



Supplement of

Dependency of the impacts of geoengineering on the stratospheric sulfur injection strategy – Part 1: Intercomparison of modal and sectional aerosol modules

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Supplement



Figure S1. Dependence of studied injection areas on a) latitude, b) latitude and altitude and c) latitude and month. Injection altitude in Pulse-eom, Pulse-Jan-Jul and seasonal is the same as Baseline scenario. Injections are done across all longitudes in all other scenarios than Point, where injections are done only in one grid box. Grey line in b) represents yearly mean tropopause altitude in CTRL simulation (simulated with SALSA).



Figure S2: Relative zonal mean sulfate deposition in baseline scenarios simulated with a) SALSA and b) M7. Figure shows zonal running means of 21 latitudinal gridboxes for 1 Tg(S)yr injection rate and running mean of 15 latitudinal gridboxes for 2, 5, 10 Tg(S)yr injection rates.



Figure S3: Deposited sulfate per country in baseline scenario with 50 Tg(S)/yr injection rate. Blue bars show results simulated with SALSA and red bars are from simulations with M7.



Figure S4. Relative global mean all-sky SW (a-b), LW (c-d) and net radiative forcing in sensitivity scenarios compared to baseline scenario with corresponding sulfur injection rate. Baseline values are shown at the bottom of each panel. SALSA results are shown in the left and M7 in right panels. Note different y-axes scale between the panels.



Figure S5. Zonal mean all sky net forcing with a-b) 5 and c-d) 50 Tg(S)yr⁻¹ injection rates in simulated sensitivity scenarios. SALSA results are shown in the left and M7 results on the right panels. Note that y-axes scale shows negative (cooling) values. Shaded areas show latitudes of injection area at the time of year (y-axes, month shown in right edge of panel a)) in each injection scenario. Latitudes of injection area are same in Baseline, High and Low scenario (10° N - 10° S)



Figure S6. a) Global mean clear sky SW forcing and b) forcing efficiency, c) lifetime and d) effective radius of stratospheric aerosols (sulfate) in baseline and Point scenarios simulated with M7.



Figure S7. Average aerosol number size distribution at the Equator and at the 20-22 km altitude in a) Baseline and b) Point scenarios simulated with M7.



Figure S8. a) Difference in column sum of gaseous sulfuric acid concentration between Onegb and Baseline scenarios b) Number size distribution in Onegb scenario at the 20 km altitude over the Equator at different longitudes. Injections are taking place over the Prime meridian in Onegb scenario.



Figure S9. a) Mean meridional wind pattern in Baseline scenario with 5 Tg(S)/yr injection rate simulated with M7. b) Difference in Sulfate production via SO_2 and OH between Low and Baseline scenarios with 5 Tg(S)/yr injection rate simulated with M7.



Figure S10. Temperature anomaly due to the stratospheric sulfur injection with different injection rates simulated with SALSA.



Figure S11. Temperature anomaly due to the stratospheric sulfur injection with different injection rates simulated with M7.



Figure S12. Residual vertical velocity in the tropics for different injection strategies compared to baseline scenario of corresponding injection rates (a-b 5 Tg(S)/yr and c-d 50 Tg(S)/yr) for SALSA (a,c) and M7 (b,d).



Figure S13. Zonal mean zonal wind (m/s) in CTRL scenarios and wind anomaly compared to CTRL in stratospheric sulfur injection scenarios in December-January-February



Figure S14. Zonal mean zonal wind (m/s) in CTRL scenarios and wind anomaly compared to CTRL in stratospheric sulfur injection scenarios in June-July-August



Figure S15. Zonal mean meridional wind (m/s) in CTRL scenarios and wind anomaly compared to CTRL in stratospheric sulfur injection scenarios in December-January-February



Figure S16. Zonal mean meridional wind (m/s) in CTRL scenarios and wind anomaly compared to CTRL in stratospheric sulfur injection scenarios in June-July-August



Figure S17. Zonal mean temperature difference between CTRL scenarios simulated with SALSA and M7.



Figure S18. Zonal mean zonal wind (m/s) at the Equator for simulated stratospheric sulfur injection scenarios with different injection rates.

All-sky SW	All-sky	TOA SW	W/m2					All-sky	TOA LW	W/m2					All-sky	TOA net	W/m2				
Tg(S)/yr	1	2	5	10	20	50	100	1	2	5	10	20	50	100	1	2	5	10	20	50	100
SALSA Baseline	-1.17	-1.89	-3.84	-6.24	-9.95	-17.57	-27.27	0.12	0.24	0.55	01.01	1.88	4.14	7.55	-1.05	-1.65	-3.29	-5.23	-8.07	-13.43	-19.72
SALSA Narrow		-2.3	-4.41		-11.05	-19			0.28	0.6		02.04	4.36			-2.02	-3.81		-9.01	-14.64	
SALSA Wide		-1.83	-3.58		-9.7	-17.26			0.23	0.49		1.67	3.77			-1.6	-3.09		-8.03	-13.49	
SALSA High		-2.19	-4.41		-11.36	-20			0.27	0.62		02.09	4.62			-1.92	-3.79		-9.27	-15.38	
SALSA Low		-1.83	-3.73		-9.99	-17.77			0.22	0.47		1.62	3.64			-1.61	-3.26		-8.37	-14.13	
SALSA Pulse-eom		-2.13	-4.13		-10.84	-18.72			0.25	0.55		02.01	4.31			-1.88	-3.58		-8.83	-14.41	
SALSA Pulse-Jan-Jul		-2.56	-5.01		-12.94	-22.71			0.29	0.65		2.15	4.74			-2.27	-4.36		-10.79	-17.97	
SALSA Point		-2.48	-4.73		-12.23	-21.73			0.29	0.6		2.17	4.7			-2.19	-4.13		-10.06	-17.03	
SALSA Seasonal		-2.03	-4.11		-11.27	-19.86			0.26	0.52		1.8	3.99			-1.77	-3.59		-9.47	-15.87	
M7 Baseline	-0.76	-1.1	-2.07	-3.4	-5.84	-11.44	-18.78	0.2	0.34	0.74	1.34	2.51	5.78	10.78	-0.56	-0.76	-1.33	-2.06	-3.33	-5.66	-8
M7 Narrow		-1.16	-1.95		-5.66	-11.74			0.35	0.74		2.56	5.96			-0.81	-1.21		-3.1	-5.78	
M7 Wide		-1.12	-2.2		-6.3	-12.02			0.31	0.67		2.38	5.47			-0.81	-1.53		-3.92	-6.55	
M7 High		-1.35	-2.46		-7.03	-13.66			0.4	0.87		2.95	6.71			-0.95	-1.59		-4.08	-6.95	
M7 Low		-1.14	-2.34		-5.95	-10.38			0.25	0.59		2.12	4.85			-0.89	-1.75		-3.83	-5.53	
M7 Pulse-eom		-1.22	-2.1		-6	-11.24			0.38	0.74		2.57	5.83			-0.84	-1.36		-3.43	-5.41	
M7 Pulse-Jan-Jul		-1.49	-2.93		-8.45	-16.45			0.39	0.85		2.99	6.99			-1.1	-2.08		-5.46	-9.46	
M7 Point		-1.51	-2.8		-8.04	-19.19			0.38	0.84		2.99	7.49			-1.13	-1.96		-5.05	-11.7	
M7 Seasonal		-1.15	-2.63		-7.62	-15.15			0.28	0.72		2.54	5.95			-0.87	-1.91		-5.08	-9.2	
Clear-sky SW	Clear-sky	TOA SW	W/m2					Clear-sky	TOA LW	W/m2					Clear-sky	TOA net	W/m2				
Clear-sky SW Tg(S)/yr	Clear-sky 1	TOA SW 2	W/m2 5	10	20	50	100	Clear-sky 1	TOA LW 2	W/m2 5	10	20	50	100	Clear-sky 1	TOA net 2	W/m2 5	10	20	50	100
Clear-sky SW Tg(S)/yr SALSA Baseline	Clear-sky 1 -1.68	TOA SW 2 -2.72	W/m2 5 -5.55	10 -8.97	20 -14.2	50 -24.88	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29	W/m2 5 0.65	10 1.21	20 2.25	50 4.97	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43	W/m2 5 -4.9	10 -7.76	20 -11.95	50 -19.91	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32	W/m2 5 -5.55 -6.33	10 -8.97	20 -14.2 -15.67	50 -24.88 -26.7	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34	W/m2 5 0.65 0.71	10 1.21	20 2.25 2.45	50 4.97 5.24	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98	W/m2 5 -4.9 -5.62	10 -7.76	20 -11.95 -13.22	50 -19.91 -21.46	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7	W/m2 5 -5.55 -6.33 -5.28	10 -8.97	20 -14.2 -15.67 -14.19	50 -24.88 -26.7 -25.33	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28	W/m2 5 0.65 0.71 0.58	10 1.21	20 2.25 2.45 2	50 4.97 5.24 4.54	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42	W/m2 5 -4.9 -5.62 -4.7	10 -7.76	20 -11.95 -13.22 -12.19	50 -19.91 -21.46 -20.79	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14	W/m2 5 -5.55 -6.33 -5.28 -6.3	10 -8.97	20 -14.2 -15.67 -14.19 -16.22	50 -24.88 -26.7 -25.33 -28.23	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33	W/m2 5 0.65 0.71 0.58 0.75	10 1.21	20 2.25 2.45 2 2.51	50 4.97 5.24 4.54 5.58	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81	W/m2 5 -4.9 -5.62 -4.7 -5.55	10 -7.76	20 -11.95 -13.22 -12.19 -13.71	50 -19.91 -21.46 -20.79 -22.65	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74	W/m2 5 -5.55 -6.33 -5.28 -6.3 -6.3	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5	50 -24.88 -26.7 -25.33 -28.23 -25.46	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33 0.27	W/m2 5 0.65 0.71 0.58 0.75 0.56	10 1.21	20 2.25 2.45 2 2.51 1.93	50 4.97 5.24 4.54 5.58 4.35	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47	W/m2 5 -4.9 -5.62 -4.7 -5.55 -5	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57	50 -19.91 -21.46 -20.79 -22.65 -21.11	<u>100</u> -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low SALSA Low	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07	W/m2 5 -5.55 -6.33 -5.28 -6.3 -6.3 -5.56 -5.98	<u>10</u> -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44	50 -24.88 -26.7 -25.33 -28.23 -28.23 -25.46 -26.48	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.3	W/m2 5 0.65 0.71 0.58 0.75 0.56	10 1.21	20 2.25 2.45 2.51 1.93 2.41	50 4.97 5.24 4.54 5.58 4.35 5.17	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77	W/m2 5 -4.9 -5.62 -4.7 -5.55 -5 -5 -5	<u>10</u> -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low Bulse-som Bulse-Jan-Jul	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72	W/m2 5 -5.55 -6.33 -5.28 -6.3 -5.56 -5.56 -5.98 -7.23	<u>10</u> -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.3 0.35	W/m2 5 0.65 0.71 0.58 0.75 0.56 0.66	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72	<u>100</u> 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37	W/m2 5 -4.9 -5.62 -4.7 -5.55 -5 -5 -5 -5 -5.32 -6.46	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low Bulse-som SALSA Pulse-Jan-Jul SALSA Point	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57	W/m2 5 -5.55 -6.33 -5.28 -6.3 -5.56 -5.98 -7.23 -6.83	<u>10</u> -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96 -30.47	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.3 0.35	W/m2 5 0.65 0.71 0.58 0.75 0.56 0.66 0.77 0.72	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22	W/m2 5 -4.9 -5.62 -4.7 -5.55 -5 -5 -5 -5 -5.32 -6.46 -6.11	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -14.73	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low Bulse-som SALSA Pulse-Jan-Jul SALSA Point SALSA Seasonal	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57 -3.02	W/m2 5 -5.55 -6.33 -5.28 -6.3 -5.56 -5.98 -7.23 -7.23 -6.83 -6.09	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96 -30.47 -28.67	100 -38.34	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.33 0.27 0.3 0.35 0.35 0.35	W/m2 5 0.65 0.71 0.58 0.75 0.56 0.66 0.77 0.72 0.72	10 1.21	20 2.25 2.45 2 2.51 1.93 2.41 2.59 2.61 2.16	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22 -2.71	W/m2 5 -4.9 -5.62 -5.55 -55 -55 -55 -532 -6.46 -6.11 -5.47	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -14.73 -14.36	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low BALSA Low BALSA Seasonal SALSA Seasonal M7 Baseline	Clear-sky 1 -1.68 	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57 -3.02 -1.67	W/m2 5 -5.55 -6.33 -5.28 -6.33 -5.56 -5.98 -7.23 -6.83 -7.23 -6.83 -6.09 -3.05	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52 -8.53	50 -24.88 -26.7 -25.33 -28.23 -25.46 -25.46 -26.48 -31.96 -30.47 -28.67 -16.43	100 -38.34 -26.7	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.3 0.35 0.35 0.35 0.31 0.31 0.41	W/m2 5 0.65 0.71 0.58 0.75 0.56 0.66 0.77 0.72 0.62 0.89	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 2.16 03.03	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.95	100 09.06	Clear-sky 1 -1.54 	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22 -2.71 -1.26	W/m2 5 -4.9 -5.62 -5 -5 -5 -5 -5 -5 -5 -5 -5.32 -6.46 -6.11 -5.47 -2.16	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -14.73 -14.36 -5.5	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86 -9.48	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low BALSA Low BALSA Seasonal SALSA Seasonal M7 Baseline M7 Narrow	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57 -3.02 -1.67 -1.72	W/m2 5 -5.55 -6.33 -5.28 -6.33 -5.56 -5.98 -7.23 -6.83 -7.23 -6.83 -6.09 -3.05 -2.85	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52 -8.53 -8.53 -8.22	50 -24.88 -26.7 -25.33 -28.23 -28.23 -25.46 -26.48 -31.96 -30.47 -28.67 -46.43 -16.89	100 -38.34 -26.7	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.3 0.35 0.35 0.35 0.35 0.31 0.41 0.41	W/m2 5 0.65 0.71 0.58 0.75 0.56 0.66 0.77 0.72 0.62 0.89 0.89 0.9	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 2.16 03.03 03.07	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.95 7.2	100 09.06	Clear-sky 1 -1.54 	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22 -2.71 -1.26 -1.29	W/m2 5 -4.9 -5.62 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -14.73 -14.36 -5.5 -5.15	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86 -9.48 -9.69	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low Bulse-som SALSA Pulse-Jan-Jul SALSA Seasonal M7 Baseline M7 Narrow M7 Wide	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57 -3.02 -1.67 -1.72 -1.72	W/m2 5 -5.55 -6.33 -5.28 -6.33 -5.56 -5.98 -7.23 -6.83 -7.23 -6.83 -6.09 -3.05 -2.85 -2.85 -3.31	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52 -8.53 -8.53 -8.22 -9.36	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96 -30.47 -28.67 -16.43 -16.89 -17.57	100 -38.34 -26.7	Clear-sky 1 0.14	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.3 0.35 0.35 0.35 0.35 0.31 0.41 0.41 0.43 0.37	W/m2 5 0.65 0.71 0.56 0.56 0.66 0.77 0.72 0.62 0.89 0.9 0.9	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 2.16 03.03 03.07 2.88	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.95 7.2 6.6	100 09.06	Clear-sky 1 -1.54 	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.47 -2.77 -3.37 -3.22 -2.71 -1.26 -1.29 -1.35	W/m2 5 -4.9 -5.62 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -14.73 -14.36 -5.5 -5.15 -5.15 -6.48	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86 -9.48 -9.69 -9.69 -10.97	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA Wide SALSA High SALSA Low Pulse-Jan-Jul SALSA Point SALSA Seasonal M7 Baseline M7 Narrow M7 Wide M7 High	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57 -3.02 -1.67 -1.72 -1.72 -2.01	W/m2 5 -5.55 -6.33 -5.28 -6.33 -5.56 -5.98 -7.23 -6.83 -7.23 -6.83 -6.09 -3.05 -2.85 -2.85 -3.31 -3.61	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52 -8.53 -8.22 -9.36 -9.36 -10.19	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96 -30.47 -28.67 -16.43 -16.89 -17.57 -19.6	100 -38.34	Clear-sky 1 0.14 	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.35 0.35 0.35 0.35 0.31 0.41 0.41 0.43 0.37 0.37	W/m2 5 0.65 0.71 0.58 0.56 0.66 0.77 0.72 0.62 0.89 0.89 0.9 0.81 0.15	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 2.16 03.03 03.07 2.88 3.58	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.95 7.2 6.6 8.12	100 09.06	Clear-sky 1 -1.54 	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22 -2.71 -1.26 -1.29 -1.35 -1.51	W/m2 5 -4.9 -5.62 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -14.73 -14.36 -5.5 -5.15 -6.48 -6.61	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86 -9.48 -9.69 -9.69 -10.97 -11.48	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low Pulse-Jan-Jul SALSA Point SALSA Seasonal M7 Baseline M7 Narrow M7 Wide M7 High M7 Low	Clear-sky 1 -1.68	TOA SW 2 -2.72 3.32 -2.7 3.14 -2.74 -3.07 -3.72 -3.57 -3.02 -1.67 -1.72 -1.72 -2.01 -1.74	W/m2 5 -5.55 -6.33 -5.56 -5.98 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -6.09 -3.05 -2.85 -3.31 -3.61 -3.55	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52 -8.53 -8.22 -9.36 -9.36 -10.19 -8.85	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96 -30.47 -28.67 -46.43 -46.89 -47.57 -19.6 -15.12	100 -38.34	Clear-sky 1 0.14 	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.35 0.35 0.35 0.35 0.31 0.41 0.41 0.43 0.37 0.5 5 0.5	W/m2 5 0.65 0.71 0.58 0.56 0.66 0.77 0.72 0.62 0.89 0.9 0.81 0.9 0.81 0.15 0.71	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 2.16 03.03 03.07 2.88 3.58 2.55	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.95 7.2 6.66 8.12 5.83	100 09.06	Clear-sky 1 -1.54 	TOA net 2 -2.43 -2.48 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22 -2.71 -1.26 -1.29 -1.35 -1.51 -1.44	W/m2 5 4.9 5.62 4.7 5.55 -5 5 -5 5.32 -6.46 -6.11 -5.47 -2.16 -1.95 -2.56 -2.56 -2.54	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -14.73 -14.36 -5.5 -5.15 -6.48 -6.61 -6.61 -6.3	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86 -9.48 -9.69 -9.69 -10.97 -11.48 -9.29	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA Wide SALSA High SALSA Low SALSA Low SALSA Point SALSA Point SALSA Point SALSA Point SALSA Point SALSA Point SALSA Point M7 Baseline M7 Narrow M7 Wide M7 High M7 Low	Clear-sky 1 -1.68 -1.68 -1.14 -1.14	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57 -3.02 -1.67 -1.72 -2.01 -1.74 -1.74 -1.8	W/m2 5 -5.55 -6.33 -5.56 -5.98 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -6.83 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.23 -7.33 -7.25 -7.33 -7.25 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.33 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.35 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55 -7.55	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52 -8.53 -8.22 -9.36 -10.19 -8.85 -8.79	50 -24.88 -26.7 -25.33 -28.23 -25.46 -25.46 -31.96 -30.47 -28.67 -16.43 -46.89 -17.57 -19.6 -15.12 -16.19	100 -38.34	Clear-sky 1 0.14 0.14 0.14 0.14 0.14 0.14 0.14 0.	TOA LW 2 0.29 0.34 0.33 0.27 0.3 0.35 0.35 0.35 0.35 0.31 0.41 0.41 0.43 0.37 0.5 0.3	W/m2 5 0.65 0.71 0.56 0.66 0.66 0.77 0.72 0.62 0.89 0.81 0.99 0.81 0.105 0.71 0.89	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 2.16 03.03 03.07 2.88 3.58 2.55 3.1	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.95 7.2 6.6 8.12 5.83 07.03	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.32 -2.71 -1.26 -1.29 -1.35 -1.51 -1.44 -1.35	W/m2 5 -4.9 -5.62 -4.7 -5.55 -5 -5.32 -6.46 -6.11 -5.47 -2.16 -1.95 -2.56 -2.56 -2.84 -2.21	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -44.73 -14.36 -5.5 -5.15 -5.15 -6.48 -6.81 -6.3 -5.69	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86 -9.48 -9.48 -9.69 -10.97 -11.48 -9.29 -9.16	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA Wide SALSA High SALSA Low SALSA Low SALSA Point SALSA Point SALSA Point SALSA Point SALSA Point M7 Baseline M7 Narrow M7 Wide M7 High M7 Low M7 Pulse-eom M7 Pulse-eom	Clear-sky 1 -1.68	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.72 -3.57 -3.02 -1.67 -1.72 -2.01 -1.74 -1.8 -2.23	W/m2 5 -5.55 -6.33 -5.28 -6.3 -5.28 -5.56 -5.98 -7.23 -6.83 -7.23 -6.83 -6.09 -3.05 -2.85 -3.31 -3.61 -3.55 -3.1 -3.43	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -8.83 -17.34 -6.52 -8.53 -8.22 -9.36 -10.19 -8.85 -8.79 -12.26	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96 -30.47 -46.43 -16.89 -17.57 -19.6 -15.12 -19.6 -15.12 -16.19 -23.42	100 -38.34 -26.7	Clear-sky 1 0.14 0.14 0.14 0.14 0.14 0.14 0.14 0.	TOA LW 2 0.29 0.34 0.33 0.27 0.3 0.35 0.35 0.35 0.35 0.35 0.31 0.41 0.43 0.37 0.5 0.3 0.45 0.3	W/m2 5 0.65 0.71 0.56 0.66 0.77 0.72 0.62 0.89 0.89 0.81 0.105 0.71 0.89 0.13	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 2.16 03.03 03.07 2.88 3.58 2.55 3.1 3.62	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.65 7.2 6.6 8.12 5.83 07.03 8.84	100 09.06	Clear-sky 1 -1.54	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22 -2.71 -1.26 -1.29 -1.35 -1.51 -1.44 -1.35 -1.76	W/m2 5 -4.9 -5.62 -4.7 -5.55 -5.32 -6.46 -6.11 -5.47 -2.16 -1.95 -2.56 -2.56 -2.84 -2.21 -3.31	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -44.73 -44.36 -5.5 -5.15 -5.15 -5.15 -6.48 -6.61 -6.3 -5.69 -8.64	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -23.86 -9.48 -9.48 -9.69 -10.97 -11.48 -9.29 -9.16 -9.16 -9.14.96	100 -29.28
Clear-sky SW Tg(S)/yr SALSA Baseline SALSA Narrow SALSA Wide SALSA High SALSA Low SALSA Low SALSA Com SALSA Point SALSA Point SALSA Point M7 Baseline M7 Narrow M7 Vide M7 High M7 Low M7 Pulse-eom M7 Pulse-Jan-Jul M7 Point	Clear-sky 1 -1.68 -1.68 -1.14 -1.14	TOA SW 2 -2.72 -3.32 -2.7 -3.14 -2.74 -3.07 -3.02 -3.57 -3.02 -1.67 -1.72 -2.01 -1.74 -1.8 -2.23 -2.25	W/m2 5 -5.55 -6.33 -5.28 -6.3 -5.56 -5.98 -7.23 -6.09 -3.05 -2.85 -3.31 -3.61 -3.55 -3.1 -4.34 -4.09	10 -8.97	20 -14.2 -15.67 -14.19 -16.22 -14.5 -15.44 -18.43 -17.34 -16.52 -8.53 -8.53 -8.52 -9.36 -10.19 -8.85 -8.79 -12.26 -11.6	50 -24.88 -26.7 -25.33 -28.23 -25.46 -26.48 -31.96 -30.47 -28.67 -16.43 -16.89 -17.57 -19.6 -15.12 -15.12 -15.12 -23.42 -27.21	100 -38.34 -38.34 -26.7 -26.7	Clear-sky 1 0.14 	TOA LW 2 0.29 0.34 0.28 0.33 0.27 0.3 0.35 0.35 0.35 0.35 0.31 0.41 0.43 0.37 0.5 0.3 0.45 0.3	W/m2 5 0.65 0.71 0.56 0.66 0.77 0.72 0.62 0.89 0.89 0.81 0.105 0.71 0.89 0.81	10 1.21	20 2.25 2.45 2.51 1.93 2.41 2.59 2.61 03.03 03.07 2.88 3.58 3.58 2.55 3.1 3.62	50 4.97 5.24 4.54 5.58 4.35 5.17 5.72 5.67 4.81 6.95 7.2 6.6 8.12 5.83 07.03 8.846 09.09	100 09.06	Clear-sky 1 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1.54 -1	TOA net 2 -2.43 -2.98 -2.42 -2.81 -2.47 -2.77 -3.37 -3.22 -2.71 -1.26 -1.29 -1.35 -1.51 -1.44 -1.35 -1.76 -1.79	W/m2 5 -4.9 -5.62 -4.7 -55 -55 -5.32 -6.46 -6.11 -5.47 -2.16 -1.95 -2.56 -2.84 -2.21 -3.31 -3.08	10 -7.76	20 -11.95 -13.22 -12.19 -13.71 -12.57 -13.03 -15.84 -44.73 -44.36 -5.5 -5.15 -5.15 -6.48 -6.61 -6.3 -5.69 -8.64 -7.99	50 -19.91 -21.46 -20.79 -22.65 -21.11 -21.31 -26.24 -24.8 -32.86 -9.48 -9.48 -9.69 -10.97 -11.48 -9.29 -9.16 -9.29 -9.16 -14.96 -14.96	100 -29.28

Table S1: Global mean All-sky and Clear-sky radiative forcing in the simulated stratospheric sulfur injection scenarios.

	Effective	radius of	stratos.	aerosols	(um)			Sulfate	burden	Tg(S)					Lifetime of	injected	sulfate				
Tg(S)/yr	1	2	5	10	20	50	100	1	2	5	10	20	50	100	1	2	5	10	20	50	100
SALSA Baseline	0.24	0.29	0.36	0.42	0.49	0.58	0.65	1.4	2.45	5.66	10.32	18.92	41.3	76.33	1.40	1.23	1.13	01.03	0.95	0.83	0.76
SALSA Narrow		0.28	0.36		0.51	0.6			2.82	6.25		20.82	44.33			1.41	1.25		01.04	0.89	
SALSA Wide		0.26	0.33		0.44	0.53			2.32	5.17		17.91	39.62			1.16	01.03		0.90	0.79	
SALSA High		0.29	0.37		0.49	0.59			2.84	6.43		21.46	47.22			1.42	1.29		01.07	0.94	
SALSA Low		0.24	0.3		0.42	0.51			2.24	05.07		17.04	37.99			1.12	01.01		0.85	0.76	
SALSA Pulse-eom		0.28	0.36		0.5	0.58			2.67	5.96		20.28	43.56			1.34	1.19		01.01	0.87	
SALSA Pulse-Jan-Jul		0.26	0.34		0.48	0.57			3.1	6.82		22.99	50.62			1.55	1.36		1.15	01.01	
SALSA Point		0.27	0.35		0.5	0.59			2.94	6.53		22.28	49.6			1.47	1.31		1.11	0.99	
SALSA Seasonal		0.24	0.31		0.42	0.52			2.54	5.76		19.96	44.28			1.27	1.15		1.00	0.89	
M7 Baseline	0.33	0.42	0.53	0.6	0.67	0.78	0.84	1.35	2.31	4.78	8.65	16.22	37.27	71.47	1.35	1.16	0.96	0.87	0.81	0.75	0.71
M7 Narrow		0.43	0.55		0.7	0.78			2.25	4.61		16.13	38.58			1.13	0.92		0.81	0.77	
M7 Wide		0.38	0.47		0.6	0.71			2.24	4.83		16.57	37.58			1.12	0.97		0.83	0.75	
M7 High		0.44	0.54		0.67	0.77			2.59	5.53		19.63	45.02			1.30	1.11		0.98	0.90	
M7 Low		0.3	0.38		0.56	0.71			02.01	4.42		14.4	31.2			01.01	0.88		0.72	0.62	
M7 Pulse-eom		0.42	0.53		0.67	0.79			2.34	4.84		16.46	37.3			1.17	0.97		0.82	0.75	
M7 Pulse-Jan-Jul		0.38	0.47		0.59	0.69			2.71	06.03		21.03	49.72			1.36	1.21		01.05	0.99	
M7 Point		0.37	0.49		0.62	0.65			2.74	5.78		20.38	55.74			1.37	1.16		01.02	1.11	
M7 Seasonal		0.35	0.42		0.54	0.62			2.43	5.43		18.99	44.74			1.22	01.09		0.95	0.89	

Table S2: Effective radius, sulfate burden and lifetime of stratospheric sulfate aerosols in the simulated stratospheric sulfur injection scenario.