.69	34.38	○	○	○
YELL2	Yellowstone NP 2	US	I	-110.40	44.57	○	○	○
YOSE1	Yosemite NP	US	I	-119.71	37.71	○	○	○
ZICA1	Zion Canyon	US	I	-113.15	37.20	○	○	○
CH002R	Payerne	Switzerland	EM	6.94	46.81	○	○	○
CH005R	Rigi	Switzerland	EM	8.46	47.07	○	○	○
DE002R	Waldhof	Germany	EM	10.76	52.80	○	○	○
DE003R	Schauinsland	Germany	EM	7.91	47.91	○	○	○
DE007R	Neuglobsow	Germany	EM	13.03	53.17	○	○	○
DE008R	Schmücke	Germany	EM	10.77	50.65	○	○	○
DE004R	Melpitz	Germany	EM	12.93	51.53	○	○	○
ES0009R	Campisabalos	Spain	EM	-3.14	41.28	○	○	○
ES1778R	Montseny	Spain	EM	2.35	41.77	○	○	○
FR0030R	Puy de Dome	France	EM	2.95	45.77	○	○	○
GB0036R	Harwell	UK	EM	-1.32	51.57	○	○	○
IT0004R	Ispra	Italy	EM	8.63	45.80	○	○	○
NL0114U	Overtoom	Netherlands	EM	4.81	52.36	○	○	○
NL0118K	Ring_A10_Zuid	Netherlands	EM	4.90	52.33	○	○	○
NO0001R	Birkenes	Norway	EM	8.25	58.38	○	○	○
NO0002R	Birkenes II	Norway	EM	8.25	58.39	○	○	○
NO0039R	Kårvatn	Norway	EM	8.88	62.78	○	○	○
NO0056R	Hurdal	Norway	EM	11.08	60.37	○	○	○
PL0005R	Diabla Gora	Poland	EM	22.07	54.15	○	○	○
SE0011R	Vavihill	Sweden	EM	13.15	56.02	○	○	○
SE0012R	Aspvreten	Sweden	EM	17.38	58.80	○	○	○
SI0008R	Iskrba	Slovenia	EM	14.87	45.57	○	○	○
CD	Chengdu	China	C	104.04	30.65	○	○	○
DL	Dalian	China	C	121.63	38.90	○	○	○
DH	Dunhuang	China	C	94.68	40.15	○	○	○
GLS	Gaolanshan	China	C	105.85	36.00	○	○	○
GC	Gucheng	China	C	115.80	39.13	○	○	○
JS	Jinsha	China	C	114.20	29.63	○	○	○
LS	Lhasa	China	C	91.13	29.67	○	○	○
LA	LinAn	China	C	119.73	30.30	○	○	○
LFS	Longfengshan	China	C	127.60	44.73	○	○	○
NJ	Nanning	China	C	108.35	22.82	○	○	○
PY	Panyu	China	C	113.35	23.00	○	○	○
TYS	Taiyangshan	China	C	111.71	29.17	○	○	○
XA	Xian	China	C	108.97	34.43	○	○	○

ZZ	Zhengzhou	China	C	113.68	34.78	○	○	○
CRLA1	Crater Lake NP	US	I	-122.14	42.90	○	○	
CY0002R	Ayia Marina	Cyprus	E	33.06	35.04	○	○	
CZ0003R	Kosetice	Czech	E	15.08	49.57	○	○	
BIBE1	Big Bend NP	US	I	-103.18	29.30			○
BIRM1	North Birmingham	US	I	-86.81	33.55			○
BRET1	Breton	US	I	-89.21	29.12			○
CHIC1	Chicago	US	I	-87.71	41.75			○
COHI1	Connecticut Hill	US	I	-76.65	42.40			○
FLTO1	Flat Tops	US	I	-107.63	39.92			○
HILL1	Hillside	US	I	-112.96	34.43			○
HOUS1	Houston Deer Park #2	US	I	-95.13	29.67			○
LTCC1	Lake Tahoe Community College	US	I	-119.97	38.92			○
OLTO1	Old Town	US	I	-68.65	44.93			○
OMAH1	Omaha	US	I	-96.43	42.15			○
OWVL1	Owens Valley	US	I	-118.33	37.36			○
PETE1	Petersburg	US	I	-132.81	56.61			○
PHOE5	Phoenix Colocated Sampler	US	I	-112.10	33.50			○
ROMA1	Cape Romain NWR	US	I	-79.66	32.94			○
RUBI1	Rubidoux	US	I	-117.42	34.00			○
SAGA1	San Gabriel	US	I	-118.03	34.30			○
SPOK1	Spokane Res.	US	I	-117.86	47.90			○
STIL1	Stilwell	US	I	-94.67	35.75			○
WAR11	Walker River Paiute Tribe	US	I	-118.81	38.95			○
AM0001R	Amberd	Armenia	EM	44.26	40.38			○
AT0002	Illmitz	Austria	EM	16.77	47.77			○
DE0001	Westerland	Germany	EM	8.31	54.93			○
DE0009	Zingst	Germany	EM	12.73	54.43			○
DK0003	Tange	Denmark	EM	9.60	56.35			○
DK0005	Keldsnor	Denmark	EM	10.73	54.73			○
DK0008	Anholt	Denmark	EM	11.52	56.72			○
DK0010	Nord, Greenland	Denmark	EM	-16.67	81.60			○
DK0012	Risoe	Denmark	EM	12.09	55.69			○
DK0031	Ulborg	Denmark	EM	8.43	56.28			○
FI0009	Utö	Finland	EM	21.38	59.78			○
FI0017	Virolahti II	Finland	EM	27.69	60.53			○
FI0022	Oulanka	Finland	EM	29.40	66.32			○
FI0036	Pallas (Matorova)	Finland	EM	24.24	68.00			○
FI0037	Ähtäri II	Finland	EM	24.18	62.58			○
IE0001	Valentia Observatory	Ireland	EM	-10.24	51.94			○
IE0005	Oak Park	Ireland	EM	-6.92	52.87			○
IE0006	Malin Head	Ireland	EM	-7.34	55.38			○

IE0008	Carnsore Point	Ireland	EM	-6.37	52.19	○
IS0002	Irafoss	Iceland	EM	-21.02	64.08	○
IS0091	Storhofdi	Iceland	EM	-20.28	63.40	○
LV0010	Rucava	Latvia	EM	21.17	56.16	○
MD0013	Leova II	Moldova	EM	28.28	46.49	○
NL0008	Bilthoven	Netherlands	EM	5.20	52.12	○
NL0009	Kollumerwaard	Netherlands	EM	6.28	53.33	○
NL0010	Vredepeel	Netherlands	EM	5.85	51.54	○
NL0091	De Zilk	Netherlands	EM	4.50	52.30	○
NO0015	Tustervatn	Norway	EM	13.92	65.83	○
NO0042	Ny-Ålesund	Norway	EM	11.89	78.91	○
NO0055	Karasjok	Norway	EM	25.22	69.47	○
NO0090	Andøya	Norway	EM	16.01	69.28	○
NO0091	Søgne	Norway	EM	7.85	58.12	○
SE0014	Råö	Sweden	EM	11.91	57.39	○
SK0002	Chopok	Slovakia	EM	19.58	48.93	○
SK0004	Stará Lesná	Slovakia	EM	20.28	49.15	○
SK0006	Starina	Slovakia	EM	22.27	49.05	○
-	Phnom Penh	Cambodia	EA	104.83	11.55	○
-	Hongwen	China	EA	118.13	24.47	○
-	Serpong	Indonesia	EA	106.57	-6.25	○
-	Rishiri	Japan	EA	141.21	45.12	○
-	Ochiishi	Japan	EA	145.50	43.15	○
-	Tappi	Japan	EA	140.35	41.25	○
-	Sadoseki	Japan	EA	138.40	38.23	○
-	Happo	Japan	EA	137.80	36.68	○
-	Ijira	Japan	EA	136.69	35.57	○
-	Oki	Japan	EA	133.19	36.28	○
-	Banryu	Japan	EA	131.80	34.67	○
-	Yusuhara	Japan	EA	132.93	33.37	○
-	Hedo	Japan	EA	128.25	26.85	○
-	Ogasawara	Japan	EA	142.22	27.08	○
-	Tokyo	Japan	EA	139.76	35.68	○
-	TanahRata	Malaysia	EA	101.38	4.47	○
-	Petaling Jaya	Malaysia	EA	101.65	3.10	○
-	Danum Valley	Malaysia	EA	117.85	4.98	○
-	Ulaanbaatar	Mongolia	EA	106.82	47.90	○
-	Terelj	Mongolia	EA	107.48	47.98	○
-	Yangon	Myanmar	EA	96.12	16.50	○
-	Metro Manila	Philippines	EA	121.07	14.63	○
-	Los Banos	Philippines	EA	121.25	14.18	○
-	Mt. Sto. Tomas	Philippines	EA	120.60	16.42	○

-	Mondy	Russia	EA	101.00	51.67	○
-	Listvyanka	Russia	EA	104.90	51.85	○
-	Irkutsk	Russia	EA	104.25	52.23	○
-	Primorskaya	Russia	EA	132.12	43.70	○
-	Bangkok	Thailand	EA	100.53	13.77	○
-	Patumthani	Thailand	EA	100.57	13.73	○
-	Khanchanaburi	Thailand	EA	100.77	14.03	○
-	Chiang Mai	Thailand	EA	98.93	18.77	○
-	Nakhon Ratchasima	Thailand	EA	101.88	14.45	○
-	Ha Noi	Viet Nam	EA	105.85	21.02	○
-	Hoa Binh	Viet Nam	EA	105.33	20.82	○
BYIS1	Baengnyeong Island	Korea	I	124.63	37.97	○

#1 Network includes I (IMPROVE), EM (EMEP), C (CAWNET) and EA (EANET).

Table S2. Observation sites of dust and seasalt operated by University of Miami, US.

Site	Country	LON	LAT	dust	seasalt
Midway Island	US	-177.40	28.20	○	○
Oahu Hawaii	US	-157.70	21.30	○	○
RSMAS Univ. of Miami	US	-80.20	25.80	○	○
Ragged Point	Barbados	-59.40	13.20	○	○
Mace Head	Ireland	-9.90	53.30	○	○
Cape Point	S. Africa	18.50	-34.30	○	○
Cheju	Korea	126.50	33.50	○	○
Hedo Okinawa	Japan	128.20	26.90	○	○
Cape Grim Tasmania	Australia	144.70	-40.70	○	○
Norfolk Island	Australia	168.00	-29.10	○	○
Funafuti	Tuvalu	-179.00	-8.50	○	
Bermuda	UK	-64.90	32.30	○	
Marsh-King George island	Antarctica	-58.30	-62.20	○	
Izana Tenerife	Spain	-16.50	28.30	○	
Mawson	Antarctica	62.50	-67.60	○	
Enewetak Atoll	US	162.30	11.30	○	
Yate	New Caledonia	167.00	-22.10	○	
Nauru	Nauru	167.00	-0.50	○	
Chatham Island	New Zealand	-176.50	-43.90		○
America Samoa	US	-170.60	-14.20		○
Fanning Island	Kiribati	-159.30	3.90		○
Palmer	Antarctica	-64.05	-64.90		○
Heimaey	Iceland	-20.30	63.40		○
Reunion Island	France	55.83	-21.20		○
Invercargill	New Zealand	168.40	-46.40		○
Wellington	New Zealand	174.90	-41.30		○

Table S3. Observation sites of AOT

Site	Country	Network ^{#1}	LON	LAT
BONDVILLE	US	A	-88.37	40.05
BSRN_sBAO_Boulder	US	A	-105.01	40.05
Billerica	US	A	-71.27	42.53
Bozeman	US	A	-111.05	45.66
Bratts_Lake	US	A	-104.70	50.28
CARTEL	US	A	-71.93	45.38
Cart_Site	US	A	-97.49	36.61
Egbert	US	A	-79.75	44.23
Fresno	US	A	-119.77	36.78
GSFC	US	A	-76.84	38.99
HJAndrews	US	A	-122.22	44.24
Halifax	US	A	-63.59	44.64
KONZA_EDC	US	A	-96.61	39.10
Kangerlussuaq	US	A	-50.62	67.00
La_Parguera	US	A	-67.05	17.97
MD_Science_Center	US	A	-76.62	39.28
Mauna_Loa	US	A	-155.58	19.54
Mexico_City	US	A	-99.18	19.33
Missoula	US	A	-114.08	46.92
Pickle_Lake	US	A	-90.22	51.45
Railroad_Valley	US	A	-115.96	38.50
Rimrock	US	A	-116.99	46.49
Rogers_Dry_Lake	US	A	-117.89	34.93
SERC	US	A	-76.50	38.88
Saturn_Island	US	A	-123.13	48.78
Sevilleta	US	A	-106.89	34.36
Sioux_Falls	US	A	-96.63	43.74
TABLE_MOUNTAIN_CA	US	A	-117.68	34.38
Alta_Floresta	Brazil	A	-56.10	-9.87
Arica	Chile	A	-70.31	-18.47
CEILAP-BA	Argentina	A	-58.50	-34.57
CUIABA-MIRANDA	Brazil	A	-56.02	-15.73
Campo_Grande_SONDA	Brazil	A	-54.54	-20.44
Trelew	Argentina	A	-65.31	-43.25
ATHENS-NOA	Greece	A	23.78	37.99
Autilla	Spain	A	-4.60	42.00
Belsk	Poland	A	20.79	51.84
Blida	Algeria	A	2.88	36.51
Bucharest_Inoe	Romania	A	26.03	44.35
Burjassot	Spain	A	-0.42	39.51

Carpentras	France	A	5.06	44.08
El_Arenosillo	Spain	A	-6.73	37.11
Ersa	France	A	9.36	43.00
Evora	Portugal	A	-7.91	38.57
FORTH_CRETE	Greece	A	25.28	35.33
Granada	Spain	A	-3.61	37.16
Gustav_Dalen_Tower	Swedish coast	A	17.47	58.59
IMS-METU-ERDEMLI	Turkey	A	34.26	36.57
Ispra	Italy	A	8.63	45.80
Kyiv	Ukraine	A	30.50	50.36
Lampedusa	Italy	A	12.63	35.52
Lecce_University	Italy	A	18.11	40.34
Lille	France	A	3.14	50.61
Malaga	Spain	A	-4.48	36.72
Minsk	Belarus	A	27.60	53.92
Modena	Italy	A	10.95	44.63
Moldova	Moldova	A	28.82	47.00
Moscow_MSU_MO	Russia	A	37.51	55.70
OHP_OBSERVATOIRE	France	A	5.71	43.94
Palaiseau	France	A	2.21	48.70
Palencia	Spain	A	-4.52	41.99
Rome_Tor_Vergata	Italy	A	12.65	41.84
Sevastopol	Ukraine	A	33.52	44.62
Thessaloniki	Greece	A	22.96	40.63
Toravere	Estonia	A	26.46	58.26
Toulon	France	A	6.01	43.14
Capo_Verde	Sal Island	A	-22.94	16.73
Dakar	Senegal	A	-16.96	14.39
Dhadnah	UAE	A	56.33	25.51
Eilat	Israel	A	34.92	29.50
IER_Cinzana	Mali	A	-5.93	13.28
Ilorin	Nigeria	A	4.34	8.32
Izana	Spain	A	-16.50	28.31
Nes_Ziona	Israel	A	34.79	31.92
SEDE_BOKER	Israel	A	34.78	30.86
Santa_Cruz_Tenerife	Tenerife	A	-16.25	28.47
Solar_Village	Saudi Arabia	A	46.40	24.91
Mongu	Zambia	A	23.15	-15.25
REUNION_ST_DENIS	France	A	55.48	-20.88
Skukuza	South Africa	A	31.59	-24.99
Birdsville	Australia	A	139.35	-25.90
Canberra	Australia	A	149.11	-35.27

Jabiru	Australia	A	132.89	-12.66
Lake_Argyle	Australia	A	128.75	-16.11
Lauder	New Zealand	S	169.68	-45.04
Chiang_Mai_Met_Sta	Thailand	A	98.97	18.77
Dushanbe	Tajikistan	A	68.86	38.55
Kanpur	India	A	80.23	26.51
Karachi	Pakistan	A	67.03	24.87
Shirahama	Japan	A	135.36	33.69
Silpakorn_Univ	Thailand	A	100.04	13.82
Yakutsk	Russia	A	129.37	61.66
Sendai	Japan	S	140.84	38.26
Chiba	Japan	S	140.10	35.63
Hedo	Japan	S	128.25	26.87
Miyako	Japan	S	125.33	24.74
SACOL	China	A	104.14	35.95
XiangHe	China	A	116.96	39.75
Akedala	China	C	87.97	47.12
Lhasa	China	C	91.13	29.67
Mt.Waliguan	China	C	100.92	36.28
Shangri-La	China	C	99.73	28.02
Dunhuang	China	C	94.68	40.15
Ejina	China	C	101.07	41.95
Hami	China	C	93.52	42.82
Hotan	China	C	79.93	37.13
Jiuquan	China	C	98.48	39.77
Minqin	China	C	103.08	38.63
Tazhong	China	C	83.67	39.00
Urumqi	China	C	108.52	41.57
Xilinhote	China	C	116.12	43.95
Zhangbei	China	C	114.70	41.15
Zhurihe	China	C	112.90	42.40
Dongsheng	China	C	109.98	39.83
Mt.Caolan	China	C	103.85	36.00
Yan'an	China	C	109.50	36.60
Yulin	China	C	109.20	38.43
Changde	China	C	111.70	29.17
Dongtan	China	C	121.96	31.52
Gucheng	China	C	115.80	39.13
Huimin	China	C	117.53	37.48
Lin'an	China	C	119.73	30.30
Mt.Longfeng	China	C	127.60	44.73
Mt.Tai	China	C	117.10	36.25

Shangdianzi	China	C	117.12	40.65
Tongyu	China	C	122.87	44.42
Yushe	China	C	112.98	37.07
Anshan	China	C	123.00	41.08
Beijing	China	C	116.47	39.80
Benxi	China	C	123.78	41.32
Chengdu	China	C	104.03	30.65
Dalian	China	C	121.63	38.90
Datong	China	C	113.33	40.10
Fushun	China	C	123.95	41.88
Hangzhou	China	C	120.17	30.23
Hefei	China	C	116.38	31.98
Kuming	China	C	102.65	25.01
Lanzhou	China	C	103.88	36.05
Naning	China	C	118.77	32.05
Nanjing	China	C	108.35	22.82
Panyu	China	C	113.35	23.00
Pudong	China	C	121.55	31.22
Shenyang	China	C	123.50	41.77
Tianjin	China	C	117.17	39.10
Wulate	China	C	87.62	43.78
Xi'an	China	C	108.97	34.43
Yinchuan	China	C	106.22	38.48
Zhengzhou	China	C	113.68	34.78

#1 The network includes A (AERONET), S (SKYNET) and C (CARINET).

Table S4 Observation sites of surface radiation fluxes by BSRN

Code	Site	Country	Longitude	Latitude
ale	Alert	US	-62.42	82.49
ber	Bermuda	US	-64.67	32.27
bon	Bondville	US	-88.37	40.07
bos	Boulder, SURFRAD	US	-105.24	40.13
bou	Boulder	US	-105.01	40.05
clh	Chesapeake Light	US	-75.71	36.91
dra	Desert Rock	US	-116.02	36.63
fpe	Fort Peck	US	-105.10	48.32
cab	Cabauw	Netherlands	4.93	51.97
car	Carpentras	France	5.06	44.08
nya	Ny-Ålesund	Norway	11.93	78.93
pal	Palaiseau	France	2.21	48.71
tor	Toravere	Estonia	26.46	58.25
sbo	Sedo Boqer	Israel	34.78	30.86
tam	Tamanrasset	Algeria	5.53	22.79
asp	Alice Springs	Australia	133.89	-23.80
dar	Darwin	Australia	130.89	-12.43
dom	Concordia Station	Antarctica	123.38	-75.10
dwn	Darwin Met Office	Australia	130.89	-12.42
gyn	Neumayer Station	Antarctica	-8.25	-70.65
lau	Lauder	New Zealand	169.69	-45.05
man	Momote	Papua New Guinea	147.43	-2.06
nau	Nauru Island	Nauru	166.92	-0.52
syo	Syowa	Antarctica	39.59	-69.01
tat	Tateno	Japan	140.13	36.06