Supplement for Evaluation of Secondary Organic Aerosol and New Particle Formation Scheme within TM5-MP v1.1

Tommi Bergman

February 19, 2021

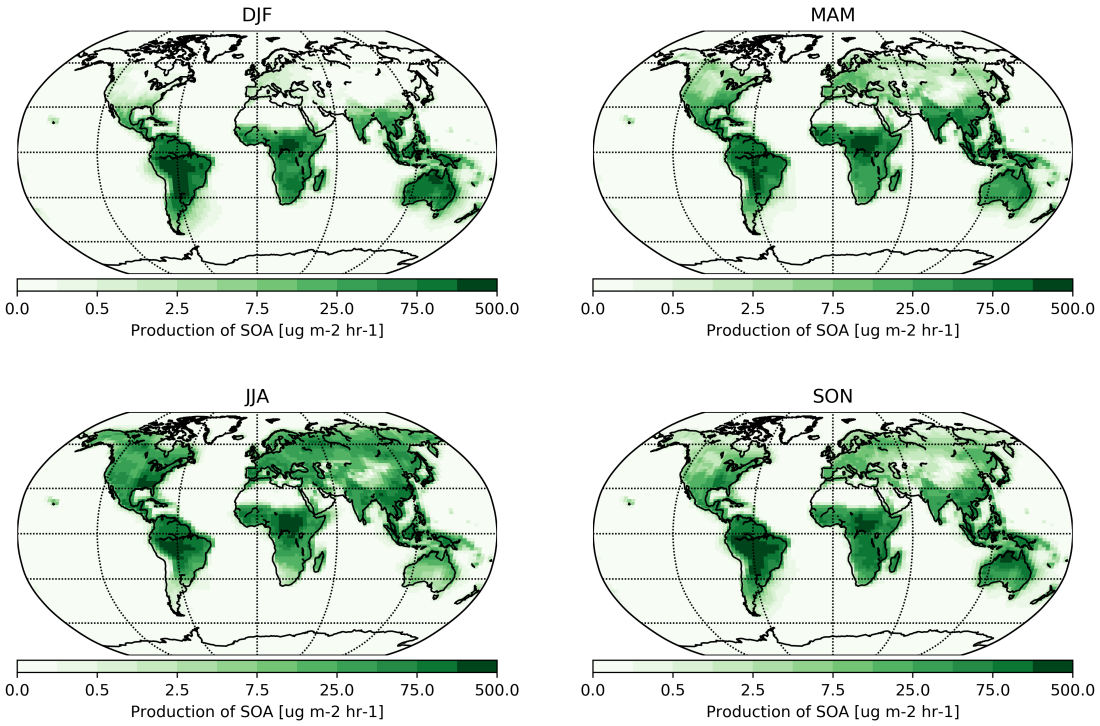

Figure S1: Seasonal mean production of SOA in NEWSOA.

Table S1: Station list from IMPROVE network.

Station name	Station code	Longitude	Latitude	Elevation
Acadia NP	ACAD1	-68.261	44.3771	157.0
Addison Pinnacle	ADPI1	-77.2099	42.0912	512.0
Agua Tibia	AGTI1	-116.9706	33.4636	507.0
Arendtsville	AREN1	-77.3079	39.9232	267.0
Badlands NP	BADL1	-101.9412	43.7435	736.0
Bandelier NM	BAND1	-106.2664	35.7797	1988.0
Big Bend NP	BIBE1	-103.178	29.3027	1066.0
Bliss SP (TRPA)	BLIS1	-120.1025	38.9761	2130.0
Blue Mounds	BLMO1	-96.1913	43.7158	473.0
Bondville	BOND1	-88.3733	40.052	263.0
Bosque del Apache	BOAP1	-106.852	33.8695	1389.0
Boulder Lake	BOLA1	-109.64	42.85	2296.0
Boundary Waters Canoe Area	BOWA1	-91.4955	47.9466	526.0
Breton Island	BRIS1	-89.76168	30.10863	-7.0
Bridger Wilderness	BRID1	-109.7579	42.9749	2626.0
Bridgton	BRMA1	-70.7292	44.1074	233.0
Brigantine NWR	BRIG1	-74.4492	39.465	5.0
Bryce Canyon NP	BRCA1	-112.1736	37.6184	2481.0
Cabinet Mountains	CABI1	-115.6709	47.9549	1441.0
Cadiz	CADI1	-87.8501	36.7842	191.0
Caney Creek	CACR1	-94.1429	34.4544	683.0
Canyonlands NP	CANY1	-109.821	38.4587	1798.0
Cape Cod	CACO1	-70.0242	41.9758	49.0
Cape Romain NWR	ROMA1	-79.6572	32.941	4.0

Capitol Reef NP	CAPI1	-111.2926	38.3022	1896.0
Casco Bay	CABA1	-70.0644	43.8325	26.0
Cedar Bluff	CEBL1	-99.7634	38.7701	665.0
Chassahowitzka NWR	CHAS1	-82.5549	28.7484	4.0
Cherokee Nation	CHER1	-97.0313	36.9562	342.0
Chiricahua NM	CHIR1	-109.389	32.0094	1554.0
Cloud Peak	CLPE1	-106.9565	44.3335	2470.0
Cohutta	COHU1	-84.6265	34.7852	735.0
Columbia Gorge #1	COGO1	-122.2103	45.5693	230.0
Columbia River Gorge	CORI1	-121.0008	45.6644	178.0
Crater Lake NP	CRLA1	-122.1361	42.8958	1996.0
Craters of the Moon NM	CRMO1	-113.5551	43.4605	1817.0
Crescent Lake	CRES1	-102.4336	41.7627	1207.0
Death Valley NP	DEVA1	-116.8478	36.5089	130.0
Denali NP	DENA1	-148.9675	63.7233	658.0
Detroit	DETR1	-83.2085	42.2286	179.0
Dolly Sods Wilderness	DOSO1	-79.4261	39.1053	1182.0
Dome Lands Wilderness	DOME1	-118.1377	35.7278	927.0
Douglas	DOUG1	-109.5397	31.3492	1230.0
Egbert	EGBE1	-79.78322	44.23115	251.0
El Dorado Springs	ELDO1	-94.0348	37.7009	297.0
Ellis	ELLI1	-99.9354	36.0853	697.0
Everglades NP	EVER1	-80.6806	25.391	1.0
Flathead	FLAT1	-114.269	47.7734	1580.0
Fort Peck	FOPE1	-105.1022	48.308	638.0
Fresno	FRES1	-119.7732	36.7818	100.0
Frostberg Reservoir (Big Piney Run)	FRRE1	-79.0122	39.7058	767.0
Gates of the Arctic NP	GAAR1	-151.517	66.9025	196.0
Gates of the Mountains	GAMO1	-111.7107	46.8262	2387.0
Gila Wilderness	GICL1	-108.2351	33.2204	1775.0
Glacier NP	GLAC1	-113.9966	48.5105	975.0
Great Basin NP	GRBA1	-114.2161	39.0052	2065.0
Great Gulf Wilderness	GRGU1	-71.2177	44.3082	453.0
Great River Bluffs	GRRI1	-91.4052	43.9373	370.0
Great Sand Dunes NM	GRSA1	-105.5185	37.7249	2498.0
Great Smoky Mountains NP	GRSM1	-83.9416	35.6334	810.0
Guadalupe Mountains NP	GUMO1	-104.8094	31.833	1672.0
Haleakala Crater	HACR1	-156.2479	20.7585	2158.0
Haleakala NP	HALE1	-156.2823	20.8086	1153.0
Hance Camp at Grand Canyon NP	GRCA2	-111.9841	35.9731	2267.0
Hawaii Volcanoes NP	HAVO1	-155.2579	19.4309	1258.0
Hells Canyon	HECA1	-116.8438	44.9702	655.0
Hercules-Glades	HEGL1	-92.9221	36.6138	404.0
Hoover	HOOV1	-119.1771	38.0881	2560.0
Ike's Backbone	IKBA1	-111.6832	34.3405	1297.0
Indian Gardens	INGA1	-112.1288	36.0778	1166.0
Is 52	NEYO1	-73.9019	40.8161	45.0
Isle Royale NP	ISLE1	-88.1491	47.4596	182.0
James River Face Wilderness	JARI1	-79.5125	37.6266	289.0
Jarbidge Wilderness	JARB1	-115.4261	41.8926	1869.0
Joshua Tree NP	JOSH1	-116.3889	34.0695	1235.0
Kaiser	KAIS1	-119.1546	37.2207	2597.0
Kalmiopsis	KALM1	-124.0589	42.552	80.0
Lake Sugema	LASU2	-92.0059	40.6932	229.0
Lassen Volcanic NP	LAVO1	-121.5768	40.5398	1732.0
Lava Beds NM	LABE1	-121.5068	41.7117	1459.0
Lawrenceville	PITT1	-79.9607	40.4654	268.0
Linville Gorge	LIGO1	-81.9331	35.9723	968.0
Livonia	LIVO1	-86.2604	38.5346	281.0

Lostwood	LOST1	-102.4022	48.6419	696.0
Lye Brook Wilderness	LYBR1	-73.1268	43.1482	1015.0
M.K. Goddard	MKGO1	-80.1453	41.4269	379.0
Makah Tribe	MAKA1	-124.595	48.37185	-999.0
Makah Tribe Site #2	MAKA2	-124.62	48.3	480.0
Mammoth Cave NP	MACA1	-86.1479	37.1318	235.0
Martha's Vineyard	MAVI1	-70.7846	41.3309	2.0
Meadview	MEAD1	-114.0684	36.0193	902.0
Medicine Lake	MELA1	-104.4757	48.4871	606.0
Mesa Verde NP	MEVE1	-108.4907	37.1984	2172.0
Mingo	MING1	-90.1432	36.9717	111.0
Mohawk Mt.	MOMO1	-73.2973	41.8214	521.0
Monture	MONT1	-113.1544	47.1222	1282.0
Moosehorn NWR	MOOS1	-67.2661	45.1259	77.0
Mount Baldy	BALD1	-109.4406	34.0584	2508.0
Mount Hood	MOHO1	-121.7837	45.2888	1531.0
Mount Rainier NP	MORA1	-122.1244	46.7583	439.0
Mount Zirkel Wilderness	MOZI1	-106.6766	40.5383	3243.0
Nebraska NF	NEBR1	-100.3387	41.8888	883.0
North Absaroka	NOAB1	-109.3816	44.7448	2482.0
North Birmingham	BIRM1	-86.8148	33.5531	175.0
North Cascades	NOCA1	-121.0646	48.7316	568.0
Northern Cheyenne	NOCH1	-106.5574	45.6495	1283.0
Okefenokee NWR	OKEF1	-82.1283	30.7405	48.0
Olympic	OLYM1	-122.9727	48.0065	599.0
Organ Pipe	ORPI1	-112.8016	31.9506	504.0
Pack Monadnock Summit	PACK1	-71.8786	42.8619	695.0
Pasayten	PASA1	-119.9275	48.3877	1627.0
Penobscot	PENO1	-68.64786	44.94798	45.0
Petrified Forest NP	PEFO1	-109.7692	35.0777	1766.0
Phoenix	PHOE1	-112.0958	33.5038	342.0
Phoenix Colocated Sampler	PHOE5	-112.0958	33.5038	342.0
Pinnacles NM	PINN1	-121.1568	36.4833	302.0
Point Reyes National Seashore	PORE1	-122.9085	38.1224	97.0
Presque Isle	PRIS1	-68.0333	46.6964	165.0
Proctor Maple R. F.	PMRF1	-72.8688	44.5284	401.0
Puget Sound	PUSO1	-122.3119	47.5696	97.0
Quabbin Summit	QURE1	-72.3346	42.2985	317.0
Quaker City	QUCI1	-81.3378	39.9428	366.0
Queen Valley	QUVA1	-111.2858	33.2939	661.0
Redwood NP	REDW1	-124.0839	41.5608	243.0
Rocky Mountain NP	ROMO1	-105.5457	40.2783	2760.0
Sac and Fox	SAFO1	-95.5682	39.9791	293.0
Saguaro NM	SAGU1	-110.7371	32.1746	941.0
Saguaro West	SAWE1	-111.2178	32.2486	714.0
Salt Creek	SACR1	-104.4042	33.4598	1072.0
San Gorgonio Wilderness	SAGO1	-116.9132	34.1939	1726.0
San Pedro Parks	SAPE1	-106.8447	36.0139	2935.0
San Rafael	RAFA1	-120.0074	34.7339	956.0
Sawtooth NF	SAWT1	-114.9271	44.1705	1990.0
Seney	SENE1	-85.9503	46.2889	214.0
Sequoia NP	SEQU1	-118.8291	36.4894	519.0
Shamrock Mine	SHMI1	-107.4842	37.3038	2351.0
Shenandoah NP	SHEN1	-78.4348	38.5229	1079.0
Shining Rock Wilderness	SHRO1	-82.7744	35.3937	1617.0
Sierra Ancha	SIAN1	-110.9421	34.0908	1600.0
Sikes	SIKE1	-92.435	32.0574	45.0
Simeonof	SIME1	-160.5063	55.3255	57.0
Sipsey Wilderness	SIPS1	-87.3388	34.3433	286.0

Snoqualmie Pass	SNPA1	-121.4259	47.422	1049.0
South Dekalb	ATLA1	-84.2903	33.688	243.0
St. Marks	SAMA1	-84.1614	30.0926	7.0
Starkey	STAR1	-118.5129	45.2249	1259.0
Stilwell	STIL1	-94.66956	35.75078	300.0
Sula Peak	SULA1	-114.0001	45.8598	1895.0
Swanquarter	SWAN1	-76.2075	35.451	-3.0
Sycamore Canyon	SYCA1	-111.9692	35.1406	2046.0
Tallgrass	TALL1	-96.5602	38.4341	390.0
Theodore Roosevelt	THRO1	-103.3777	46.8948	852.0
Three Sisters Wilderness	THSI1	-122.0434	44.291	885.0
Thunder Basin	THBA1	-105.2874	44.6634	1195.0
Tonto NM	TONT1	-111.1068	33.6548	775.0
Trapper Creek	TRCR1	-150.3156	62.3153	155.0
Trinity	TRIN1	-122.8046	40.7864	1014.0
Tuxedni	TUXE1	-152.6656	59.9925	15.0
UL Bend	ULBE1	-108.7196	47.5823	891.0
Upper Buffalo Wilderness	UPBU1	-93.203	35.8258	722.0
Viking Lake	VILA1	-95.045	40.969	371.0
Virgin Islands NP	VIIS1	-64.7962	18.3363	51.0
Voyageurs NP #2	VOYA2	-92.8286	48.4126	429.0
Washington D.C.	WASH1	-77.0344	38.8762	15.0
Weminuche Wilderness	WEMI1	-107.7999	37.6594	2750.0
Wheeler Peak	WHPE1	-105.452	36.5854	3366.0
White Mountain	WHIT1	-105.5349	33.4687	2063.0
White Pass	WHPA1	-121.3881	46.6243	1827.0
White River NF	WHRI1	-106.8209	39.1536	3413.0
Wichita Mountains	WIMO1	-98.713	34.7323	509.0
Wind Cave	WICA1	-103.4838	43.5576	1296.0
Wrightwood	WRIG1	-117.69	34.38	2106.0
Yellowstone NP 2	YELL2	-110.4002	44.5653	2425.0
Yosemite NP	YOSE1	-119.7061	37.7133	1603.0
Zion Canyon	ZICA1	-113.1508	37.1983	1215.0

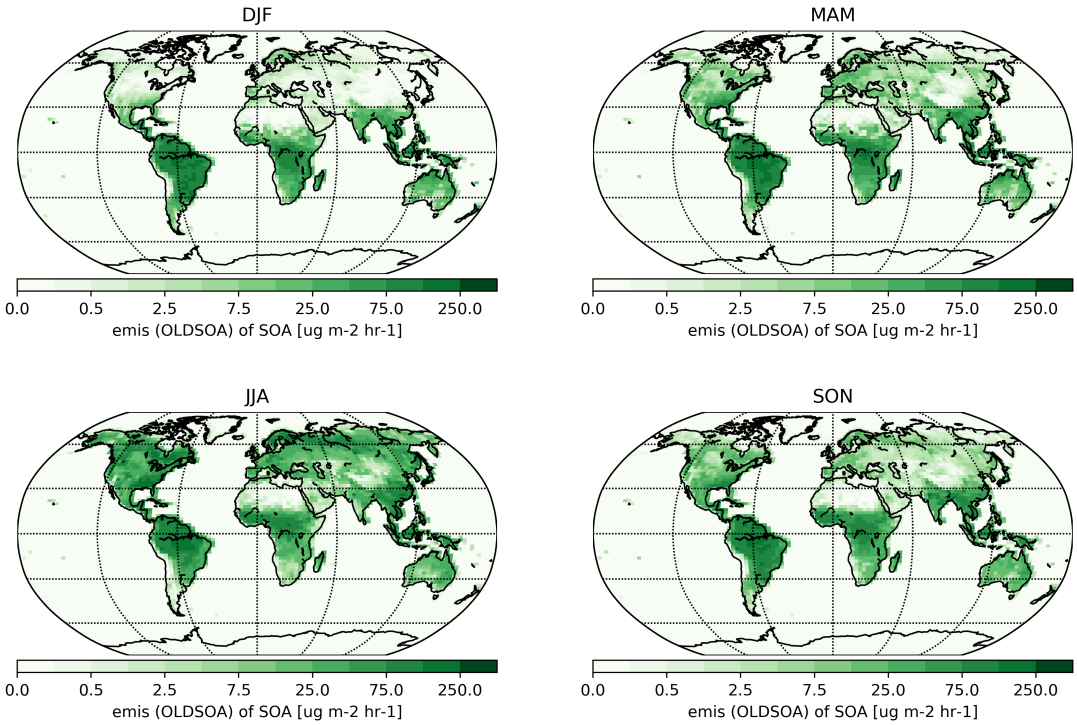

Figure S2: Seasonal mean production of SOA in OLDSOA

Table S2: Station list from EMEP network.

Station name	Station code	Longitude	Latitude	Elevation
Campisabalos	ES0009R	-3.142778	41.281111	1360.0m
Diabla Gora	PL0005R	22.066667	54.15	157.0m
Harwell	GB0036R	-1.316667	51.573056	137.0m
Iskrba	SI0008R	14.866667	45.566667	520.0m
K-puszta	HU0002R	19.583333	46.966667	125.0m
Leova II	MD0013R	28.2835	46.4884	166.0m
Melpitz	DE0044R	12.93386	51.53014	86.0m
Montseny	ES1778R	2.35	41.766667	700.0m
Neuglobsow	DE0007R	13.033333	53.166667	62.0m
Payerne	CH0002R	6.944722	46.813056	489.0m
Puy de Dôme	FR0030R	2.95	45.76667	1465.0m
Rigi	CH0005R	8.463889	47.0675	1031.0m
Schauinsland	DE0003R	7.908611	47.914722	1205.0m
Schmücke	DE0008R	10.766667	50.65	937.0m
Vavihill	SE0011R	13.15	56.016667	175.0m

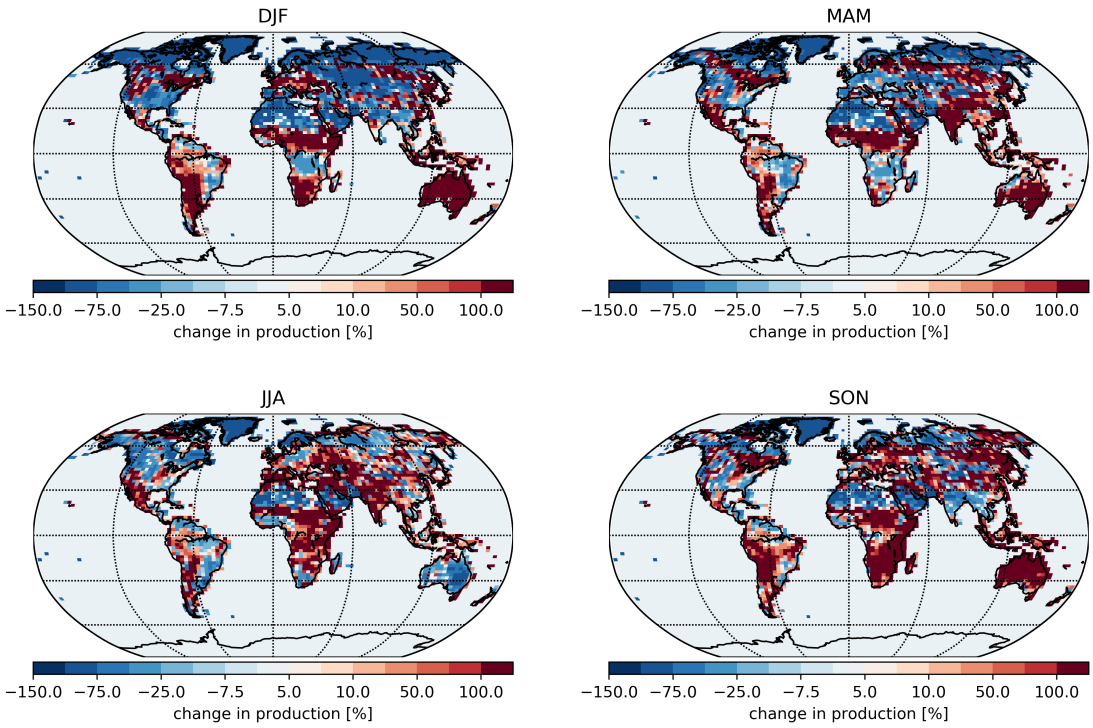

Figure S3: Change in seasonal mean production of SOA.

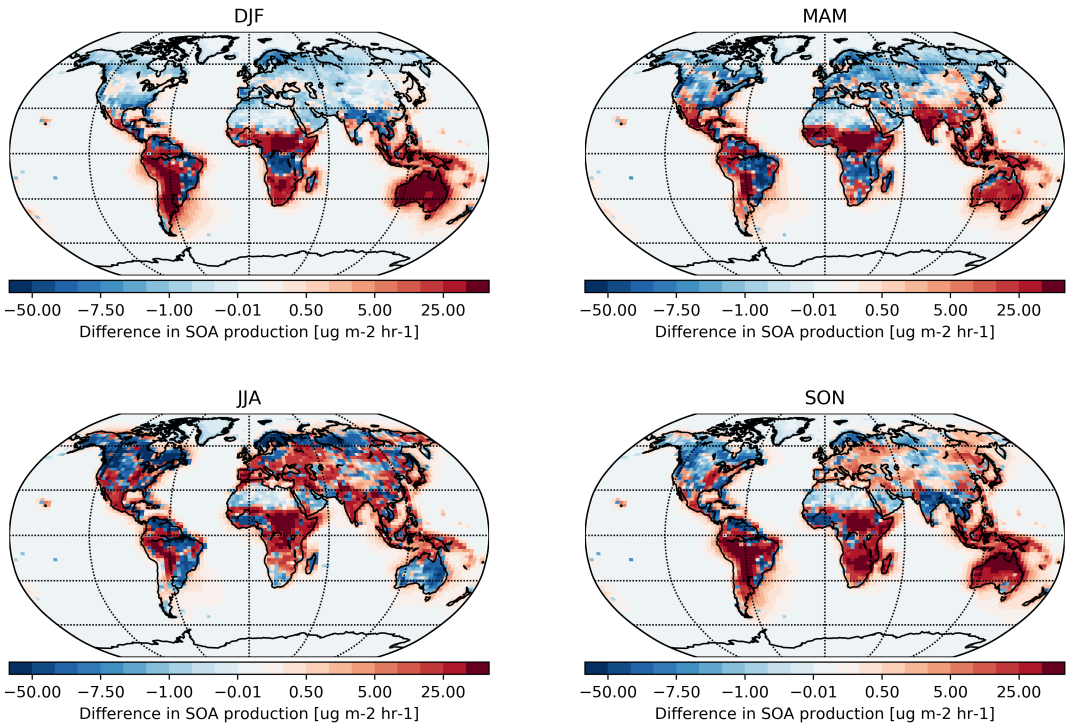

Figure S4: Seasonal mean difference in production of SOA between OLDSOA and NEWSOA

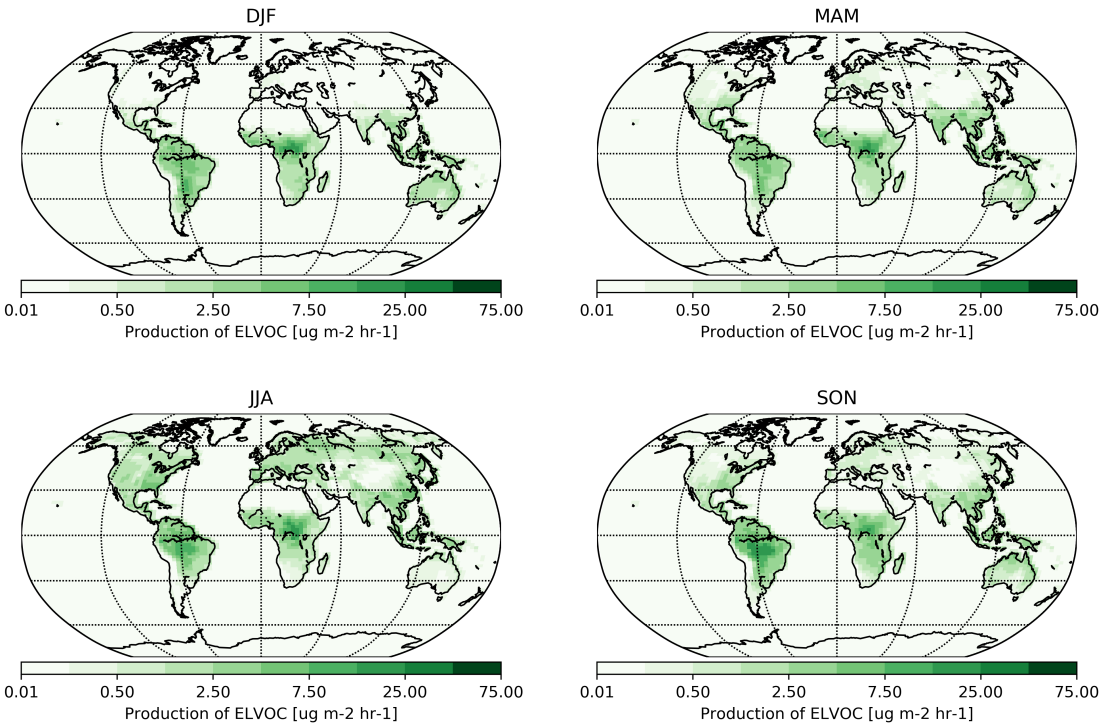

Figure S5: Seasonal mean production of ELVOC in NEWSOA.

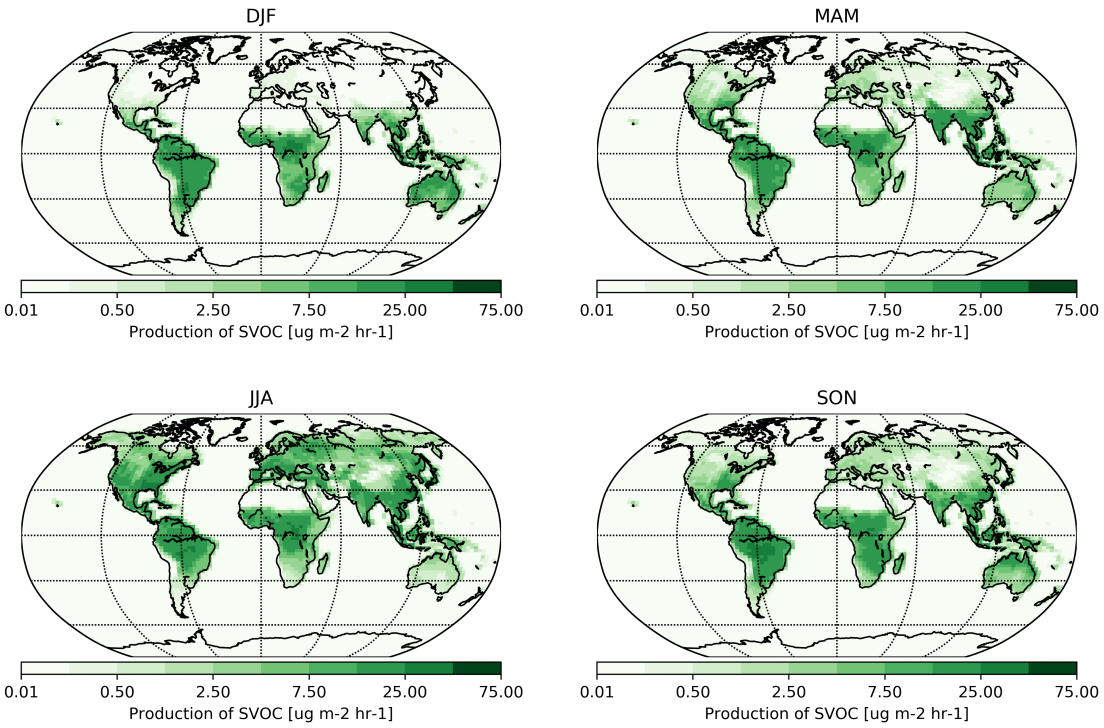

Figure S6: Seasonal mean production of SVOC in NEWSOA.

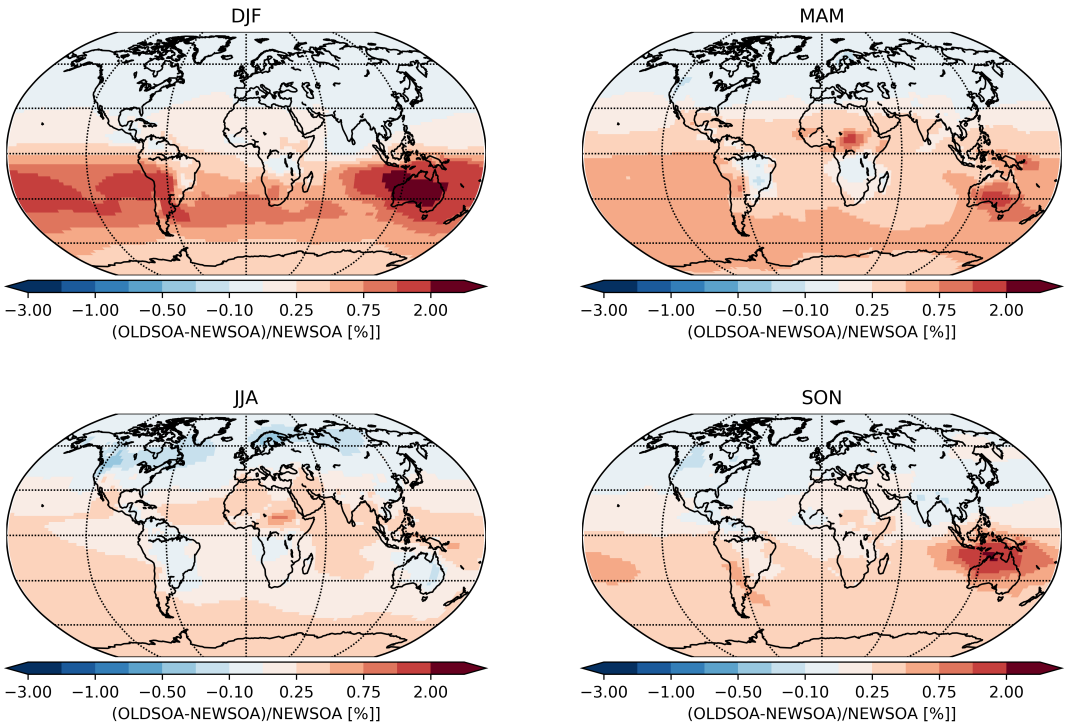

Figure S7: Seasonal mean fractional change in SOA burden.

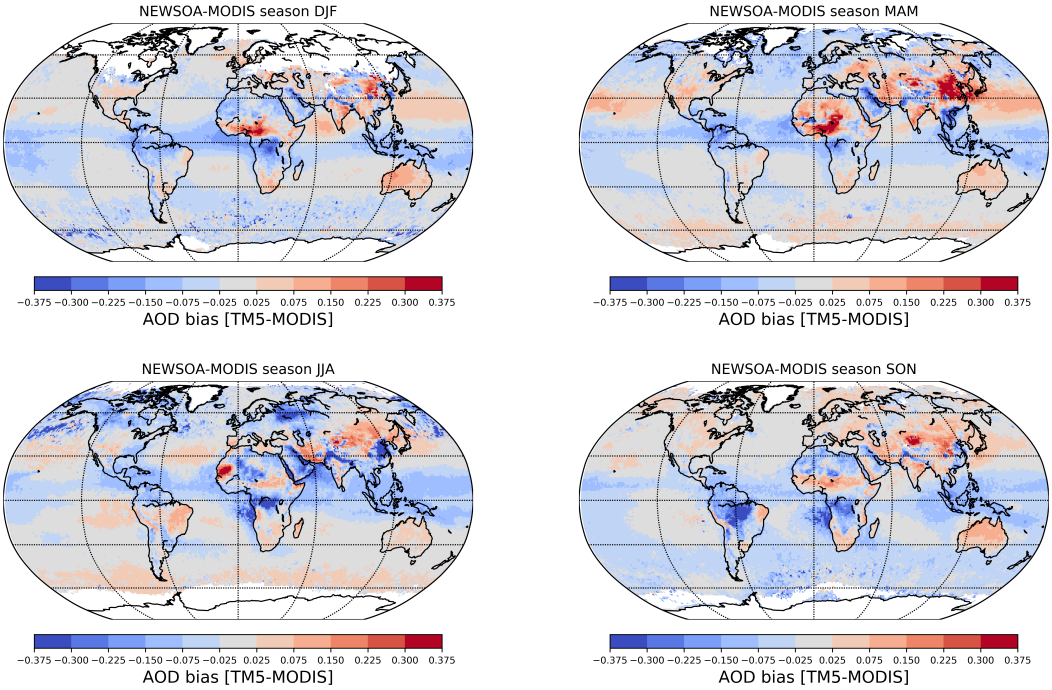

Figure S8: Seasonal mean AOD difference between MODIS and NEWSOA.

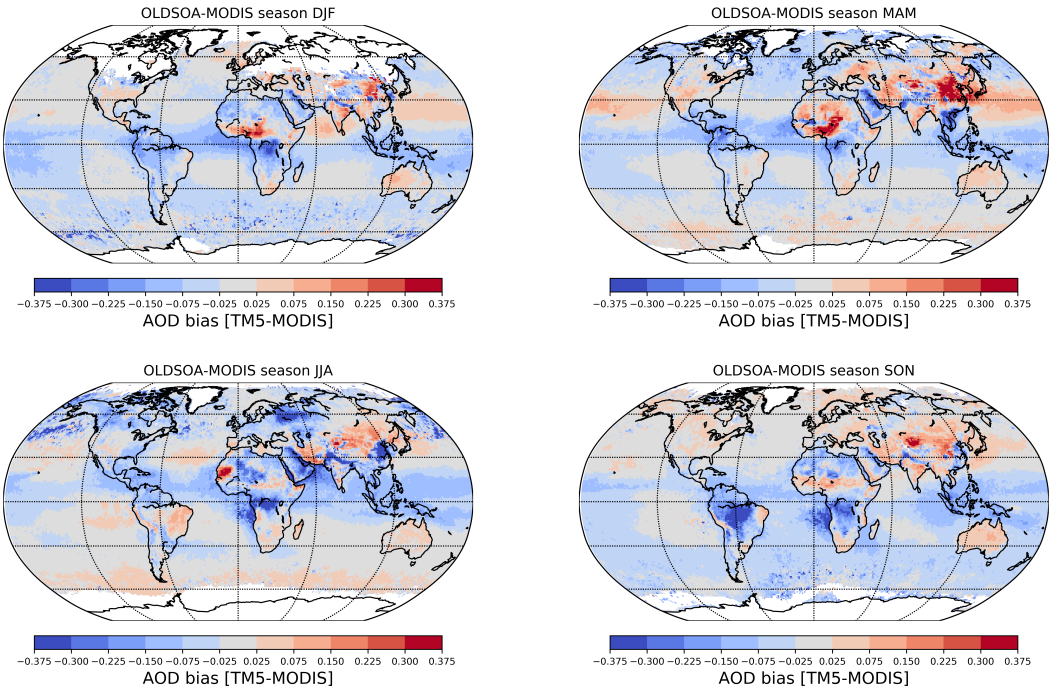

Figure S9: Seasonal mean AOD difference between MODIS and OLDSOA.

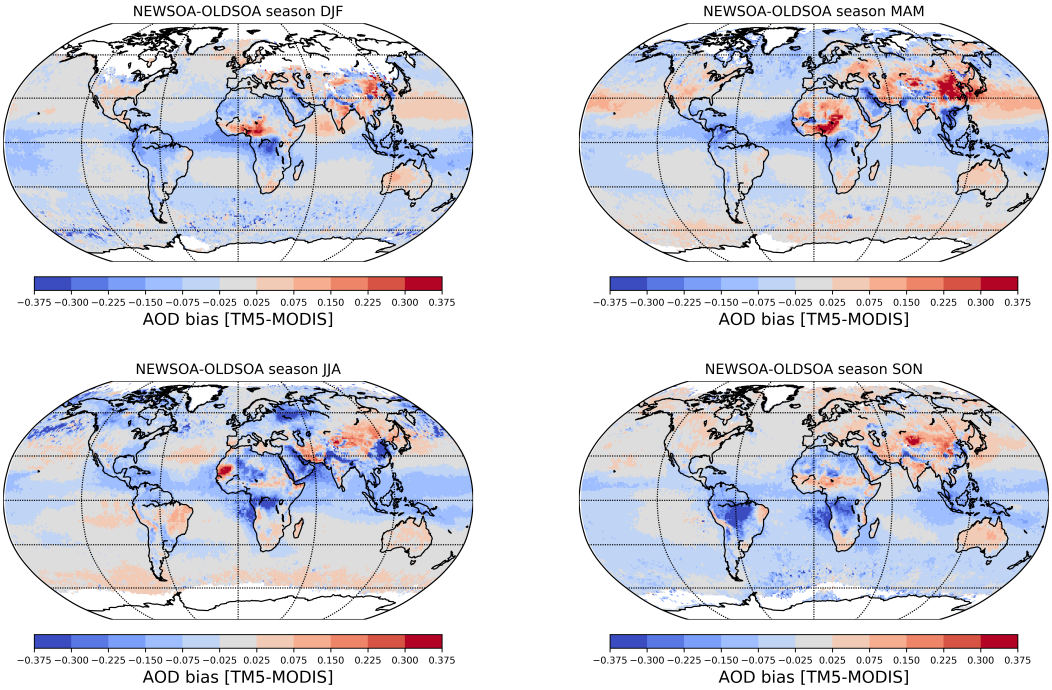

Figure S10: Seasonal mean AOD differenc between OLDSOA and NEWSOA.

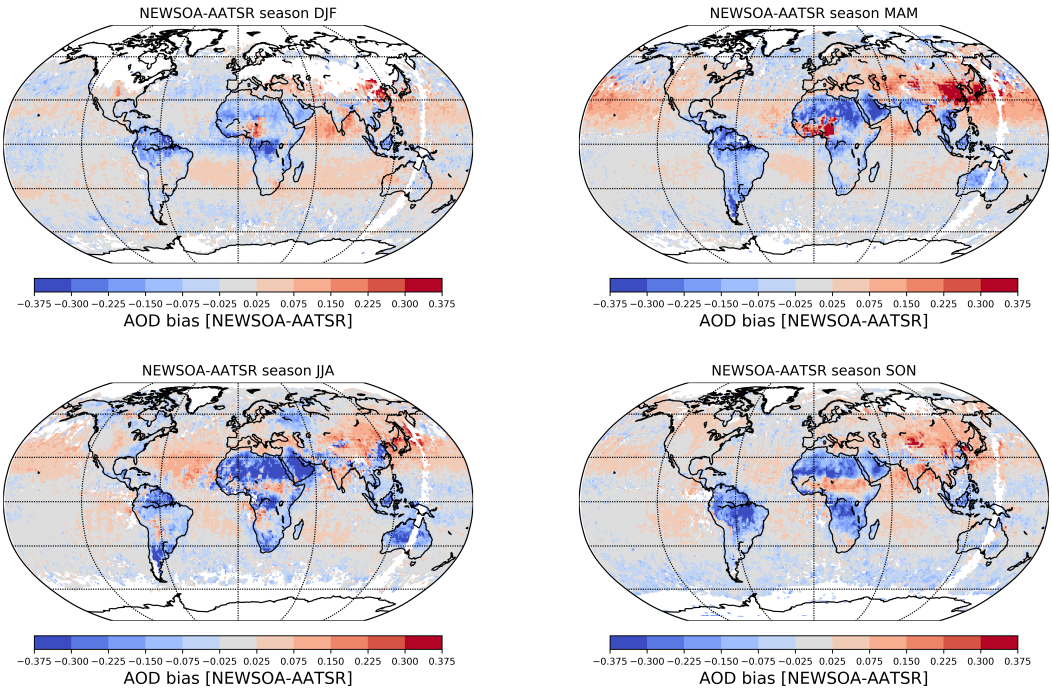

Figure S11: Seasonal mean AOD difference between AATSR and NEWSOA.

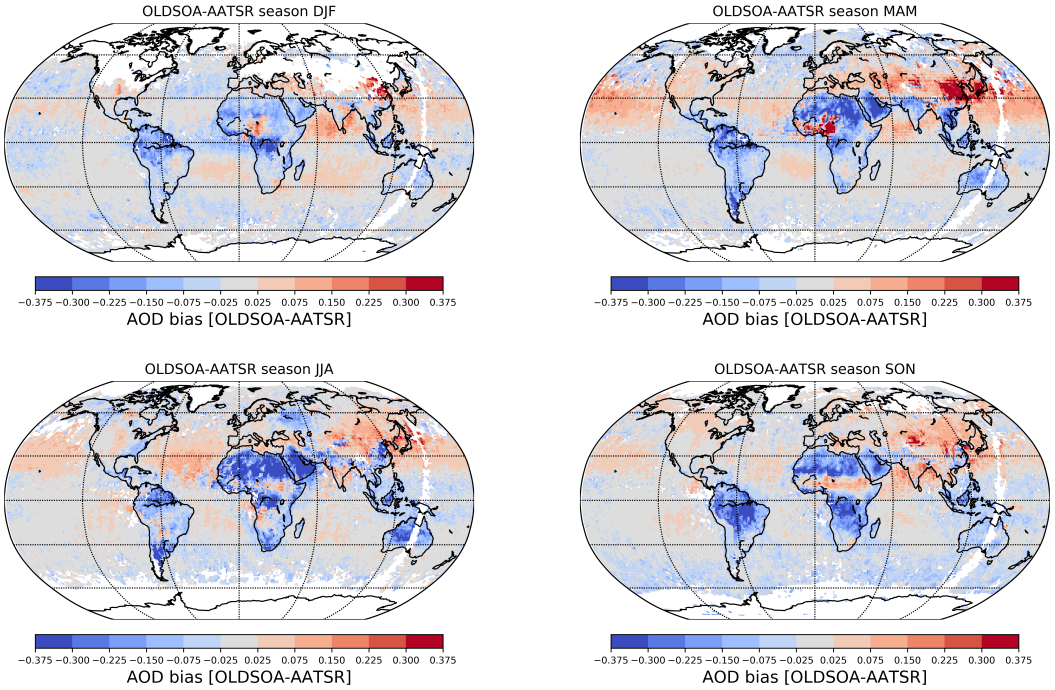

Figure S12: Seasonal mean AOD difference between AATSR and OLDSOA.

Table S3: Station list for EBAS CPC data.

Station name	Station code	Longitude	Latitude	Elevation
Alert	CA0420G	-62.3415260315	82.4991455078	210.0m
Appalachian State University, Boone (NC)	US3446C	-81.7	36.2	1100.0m
Barrow	US0008R	-156.611465454	71.3230133057	11.0m
Bondville	US0035R	-88.36667	40.05	213.0m
Cape Point	ZA0001G	18.48968	-34.35348	230.0m
Cape San Juan	PR0100C	-65.618	18.381	65.0m
East Trout Lake	CA0102R	-104.986864	54.353743	500.0m
Gosan	KR0101R	126.163111	33.293917	71.0m
Harwell	GB0036R	-1.316667	51.573056	137.0m
Hyytiälä	FI0050R	24.283333	61.85	181.0m
Izana	ES0018G	-16.4994	28.309	2373.0m
Jungfraujoch	CH0001G	7.985	46.5475	3578.0m
Lulin	TW0100R	120.87	23.47	2862.0m
Mace Head	IE0031R	-9.89944	53.32583	5.0m
Mauna Loa	US1200R	-155.576156616	19.5362300873	3397.0m
Mt Cimone	IT0009R	10.7	44.183333	2165.0m
Neumayer	DE0060G	-8.266	-70.666	42.0m
Pallas (Sammaltunturi)	FI0096G	24.116111111	67.973333333	565.0m
Preila	LT0015R	21.0305555556	55.3761111111	5.0m
Puy de Dôme	FR0030R	2.964886	45.772223	1465.0m
Samoa (Cape Matatula)	US6001R	-170.56451416	-14.2474746704	77.0m
South Pole	US6004G	-24.7999992371	-89.9969482422	2841.0m
Southern Great Plains E13	US6002C	-97.484999	36.605	318.0m
Steamboat Springs, Colorado (Storm Peak Laboratory)	US9050R	-106.74	40.445	3220.0m
Trinidad Head	US6005G	-124.151000977	41.0541000366	107.0m
Whistler Mountain	CA0100R	-122.957603455	50.059299469	2182.0m
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.88668	78.90715	474.0m