The Rock Geochemical Model (RokGeM) v0.9
Supplementary Information

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B Full time-series results

B.1 Time-series output years

1,000.5	3,000.5	10,010.5	100,010.5
1,990.5	3,100.5	11,000.5	110,010.5
2,002.5	3,200.5	12,010.5	120,010.5
2,010.5	3,300.5	13,000.5	130,010.5
2,020.5	3,400.5	14,010.5	140,010.5
2,030.5	3,500.5	15,000.5	150,010.5
2,040.5	3,600.5	16,010.5	160,010.5
2,050.5	3,700.5	17,000.5	170,010.5
2,060.5	3,800.5	18,010.5	180,010.5
2,070.5	3,900.5	19,000.5	190,010.5
2,080.5	4,010.5	20,010.5	200,010.5
2,090.5	4,100.5	22,010.5	220,010.5
2,100.5	4,200.5	24,010.5	240,010.5
2,120.5	4,300.5	26,010.5	260,010.5
2,140.5	4,400.5	28,010.5	280,010.5
2,160.5	4,500.5	30,010.5	300,010.5
2,180.5	4,600.5	32,010.5	320,010.5
2,200.5	4,700.5	34,010.5	340,010.5
2,220.5	4,800.5	36,010.5	360,010.5
2,240.5	4,900.5	38,010.5	380,010.5
2,260.5	5,000.5	40,010.5	400,010.5
2,280.5	5,200.5	42,010.5	420,010.5
2,300.5	5,400.5	44,010.5	440,010.5
2,350.5	5,600.5	46,010.5	460,010.5
2,400.5	5,800.5	48,010.5	480,010.5
2,450.5	6,010.5	50,010.5	500,010.5
2,500.5	6,200.5	55,000.5	550,010.5
2,550.5	6,400.5	60,010.5	600,010.5
2,600.5	6,600.5	65,000.5	650,010.5
2,650.5	6,800.5	70,010.5	700,010.5
2,700.5	7,000.5	75,000.5	750,010.5
2,750.5	7,500.5	80,010.5	800,010.5
2,800.5	8,010.5	85,000.5	850,010.5
2,850.5	8,500.5	90,010.5	900,010.5
2,900.5	9,000.5	95,000.5	950,010.5
2,950.5	9,500.5		1,000,010.5

Table 3: Time-series output years for pulse emissions scenarios with pulse at year 1990. Half-years are specified as some output (from BioGeM and SedGeM) is averaged over a year straddling the time-point specified. Each vertical block of numbers corresponds to a panel in the broken linear time-series plots throughout the thesis.

B.2 Time-series of key variables

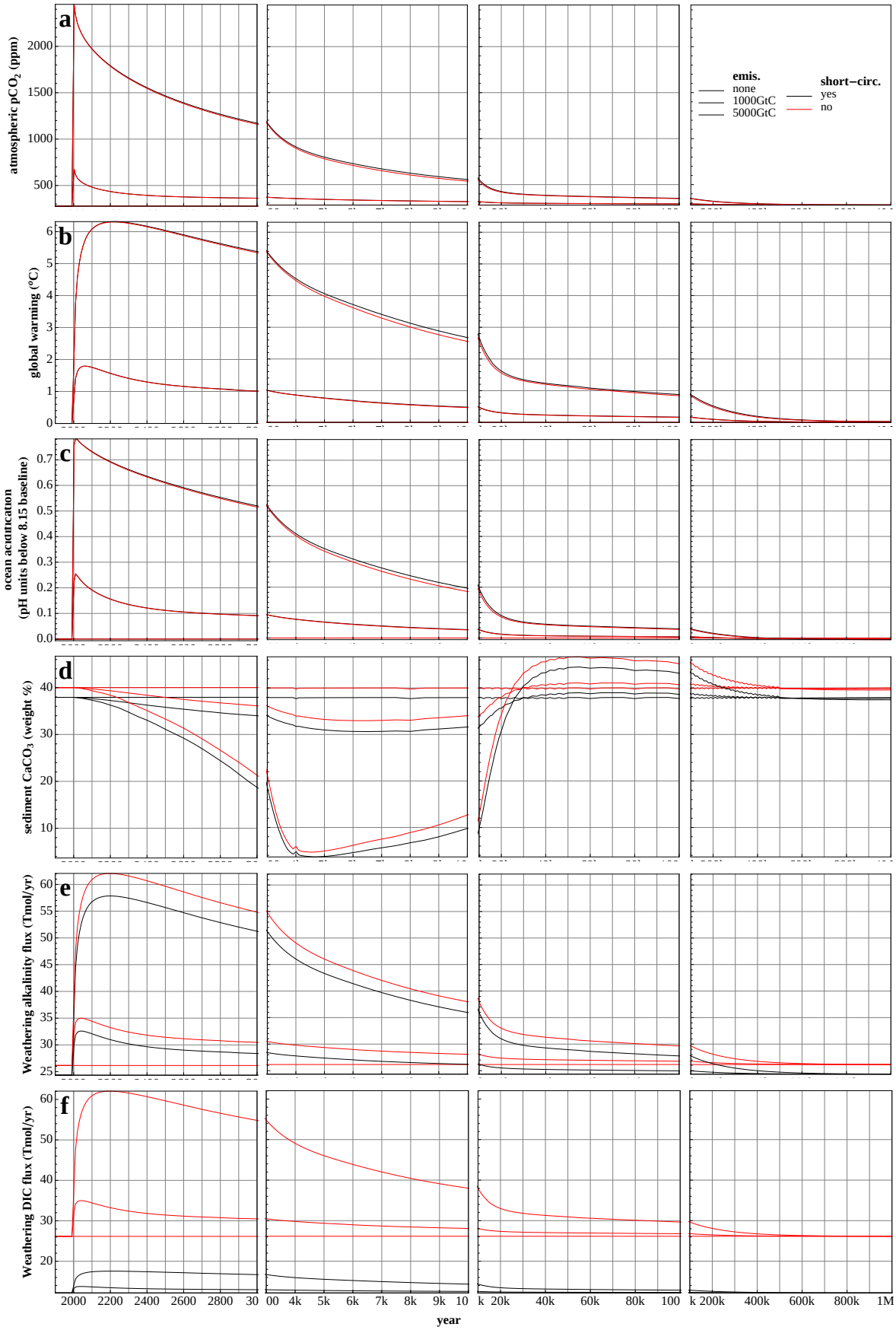

Figure 23: Timeseries of key variables for short-circuit test ensemble

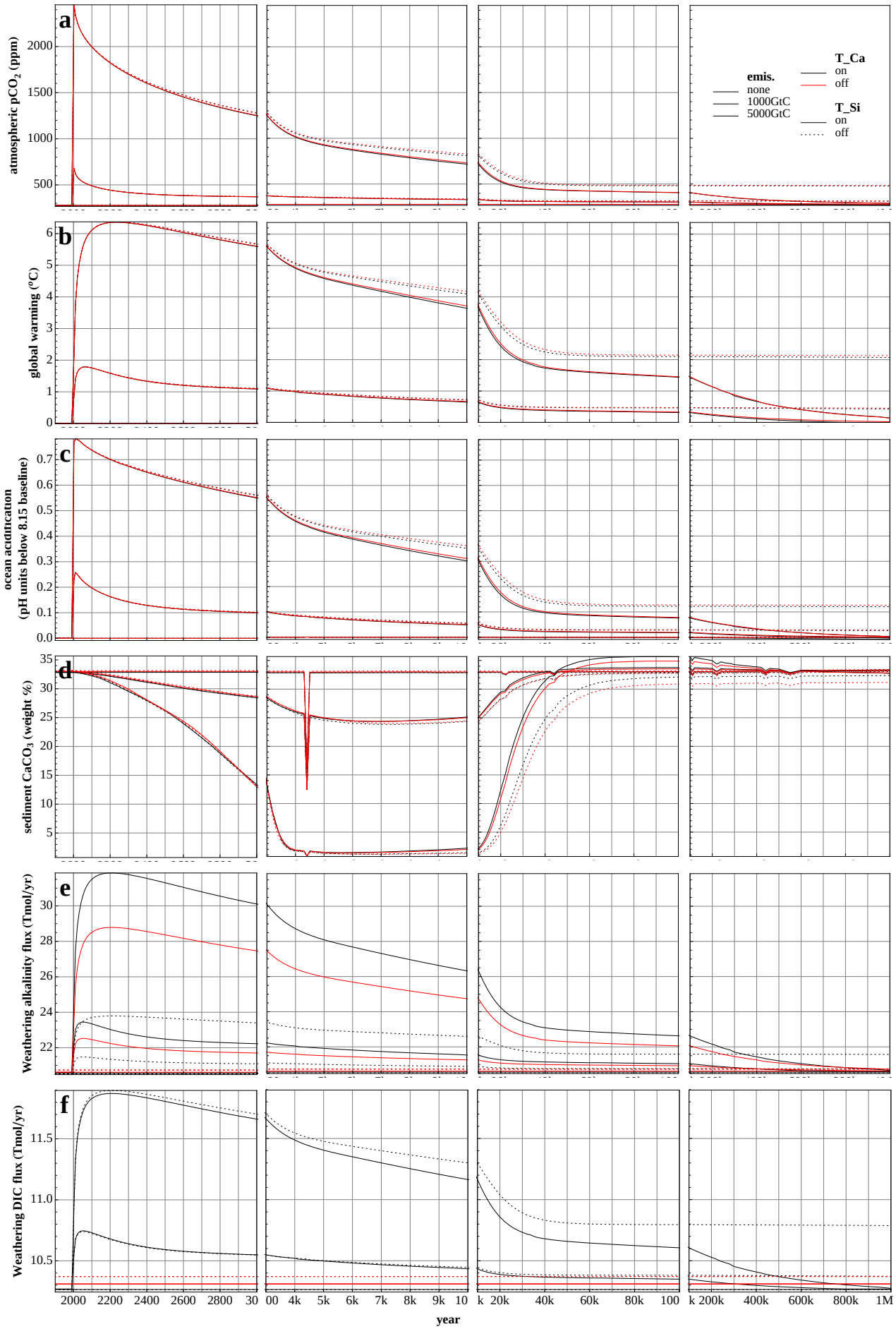

Figure 24: Timeseries of key variables for weathering-temperature feedbacks ensemble

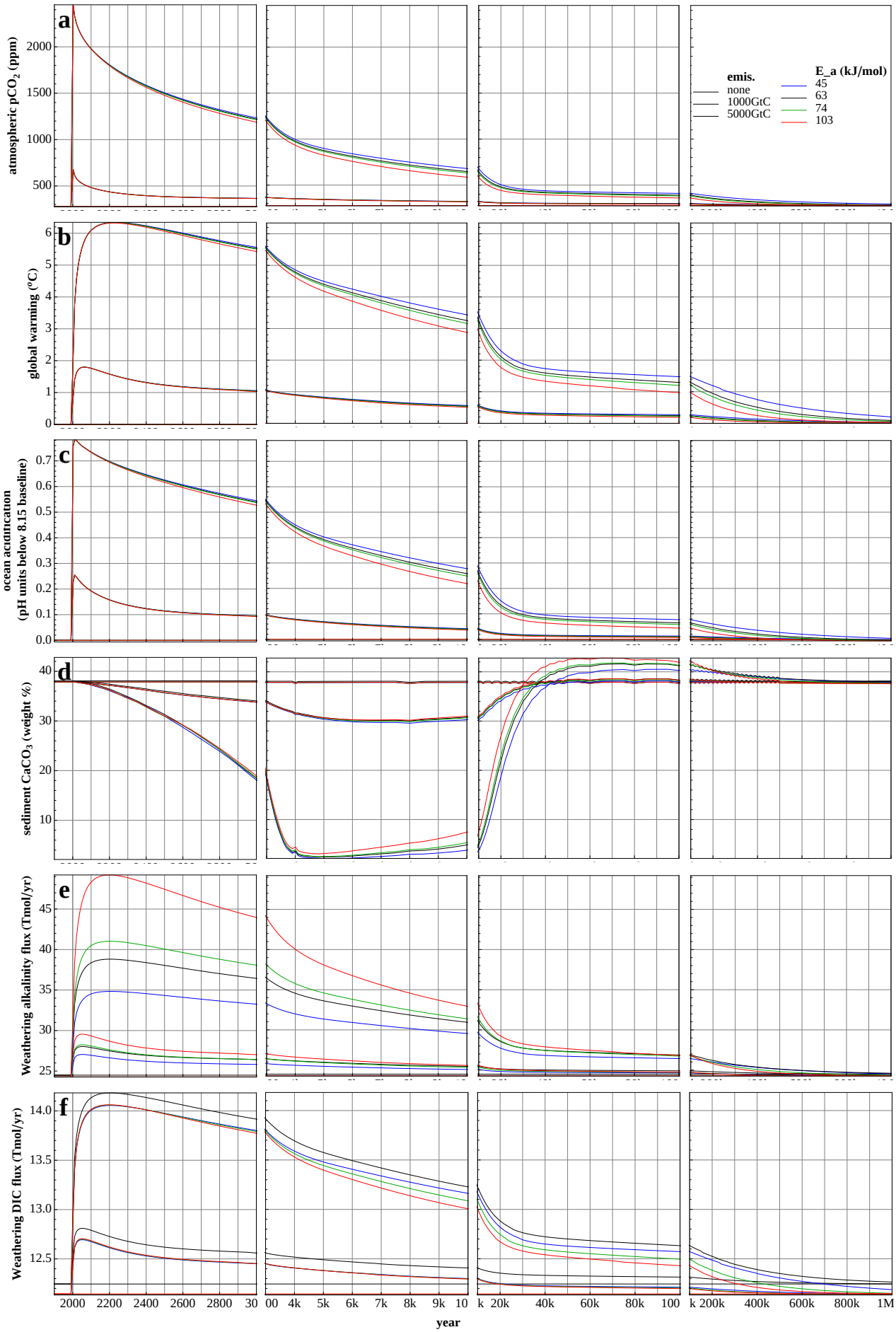

Figure 25: Timeseries of key variables for weathering activation energy ensemble

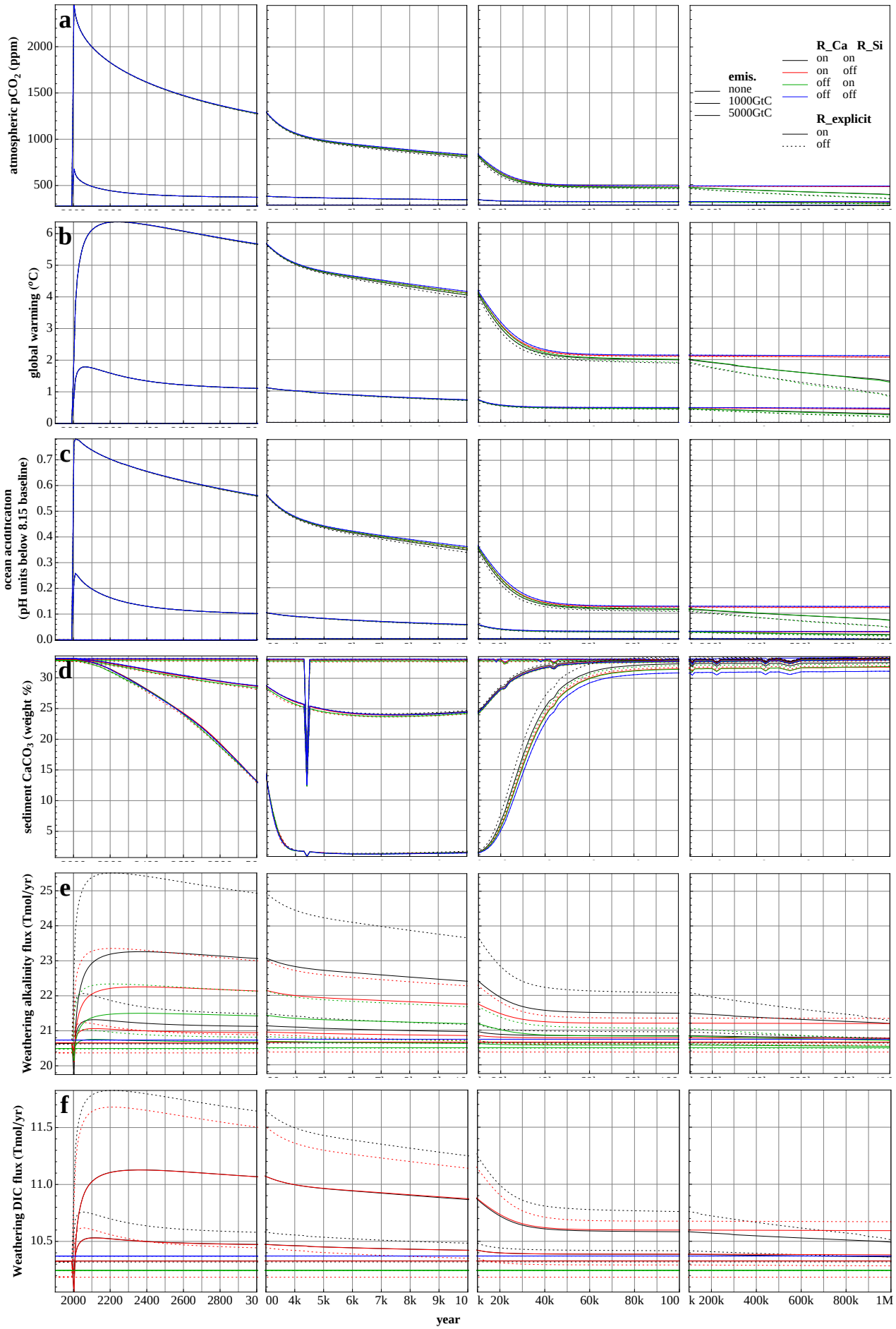

Figure 26: Timeseries of key variables for weathering-runoff feedbacks ensemble

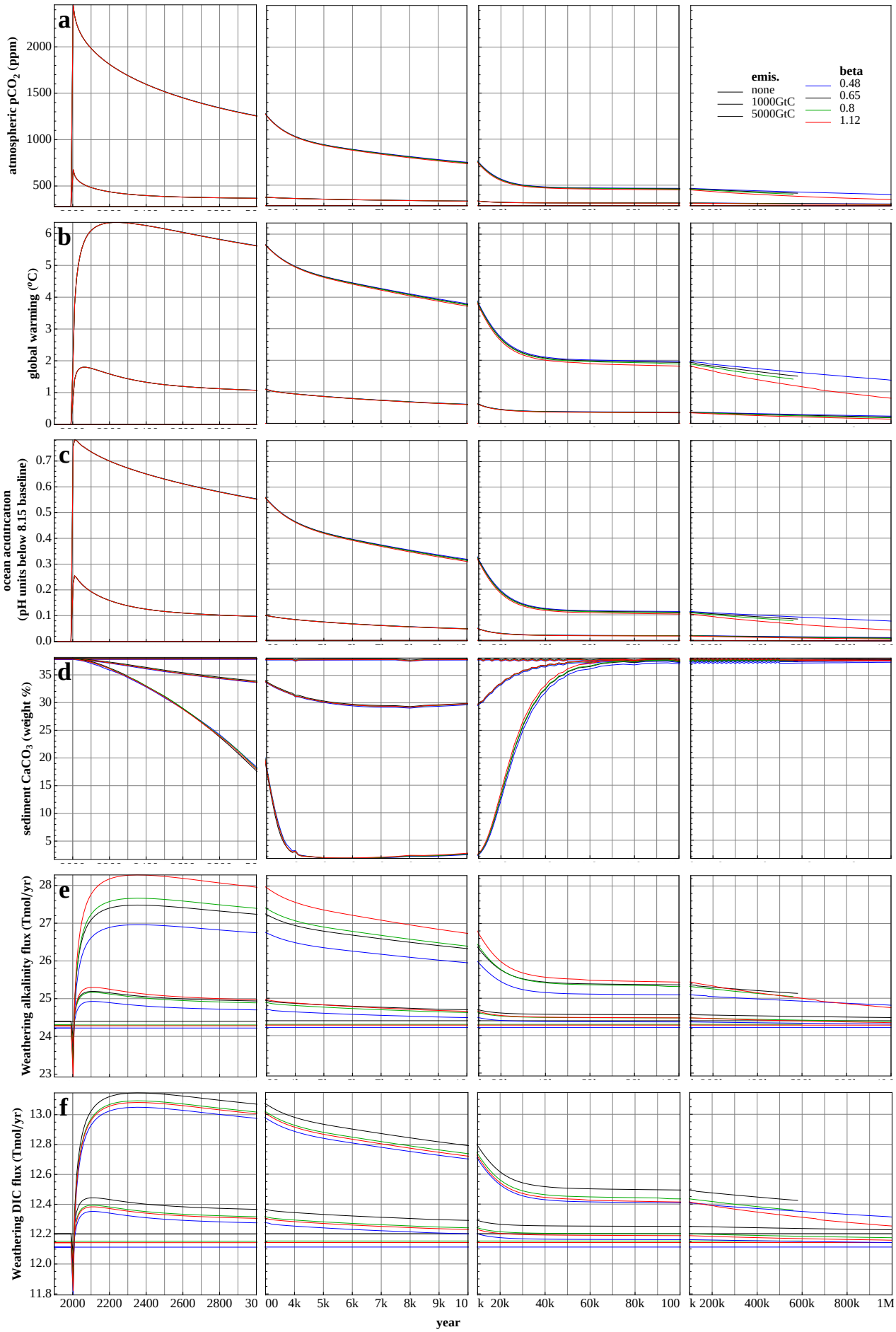

Figure 27: Timeseries of key variables for fractional power of explicit weathering-runoff dependence ensemble

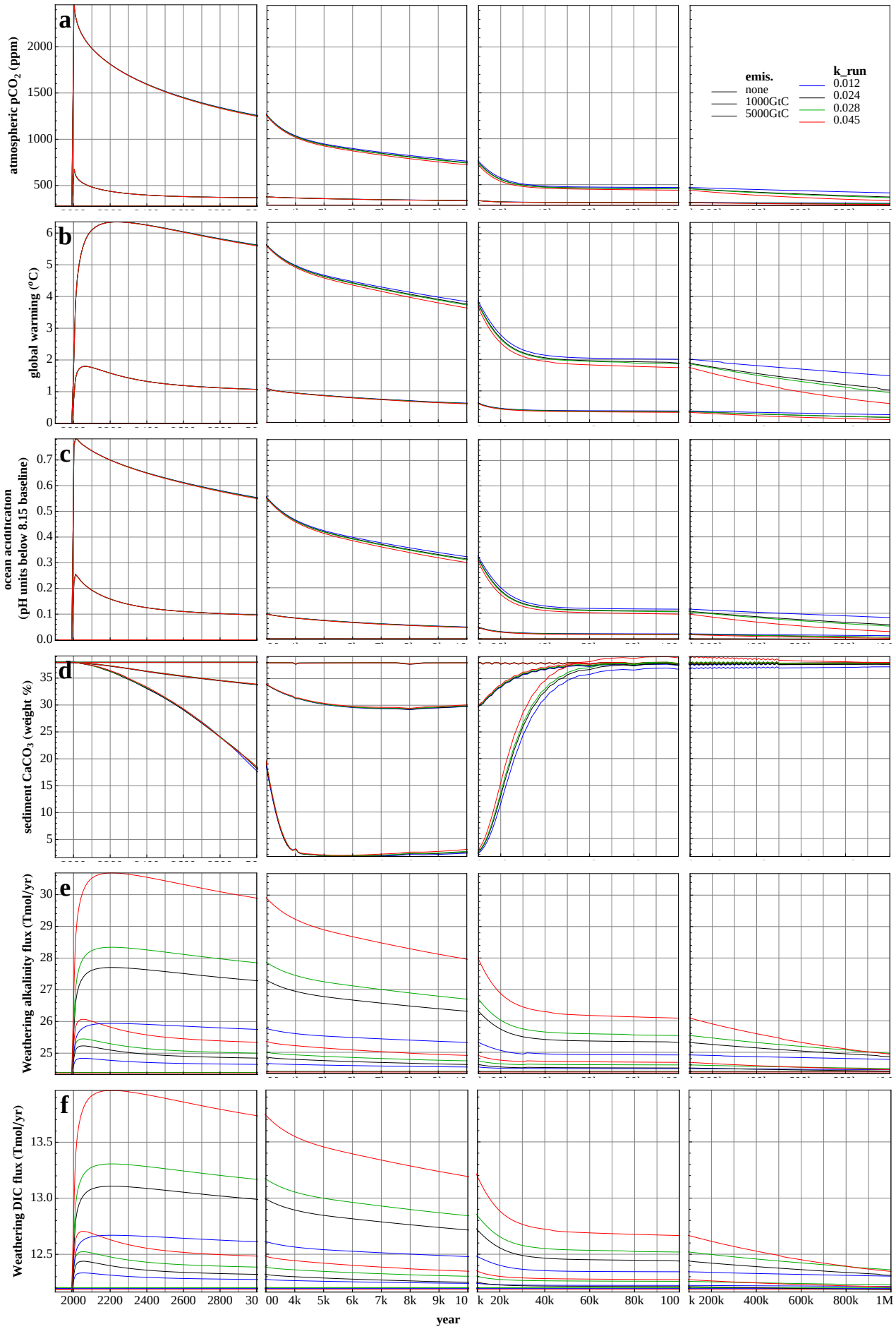

Figure 28: Timeseries of key variables for runoff-temperature correlation constant ensemble

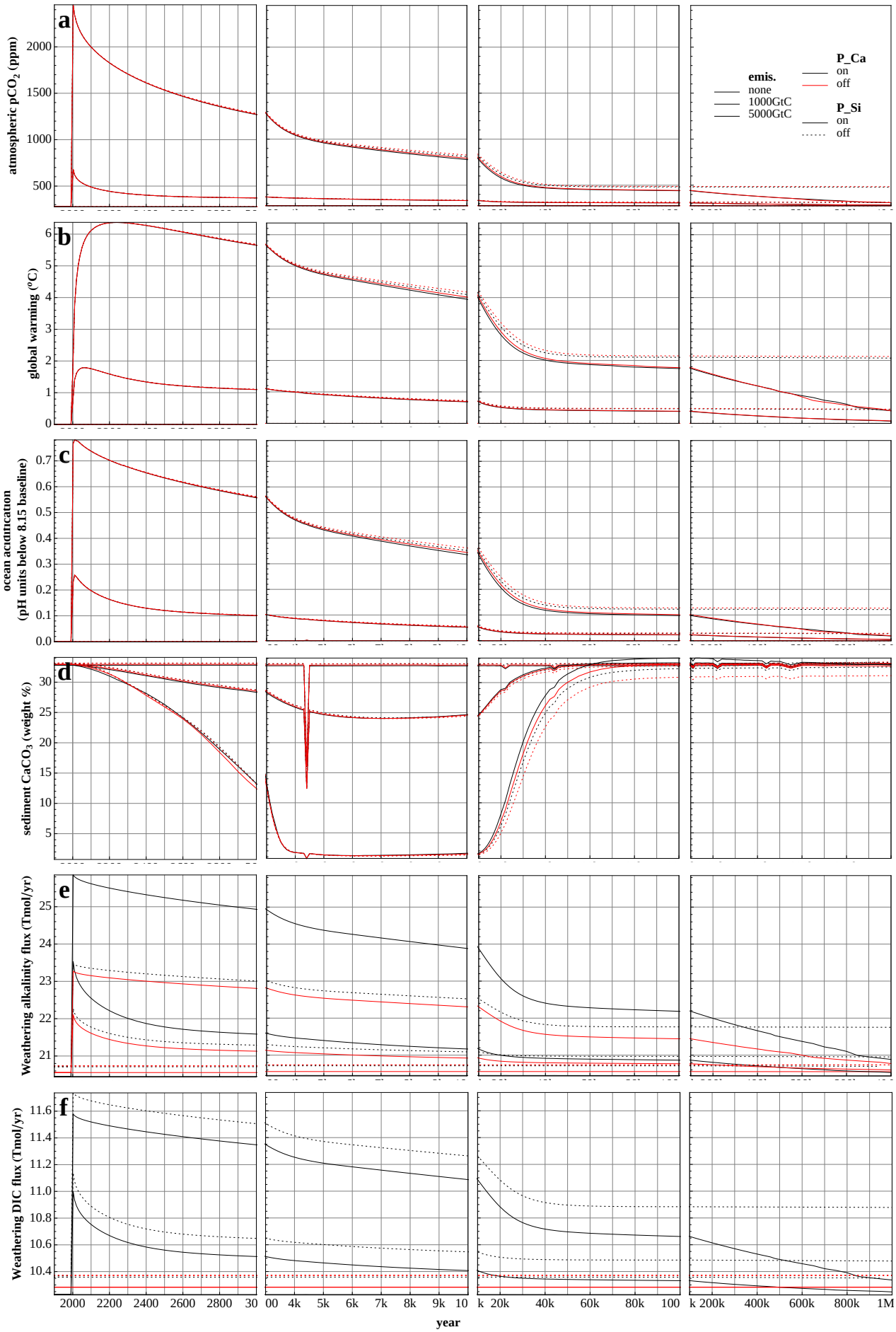

Figure 29: Timeseries of key variables for weathering-productivity feedbacks ensemble

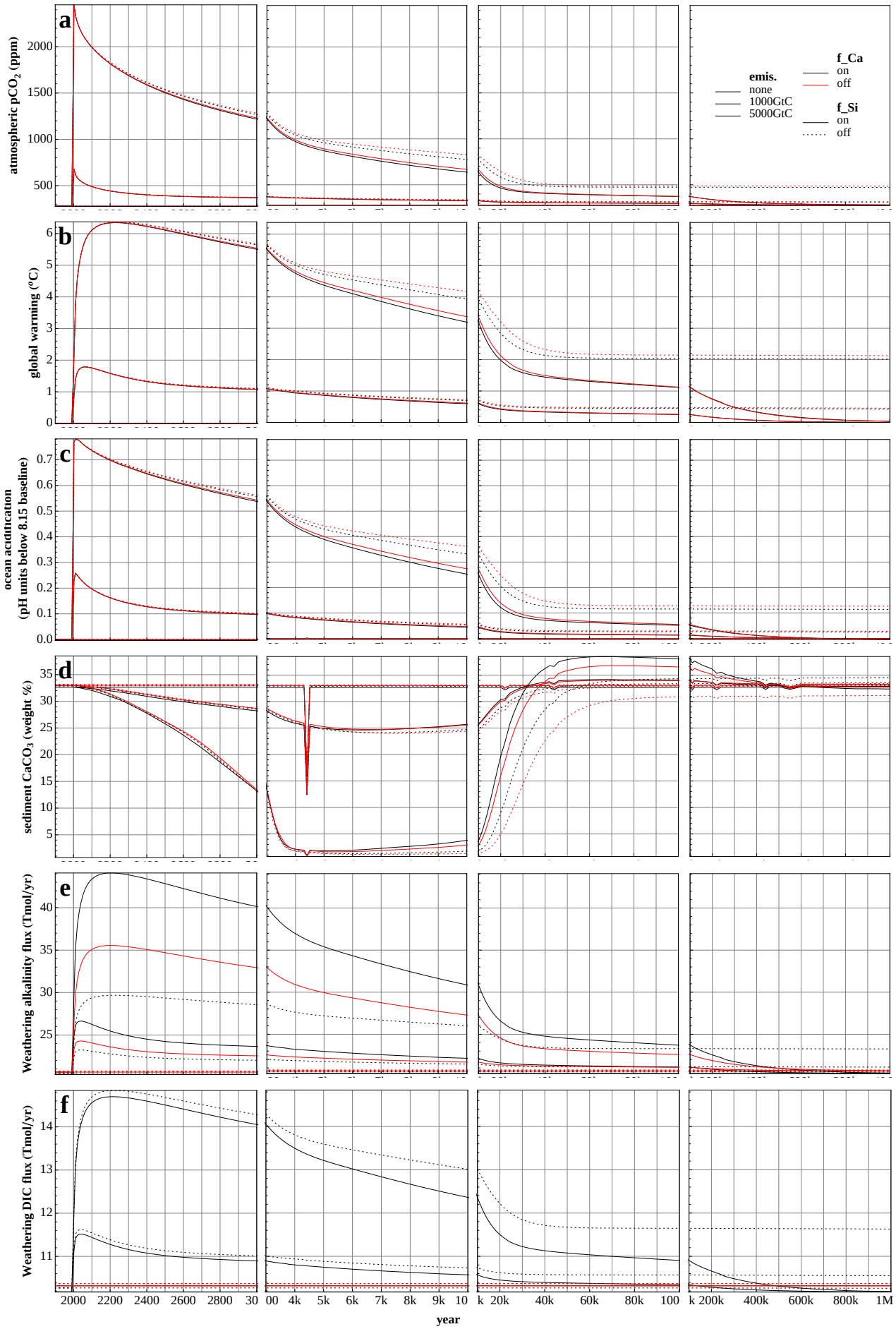

Figure 30: Timeseries of key variables for calcite and silicate weathering feedbacks ensemble

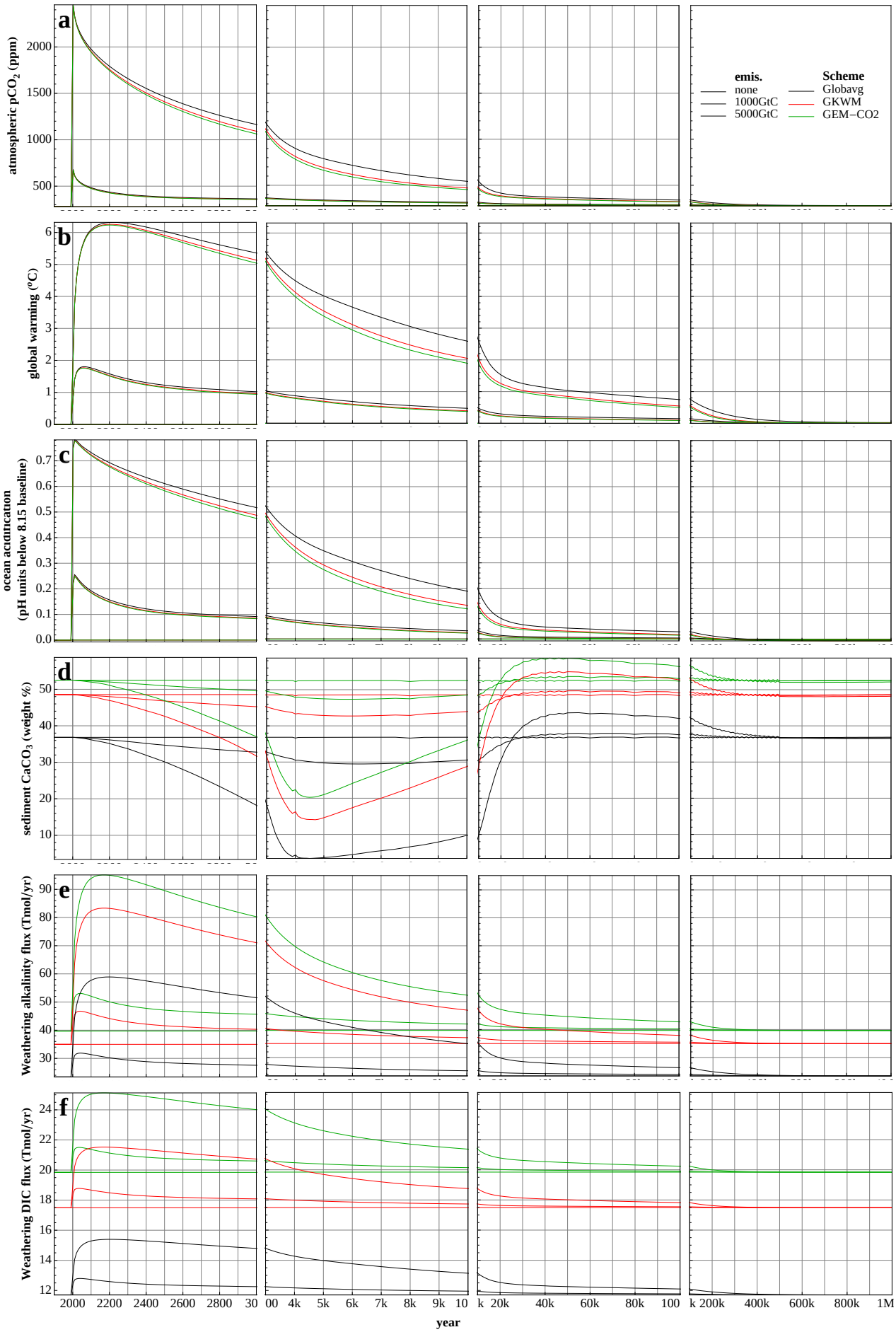

Figure 31: Timeseries of key variables for weathering schemes ensemble

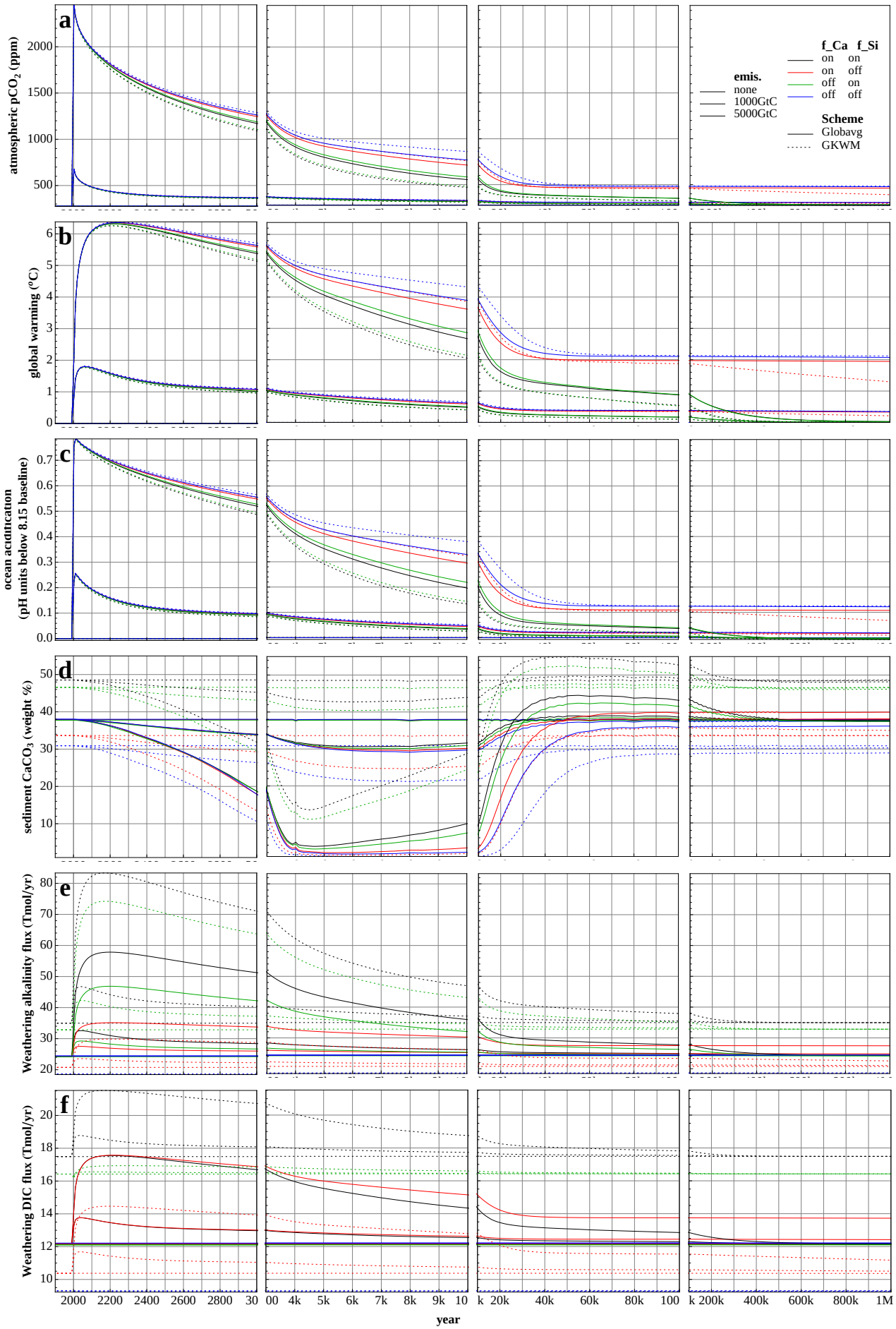

Figure 32: Timeseries of key variables for weathering schemes with f_Ca and f_Si on/off ensemble

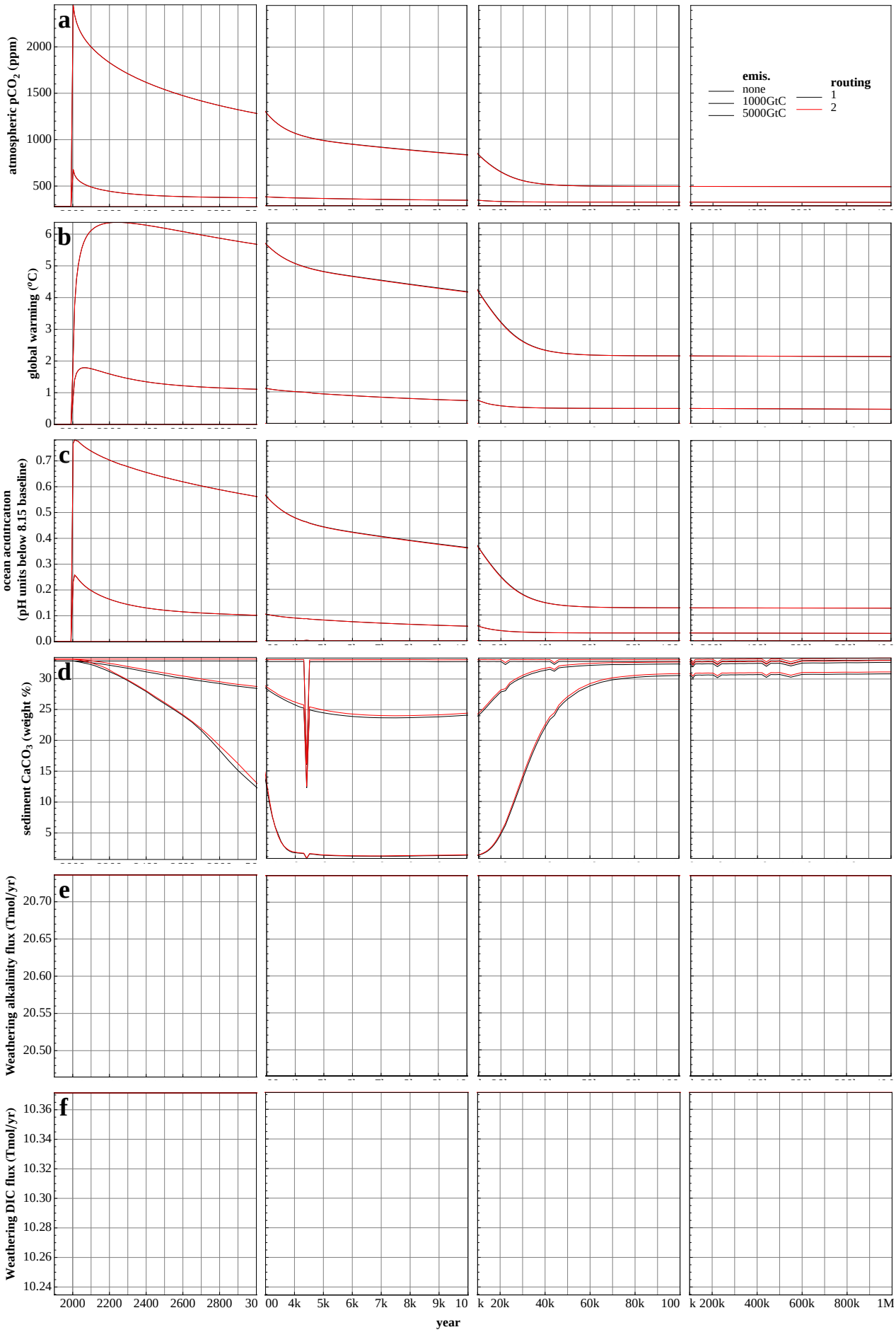

Figure 33: Timeseries of key variables for river routing schemes ensemble

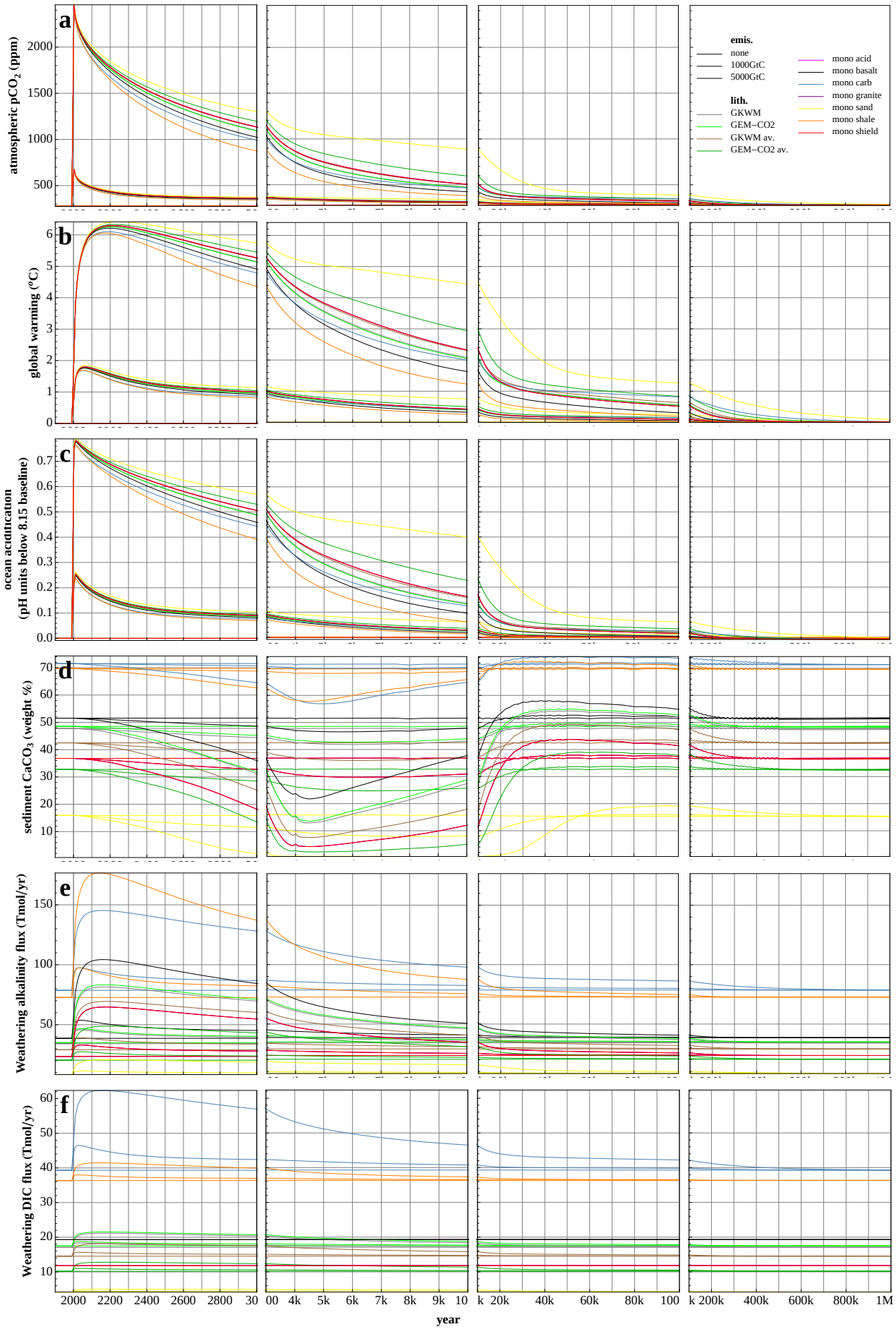

Figure 34: Timeseries of key variables for lithologies ensemble

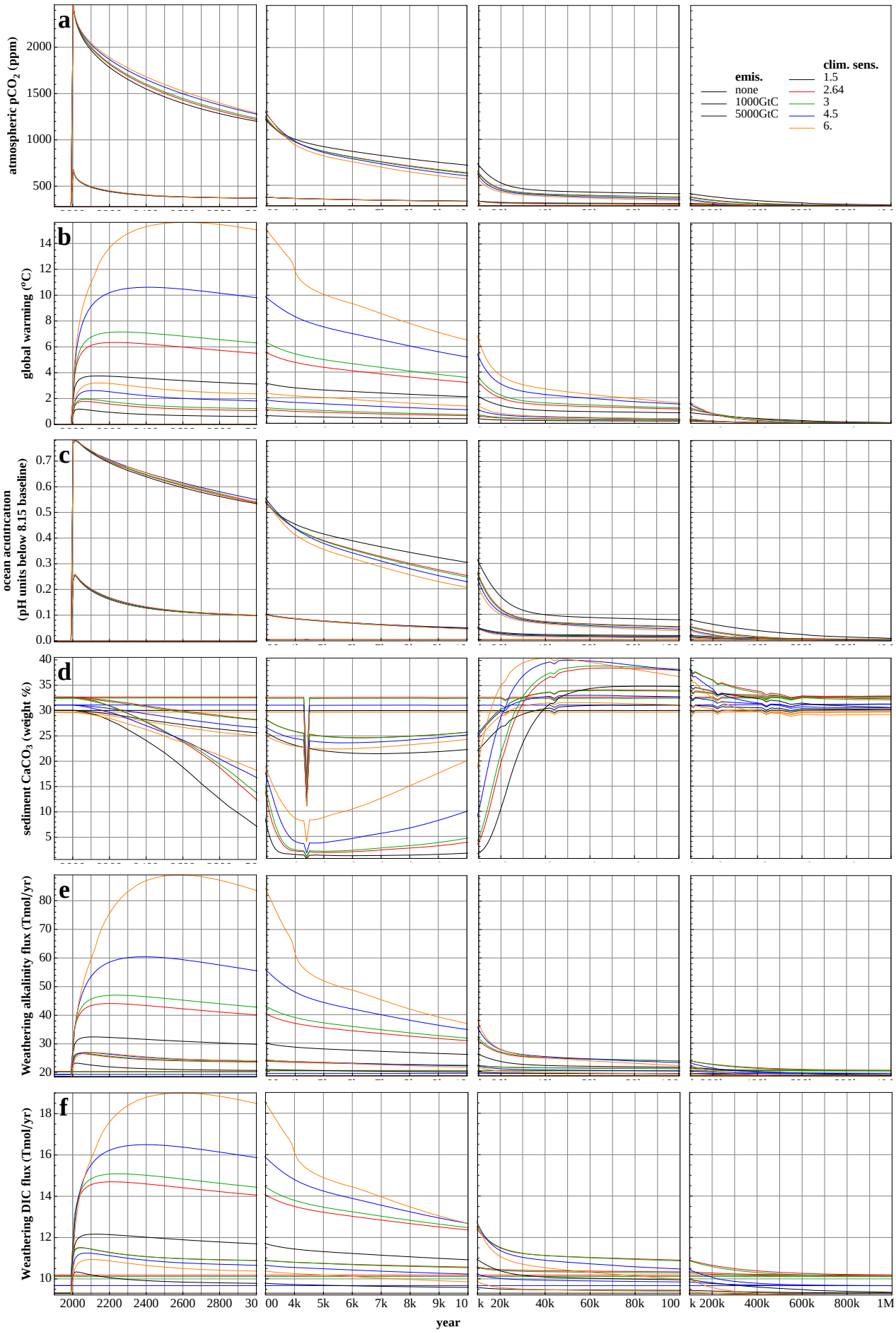

Figure 35: Timeseries of key variables for climate sensitivity ensemble

B.3 Tabulated results for key variables

Table 4: **Atmospheric pCO_2** (ppm) reached at specific calendar years

variables		year								
emis.	short-circ.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	yes	363	340	316	302	295	291	286	280	279
1000GtC	no	363	339	315	301	295	290	285	280	279
5000GtC	yes	1171	798	555	425	377	351	320	287	280
5000GtC	no	1160	780	538	418	373	348	317	286	280

variables			year								
emis.	T_Ca	T_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	371	351	330	315	307	303	296	284	275
1000GtC	on	off	373	355	335	322	316	315	315	314	312
1000GtC	off	on	371	352	331	317	308	304	298	287	279
1000GtC	off	off	373	356	336	323	317	316	316	315	314
5000GtC	on	on	1250	923	717	523	429	406	374	320	289
5000GtC	on	off	1278	975	810	620	488	481	480	479	477
5000GtC	off	on	1254	931	732	535	432	407	374	319	288
5000GtC	off	off	1283	984	828	642	496	487	487	486	485

variables		year								
emis.	E_a (kJ/mol)	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	45	367	345	323	309	302	299	295	286	280
1000GtC	63	366	344	322	307	300	297	292	283	279
1000GtC	74	366	344	321	307	299	296	290	282	279
1000GtC	103	365	342	318	304	297	293	287	280	279
5000GtC	45	1235	899	680	505	430	410	380	327	294
5000GtC	63	1221	876	647	482	414	391	358	308	285
5000GtC	74	1214	865	632	471	406	381	348	302	283
5000GtC	103	1188	825	586	442	386	360	327	290	281

variables				year								
emis.	R_Ca	R_Si	R_explicit	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	on	373	355	335	321	314	313	311	306	299
1000GtC	on	on	off	372	354	334	320	313	311	308	301	292
1000GtC	on	off	on	373	355	336	322	316	315	315	314	312
1000GtC	on	off	off	373	355	336	322	316	315	315	314	312
1000GtC	off	on	on	373	355	336	322	315	313	311	305	296
1000GtC	off	on	off	373	355	335	321	314	311	308	300	291
1000GtC	off	off	on	373	356	336	323	317	316	316	315	314
1000GtC	off	off	off	373	356	336	323	317	316	316	315	314
5000GtC	on	on	on	1276	971	803	611	480	468	457	431	392
5000GtC	on	on	off	1272	962	785	590	469	455	439	400	348
5000GtC	on	off	on	1280	978	818	629	491	484	483	481	478
5000GtC	on	off	off	1279	977	814	624	489	482	481	480	479
5000GtC	off	on	on	1280	978	816	625	483	470	459	431	389
5000GtC	off	on	off	1277	973	805	611	474	458	441	398	345
5000GtC	off	off	on	1283	984	828	642	496	487	487	486	484
5000GtC	off	off	off	1283	984	828	642	496	487	487	486	484

variables		year								
emis.	beta	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.48	368	348	327	313	307	306	305	301	296
1000GtC	0.65	368	348	327	313	307	306	304	299	294
1000GtC	0.8	368	348	326	313	307	305	303	298	292
1000GtC	1.12	368	347	326	312	306	304	302	295	288
5000GtC	0.48	1258	940	749	566	473	465	455	431	398
5000GtC	0.65	1256	938	743	561	470	460	449	419	-
5000GtC	0.8	1256	936	740	558	467	457	443	408	-
5000GtC	1.12	1254	932	733	550	461	449	430	388	344

variables		year								
emis.	k_run	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.012	368	348	327	314	308	307	306	302	297
1000GtC	0.024	368	348	327	313	307	305	303	297	290
1000GtC	0.028	368	348	326	313	306	305	303	297	290
1000GtC	0.045	367	347	325	312	305	303	300	292	285
5000GtC	0.012	1259	944	756	574	477	470	462	441	411
5000GtC	0.024	1255	936	741	559	467	457	442	408	366
5000GtC	0.028	1254	932	735	554	465	454	439	401	358
5000GtC	0.045	1247	922	717	537	454	440	419	372	327

variables			year								
emis.	P_Ca	P_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	372	353	333	318	311	308	303	293	283
1000GtC	on	off	373	355	335	322	316	315	315	314	313
1000GtC	off	on	372	354	334	319	312	309	304	294	284
1000GtC	off	off	373	356	336	323	317	316	316	315	314
5000GtC	on	on	1270	959	778	579	458	440	416	363	310
5000GtC	on	off	1278	975	810	620	488	481	481	480	478
5000GtC	off	on	1274	967	793	595	463	443	419	364	309
5000GtC	off	off	1283	984	828	642	496	487	487	486	484

variables			year								
emis.	f_Ca	f_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	369	348	326	311	302	298	291	281	278
1000GtC	on	off	372	354	334	320	314	314	314	313	311
1000GtC	off	on	370	350	328	312	303	298	291	281	278
1000GtC	off	off	373	356	336	323	317	316	316	315	314
5000GtC	on	on	1219	870	637	465	398	372	339	296	281
5000GtC	on	off	1269	957	776	583	478	474	473	472	470
5000GtC	off	on	1231	890	668	483	401	373	338	295	280
5000GtC	off	off	1283	984	828	642	496	487	487	486	484

variables		year								
emis.	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	Globavg	364	340	315	301	294	289	284	279	279
1000GtC	GKWM	358	333	309	296	290	286	281	279	278
1000GtC	GEM-CO2	356	331	307	295	289	285	281	279	278
5000GtC	Globavg	1165	788	543	415	366	340	310	284	280
5000GtC	GKWM	1092	692	471	386	348	322	296	280	279
5000GtC	GEM-CO2	1063	662	454	378	343	318	293	280	279

variables				year								
emis.	f_Ca	f_Si	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	Globavg	363	340	316	302	295	291	286	280	279
1000GtC	on	on	GKWM	358	333	309	296	290	286	281	279	278
1000GtC	on	off	Globavg	367	347	325	312	307	306	306	305	304
1000GtC	on	off	GKWM	369	348	327	313	306	305	304	300	294
1000GtC	off	on	Globavg	364	342	318	304	296	291	286	280	279
1000GtC	off	on	GKWM	359	334	310	297	290	286	281	279	278
1000GtC	off	off	Globavg	368	349	328	315	309	308	308	307	305
1000GtC	off	off	GKWM	371	351	331	317	309	309	308	307	305
5000GtC	on	on	Globavg	1171	798	555	425	377	351	320	287	280
5000GtC	on	on	GKWM	1092	692	471	386	348	322	296	280	279
5000GtC	on	off	Globavg	1246	919	713	539	469	466	465	464	462
5000GtC	on	off	GKWM	1262	951	761	567	465	456	447	423	391
5000GtC	off	on	Globavg	1189	825	583	438	380	352	319	287	280
5000GtC	off	on	GKWM	1107	710	482	389	349	320	294	280	279
5000GtC	off	off	Globavg	1263	951	769	588	486	482	481	480	478
5000GtC	off	off	GKWM	1288	1005	861	678	499	486	485	485	484

variables		year								
emis.	routing	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1	373	356	337	323	316	316	316	315	314
1000GtC	2	373	356	336	323	317	316	316	315	314
1000GtC	3	379	364	349	339	340	353	378	469	660
5000GtC	1	1283	986	831	646	496	487	487	486	484
5000GtC	2	1283	984	828	642	496	487	487	486	484
5000GtC	3	1305	1026	901	737	544	539	575	701	936

variables		year								
emis.	lith.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	GKWM	358	333	309	297	290	286	281	279	278
1000GtC	GEM-CO2	358	333	309	296	290	286	281	279	-
1000GtC	GKWM av.	361	336	312	298	291	287	282	278	277
1000GtC	GEM-CO2 av.	365	342	318	303	295	290	284	279	277
1000GtC	mono acid	362	337	311	297	290	286	281	279	278
1000GtC	mono basalt	354	328	303	292	286	282	279	278	278
1000GtC	mono carb	349	331	310	297	292	290	285	280	278
1000GtC	mono granite	362	337	311	297	290	286	281	279	278
1000GtC	mono sand	375	358	339	319	303	298	293	284	279
1000GtC	mono shale	343	321	298	287	283	281	279	278	278
1000GtC	mono shield	362	337	311	297	290	286	281	279	278
5000GtC	GKWM	1097	697	474	387	350	323	297	280	279
5000GtC	GEM-CO2	1092	692	471	386	348	322	295	280	279
5000GtC	GKWM av.	1131	741	503	398	356	330	302	281	279
5000GtC	GEM-CO2 av.	1196	840	596	435	374	347	315	285	279
5000GtC	mono acid	1136	749	505	390	346	320	295	280	279
5000GtC	mono basalt	1023	621	423	356	324	302	285	279	279
5000GtC	mono carb	992	644	465	392	361	345	322	291	280
5000GtC	mono granite	1136	749	505	390	346	320	295	280	279
5000GtC	mono sand	1300	1046	887	661	427	387	357	310	285
5000GtC	mono shale	874	535	381	329	308	293	282	279	279
5000GtC	mono shield	1136	749	505	390	346	320	295	280	279

variables		year								
emis.	clim. sens.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1.5	370	349	328	314	306	302	296	285	279
1000GtC	2.64	369	348	326	311	302	298	290	281	278
1000GtC	3	370	349	326	311	302	297	290	281	278
1000GtC	4.5	371	351	326	309	299	294	287	279	277
1000GtC	6.	370	350	324	305	296	290	284	279	278
5000GtC	1.5	1201	921	720	526	432	408	375	319	285
5000GtC	2.64	1219	871	637	465	398	372	339	296	281
5000GtC	3	1233	868	629	459	394	367	333	292	279
5000GtC	4.5	1278	857	603	444	382	350	314	283	278
5000GtC	6.	1289	820	569	427	370	336	304	281	278

Table 5: **Percentages** of remaining excess **Atmospheric pCO_2** reached at specific calendar years

variables		year								
emis.	short-circ.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	yes	21.3	15.4	9.5	6.0	4.2	3.2	1.9	0.4	0.1
1000GtC	no	21.1	15.2	9.2	5.8	4.1	3.1	1.8	0.4	0.1
5000GtC	yes	41.1	23.9	12.7	6.7	4.5	3.4	1.9	0.4	0.1
5000GtC	no	40.5	23.1	11.9	6.4	4.4	3.2	1.8	0.4	0.1

variables			year								
emis.	T_Ca	T_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	23.1	18.3	12.9	9.2	7.2	6.1	4.4	1.4	-0.8
1000GtC	on	off	23.6	19.1	14.3	10.9	9.3	9.2	9.1	8.9	8.5
1000GtC	off	on	23.2	18.5	13.2	9.6	7.5	6.5	4.9	2.1	0.4
1000GtC	off	off	23.7	19.3	14.5	11.2	9.6	9.4	9.4	9.2	9.0
5000GtC	on	on	44.7	29.7	20.2	11.3	6.9	5.9	4.4	1.9	0.5
5000GtC	on	off	46.0	32.0	24.5	15.7	9.7	9.3	9.3	9.3	9.2
5000GtC	off	on	44.9	30.0	20.9	11.8	7.1	5.9	4.4	1.9	0.5
5000GtC	off	off	46.2	32.5	25.3	16.7	10.0	9.6	9.6	9.6	9.5

variables		year								
emis.	E_a (kJ/mol)	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	45	22.1	16.8	11.3	7.8	6.0	5.3	4.2	2.0	0.6
1000GtC	63	21.9	16.5	10.9	7.3	5.5	4.7	3.4	1.3	0.2
1000GtC	74	21.9	16.4	10.7	7.1	5.3	4.4	3.0	1.0	0.2
1000GtC	103	21.6	16.0	10.1	6.5	4.7	3.6	2.2	0.6	0.1
5000GtC	45	44.0	28.5	18.5	10.4	7.0	6.1	4.7	2.2	0.7
5000GtC	63	43.4	27.5	17.0	9.4	6.3	5.2	3.7	1.4	0.3
5000GtC	74	43.0	27.0	16.3	8.9	5.9	4.7	3.2	1.1	0.2
5000GtC	103	41.9	25.1	14.1	7.5	5.0	3.8	2.3	0.6	0.1

variables				year								
emis.	R_Ca	R_Si	R_explicit	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	on	23.6	19.1	14.2	10.8	9.1	8.7	8.3	7.0	5.2
1000GtC	on	on	off	23.5	18.9	13.9	10.4	8.7	8.2	7.5	5.7	3.5
1000GtC	on	off	on	23.6	19.2	14.4	11.0	9.4	9.3	9.2	8.9	8.3
1000GtC	on	off	off	23.6	19.2	14.3	10.9	9.4	9.2	9.1	8.9	8.5
1000GtC	off	on	on	23.6	19.2	14.3	10.9	9.1	8.7	8.2	6.7	4.6
1000GtC	off	on	off	23.5	19.1	14.1	10.6	8.8	8.3	7.5	5.6	3.2
1000GtC	off	off	on	23.7	19.3	14.5	11.2	9.6	9.4	9.4	9.2	9.0
1000GtC	off	off	off	23.7	19.3	14.5	11.2	9.6	9.4	9.4	9.2	9.0
5000GtC	on	on	on	45.9	31.9	24.1	15.3	9.3	8.7	8.2	7.0	5.3
5000GtC	on	on	off	45.7	31.5	23.3	14.3	8.8	8.1	7.4	5.6	3.2
5000GtC	on	off	on	46.1	32.2	24.8	16.2	9.8	9.5	9.4	9.3	9.2
5000GtC	on	off	off	46.0	32.1	24.7	15.9	9.7	9.4	9.3	9.3	9.2
5000GtC	off	on	on	46.1	32.2	24.7	16.0	9.4	8.8	8.3	7.0	5.1
5000GtC	off	on	off	45.9	32.0	24.2	15.3	9.0	8.3	7.5	5.5	3.1
5000GtC	off	off	on	46.2	32.5	25.3	16.7	10.0	9.6	9.6	9.6	9.5
5000GtC	off	off	off	46.2	32.5	25.3	16.7	10.0	9.6	9.6	9.6	9.5

variables		year								
emis.	beta	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.48	22.5	17.5	12.2	8.8	7.3	7.0	6.7	5.7	4.4
1000GtC	0.65	22.5	17.4	12.1	8.7	7.2	6.9	6.5	5.3	3.9
1000GtC	0.8	22.5	17.4	12.1	8.7	7.1	6.8	6.3	5.0	3.4
1000GtC	1.12	22.4	17.3	12.0	8.5	7.0	6.5	5.9	4.3	2.6
5000GtC	0.48	45.1	30.4	21.6	13.3	9.0	8.6	8.1	7.1	5.5
5000GtC	0.65	45.0	30.4	21.4	13.0	8.8	8.4	7.9	6.5	-
5000GtC	0.8	44.9	30.2	21.2	12.9	8.7	8.2	7.6	6.0	-
5000GtC	1.12	44.9	30.1	20.9	12.5	8.4	7.8	7.0	5.0	3.0

variables		year								
emis.	k_run	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.012	22.5	17.5	12.3	8.9	7.4	7.2	6.9	6.0	4.8
1000GtC	0.024	22.5	17.4	12.1	8.7	7.1	6.8	6.2	4.8	3.1
1000GtC	0.028	22.4	17.4	12.1	8.7	7.1	6.7	6.2	4.8	3.1
1000GtC	0.045	22.3	17.2	11.8	8.4	6.8	6.2	5.5	3.6	1.7
5000GtC	0.012	45.1	30.6	22.0	13.6	9.2	8.8	8.4	7.5	6.1
5000GtC	0.024	44.9	30.2	21.3	12.9	8.7	8.2	7.5	6.0	4.0
5000GtC	0.028	44.9	30.1	21.0	12.7	8.6	8.1	7.4	5.7	3.7
5000GtC	0.045	44.6	29.6	20.2	11.9	8.1	7.4	6.5	4.3	2.2

variables			year								
emis.	P_Ca	P_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	23.3	18.7	13.6	10.0	8.2	7.4	6.3	3.8	1.3
1000GtC	on	off	23.6	19.1	14.2	10.9	9.3	9.2	9.1	9.0	8.6
1000GtC	off	on	23.4	18.9	13.8	10.3	8.3	7.6	6.5	3.9	1.5
1000GtC	off	off	23.7	19.3	14.5	11.2	9.6	9.4	9.4	9.2	9.0
5000GtC	on	on	45.6	31.3	23.0	13.8	8.3	7.4	6.4	3.9	1.5
5000GtC	on	off	46.0	32.0	24.5	15.7	9.7	9.3	9.3	9.3	9.2
5000GtC	off	on	45.8	31.7	23.7	14.6	8.5	7.6	6.5	4.0	1.4
5000GtC	off	off	46.2	32.5	25.3	16.7	10.0	9.6	9.6	9.6	9.5

variables			year								
emis.	f_Ca	f_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	22.6	17.5	11.9	8.2	6.1	4.9	3.1	0.8	-0.0
1000GtC	on	off	23.4	18.9	13.9	10.5	9.0	8.9	8.8	8.7	8.3
1000GtC	off	on	22.9	17.9	12.3	8.6	6.3	5.0	3.1	0.7	-0.1
1000GtC	off	off	23.7	19.3	14.5	11.2	9.6	9.4	9.4	9.2	9.0
5000GtC	on	on	43.3	27.2	16.5	8.6	5.5	4.3	2.8	0.8	0.1
5000GtC	on	off	45.6	31.2	22.9	14.0	9.2	9.0	9.0	8.9	8.8
5000GtC	off	on	43.8	28.2	17.9	9.4	5.7	4.4	2.8	0.8	0.1
5000GtC	off	off	46.2	32.5	25.3	16.7	10.0	9.6	9.6	9.6	9.5

variables		year								
emis.	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	Globavg	21.4	15.4	9.3	5.8	3.9	2.8	1.5	0.3	0.1
1000GtC	GKWM	20.0	13.8	7.7	4.6	3.0	1.9	0.8	0.1	0.1
1000GtC	GEM-CO2	19.5	13.4	7.3	4.3	2.8	1.7	0.7	0.1	0.1
5000GtC	Globavg	40.7	23.5	12.2	6.3	4.0	2.8	1.5	0.3	0.1
5000GtC	GKWM	37.5	19.0	8.9	5.0	3.2	2.0	0.8	0.1	0.0
5000GtC	GEM-CO2	36.2	17.7	8.1	4.6	3.0	1.9	0.7	0.1	0.0

variables				year								
emis.	f_Ca	f_Si	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	Globavg	21.3	15.4	9.5	6.0	4.2	3.2	1.9	0.4	0.1
1000GtC	on	on	GKWM	20.0	13.8	7.7	4.6	3.0	1.9	0.8	0.1	0.1
1000GtC	on	off	Globavg	22.3	17.2	11.8	8.5	7.2	7.1	7.0	6.8	6.5
1000GtC	on	off	GKWM	22.7	17.6	12.2	8.7	7.1	6.8	6.4	5.4	4.1
1000GtC	off	on	Globavg	21.6	15.9	10.0	6.4	4.4	3.3	1.9	0.4	0.1
1000GtC	off	on	GKWM	20.3	14.1	8.0	4.7	3.0	1.9	0.8	0.1	0.1
1000GtC	off	off	Globavg	22.6	17.7	12.5	9.1	7.6	7.5	7.5	7.2	6.8
1000GtC	off	off	GKWM	23.1	18.3	13.3	9.7	7.8	7.6	7.5	7.3	6.8
5000GtC	on	on	Globavg	41.1	23.9	12.7	6.7	4.5	3.4	1.9	0.4	0.1
5000GtC	on	on	GKWM	37.5	19.1	8.9	5.0	3.2	2.0	0.8	0.1	0.0
5000GtC	on	off	Globavg	44.5	29.5	20.0	12.0	8.8	8.6	8.6	8.6	8.5
5000GtC	on	off	GKWM	45.2	30.9	22.2	13.3	8.6	8.2	7.8	6.7	5.2
5000GtC	off	on	Globavg	41.9	25.1	14.0	7.3	4.7	3.4	1.9	0.4	0.1
5000GtC	off	on	GKWM	38.2	19.9	9.4	5.1	3.3	2.0	0.7	0.1	0.0
5000GtC	off	off	Globavg	45.3	31.0	22.6	14.2	9.6	9.4	9.3	9.3	9.2
5000GtC	off	off	GKWM	46.4	33.4	26.8	18.4	10.1	9.5	9.5	9.5	9.5

variables		year								
emis.	routing	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1	23.7	19.3	14.5	11.2	9.6	9.4	9.4	9.2	8.8
1000GtC	2	23.7	19.3	14.5	11.2	9.6	9.4	9.4	9.2	9.0
1000GtC	3	24.7	20.8	17.1	14.8	15.1	18.1	24.5	46.8	94.1
5000GtC	1	46.2	32.6	25.5	16.9	10.0	9.6	9.6	9.5	9.5
5000GtC	2	46.2	32.5	25.3	16.7	10.0	9.6	9.6	9.6	9.5
5000GtC	3	47.1	34.3	28.5	21.0	12.2	11.9	13.6	19.4	30.1

variables		year								
emis.	lith.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	GKWM	20.1	13.9	7.8	4.6	3.0	2.0	0.8	0.1	0.1
1000GtC	GEM-CO2	20.0	13.8	7.7	4.6	3.0	1.9	0.8	0.1	-
1000GtC	GKWM av.	20.6	14.5	8.4	5.0	3.3	2.1	0.9	-0.0	-0.2
1000GtC	GEM-CO2 av.	21.8	16.0	10.0	6.2	4.1	3.0	1.5	0.1	-0.2
1000GtC	mono acid	20.9	14.6	8.3	4.8	3.0	1.9	0.8	0.1	0.1
1000GtC	mono basalt	19.0	12.5	6.3	3.4	2.0	1.1	0.4	0.1	0.1
1000GtC	mono carb	17.9	13.4	8.1	4.9	3.6	2.9	1.8	0.4	-0.1
1000GtC	mono granite	20.9	14.6	8.3	4.8	3.0	1.9	0.8	0.1	0.1
1000GtC	mono sand	24.0	19.9	15.0	10.2	6.1	4.9	3.6	1.4	0.2
1000GtC	mono shale	16.5	10.8	4.9	2.3	1.3	0.7	0.2	0.1	0.1
1000GtC	mono shield	20.9	14.6	8.3	4.8	3.0	1.9	0.8	0.1	0.1
5000GtC	GKWM	37.7	19.3	9.0	5.0	3.3	2.1	0.9	0.1	0.0
5000GtC	GEM-CO2	37.5	19.1	8.9	5.0	3.2	2.0	0.8	0.1	0.0
5000GtC	GKWM av.	39.2	21.3	10.3	5.5	3.6	2.4	1.1	0.1	0.0
5000GtC	GEM-CO2 av.	42.2	25.8	14.6	7.2	4.4	3.2	1.7	0.3	0.0
5000GtC	mono acid	39.4	21.7	10.4	5.2	3.1	1.9	0.8	0.1	0.0
5000GtC	mono basalt	34.3	15.8	6.7	3.6	2.1	1.1	0.3	0.1	0.0
5000GtC	mono carb	33.3	17.0	8.7	5.3	3.9	3.1	2.0	0.6	0.1
5000GtC	mono granite	39.4	21.7	10.4	5.2	3.1	1.9	0.8	0.1	0.0
5000GtC	mono sand	46.9	35.2	27.9	17.6	6.8	5.0	3.6	1.4	0.3
5000GtC	mono shale	27.8	11.9	4.8	2.4	1.4	0.7	0.2	0.1	0.1
5000GtC	mono shield	39.4	21.7	10.4	5.2	3.1	1.9	0.8	0.1	0.0

variables		year								
emis.	clim. sens.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1.5	22.8	17.7	12.5	8.9	6.9	5.9	4.4	1.8	0.2
1000GtC	2.64	22.6	17.5	11.9	8.2	6.1	4.9	3.1	0.8	-0.0
1000GtC	3	22.8	17.6	11.9	8.1	6.0	4.7	3.0	0.7	0.0
1000GtC	4.5	23.0	18.0	11.9	7.6	5.3	3.9	2.1	0.3	-0.2
1000GtC	6.	22.9	17.8	11.3	6.6	4.4	3.1	1.6	0.2	-0.1
5000GtC	1.5	42.4	29.5	20.3	11.4	7.1	6.0	4.5	1.9	0.3
5000GtC	2.64	43.3	27.2	16.5	8.6	5.5	4.3	2.8	0.8	0.1
5000GtC	3	43.9	27.1	16.1	8.3	5.3	4.1	2.5	0.7	0.1
5000GtC	4.5	45.9	26.6	14.9	7.6	4.8	3.3	1.6	0.3	-0.0
5000GtC	6.	46.4	24.9	13.3	6.9	4.2	2.6	1.2	0.1	-0.0

Table 6: **Years** that specific values of **Atmospheric pCO_2** are reached

variables		**Atmospheric pCO_2 (ppm)**									
emis.	short-circ.	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	yes	678	2000	-	-	-	2080	2400	3900	24010	-
1000GtC	no	678	2000	-	-	-	2080	2350	3900	24010	-
5000GtC	yes	2453	2000	2500	3600	5800	13000	28010	110010	330010	-
5000GtC	no	2453	2000	2450	3500	5400	12010	26010	95000	310010	-

variables			**Atmospheric pCO_2 (ppm)**									
emis.	T_Ca	T_Si	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	on	on	680	2000	-	-	-	2090	2450	5400	140000	850000
1000GtC	on	off	681	2000	-	-	-	2090	2450	6000	-	-
1000GtC	off	on	681	2000	-	-	-	2090	2450	5400	170000	-
1000GtC	off	off	681	2000	-	-	-	2090	2450	6200	-	-
5000GtC	on	on	2453	2000	2550	4200	9500	24000	120000	300000	800000	-
5000GtC	on	off	2453	2000	2600	4600	13000	40000	-	-	-	-
5000GtC	off	on	2453	2000	2550	4200	9500	24000	120000	320000	750000	-
5000GtC	off	off	2453	2000	2600	4800	14000	46000	-	-	-	-

variables		**Atmospheric pCO_2 (ppm)**									
emis.	E_a (kJ/mol)	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	45	678	2000	-	-	-	2080	2400	4400	90010	-
1000GtC	63	678	2000	-	-	-	2080	2400	4300	55000	-
1000GtC	74	678	2000	-	-	-	2080	2400	4300	44010	-
1000GtC	103	678	2000	-	-	-	2080	2400	4100	30010	-
5000GtC	45	2453	2000	2550	4010	8010	22010	130010	340010	860010	-
5000GtC	63	2453	2000	2500	3900	7500	18010	80010	230010	620010	-
5000GtC	74	2453	2000	2500	3800	7000	17000	65000	200010	520010	-
5000GtC	103	2453	2000	2500	3700	6200	15000	36010	130010	370010	-

variables				Atmospheric pCO_2 (ppm)									
emis.	R_Ca	R_Si	R_explicit	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	on	on	on	681	2000	-	-	-	2090	2450	6000	1000000	-
1000GtC	on	on	off	681	2000	-	-	-	2090	2450	5800	600000	-
1000GtC	on	off	on	681	2000	-	-	-	2090	2450	6000	-	-
1000GtC	on	off	off	681	2000	-	-	-	2090	2450	6000	-	-
1000GtC	off	on	on	681	2000	-	-	-	2090	2450	6000	800000	-
1000GtC	off	on	off	681	2000	-	-	-	2090	2450	6000	550000	-
1000GtC	off	off	on	681	2000	-	-	-	2090	2450	6200	-	-
1000GtC	off	off	off	681	2000	-	-	-	2090	2450	6200	-	-
5000GtC	on	on	on	2453	2000	2600	4600	13000	38000	950000	-	-	-
5000GtC	on	on	off	2452	2000	2550	4500	12000	34000	500000	1000000	-	-
5000GtC	on	off	on	2453	2000	2600	4700	13000	44000	-	-	-	-
5000GtC	on	off	off	2453	2000	2600	4700	13000	42000	-	-	-	-
5000GtC	off	on	on	2453	2000	2600	4700	13000	40000	900000	-	-	-
5000GtC	off	on	off	2453	2000	2600	4600	13000	36000	500000	1000000	-	-
5000GtC	off	off	on	2453	2000	2600	4800	14000	46000	-	-	-	-
5000GtC	off	off	off	2453	2000	2600	4800	14000	46000	-	-	-	-

variables		Atmospheric pCO_2 (ppm)									
emis.	beta	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	0.48	678	2000	-	-	-	2080	2400	4700	600010	-
1000GtC	0.65	678	2000	-	-	-	2080	2400	4700	450010	-
1000GtC	0.8	678	2000	-	-	-	2080	2400	4700	370010	-
1000GtC	1.12	678	2000	-	-	-	2080	2400	4700	270010	-
5000GtC	0.48	2453	2000	2550	4300	10010	32010	980010	-	-	-
5000GtC	0.65	2453	2000	2550	4300	10010	30010	-	-	-	-
5000GtC	0.8	2453	2000	2550	4300	10010	30010	-	-	-	-
5000GtC	1.12	2453	2000	2550	4200	9500	28010	400010	920010	-	-

variables		Atmospheric pCO_2 (ppm)									
emis.	k_run	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	0.012	678	2000	-	-	-	2080	2400	4800	700010	-
1000GtC	0.024	678	2000	-	-	-	2080	2400	4700	350010	-
1000GtC	0.028	678	2000	-	-	-	2080	2400	4700	340010	-
1000GtC	0.045	678	2000	-	-	-	2080	2400	4600	200010	-
5000GtC	0.012	2453	2000	2550	4300	11000	34010	-	-	-	-
5000GtC	0.024	2453	2000	2550	4300	10010	30010	600010	-	-	-
5000GtC	0.028	2453	2000	2550	4200	10010	28010	520010	-	-	-
5000GtC	0.045	2453	2000	2550	4200	9000	26010	310010	700010	-	-

variables			Atmospheric pCO_2 (ppm)									
emis.	P_Ca	P_Si	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	on	on	681	2000	-	-	-	2090	2450	5600	300000	-
1000GtC	on	off	681	2000	-	-	-	2090	2450	6000	-	-
1000GtC	off	on	681	2000	-	-	-	2090	2450	5800	320000	-
1000GtC	off	off	681	2000	-	-	-	2090	2450	6200	-	-
5000GtC	on	on	2453	2000	2550	4500	12000	30000	300000	650000	-	-
5000GtC	on	off	2453	2000	2600	4600	13000	40000	-	-	-	-
5000GtC	off	on	2453	2000	2550	4600	12000	32000	300000	600000	-	-
5000GtC	off	off	2453	2000	2600	4800	14000	46000	-	-	-	-

variables			Atmospheric pCO_2 (ppm)									
emis.	f_Ca	f_Si	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	on	on	681	2000	-	-	-	2090	2450	4800	75000	1000000
1000GtC	on	off	681	2000	-	-	-	2090	2450	5800	-	-
1000GtC	off	on	681	2000	-	-	-	2090	2450	5000	80000	950000
1000GtC	off	off	681	2000	-	-	-	2090	2450	6200	-	-
5000GtC	on	on	2453	2000	2550	3900	7500	17000	48000	170000	460000	-
5000GtC	on	off	2453	2000	2550	4400	11000	34000	-	-	-	-
5000GtC	off	on	2453	2000	2550	4000	8000	19000	55000	170000	440000	-
5000GtC	off	off	2453	2000	2600	4800	14000	46000	-	-	-	-

variables		Atmospheric pCO_2 (ppm)									
emis.	Scheme	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	Globavg	679	2000	-	-	-	2080	2400	3900	22010	-
1000GtC	GKWM	677	2000	-	-	-	2080	2350	3500	16010	-
1000GtC	GEM-CO2	677	2000	-	-	-	2070	2350	3300	14010	-
5000GtC	Globavg	2454	2000	2500	3500	5600	12010	24010	80010	260010	-
5000GtC	GKWM	2450	2000	2450	3300	4500	9000	17000	48010	180010	-
5000GtC	GEM-CO2	2448	2000	2400	3200	4300	8500	15000	42010	170010	-

variables				Atmospheric pCO_2 (ppm)									
emis.	f_Ca	f_Si	Scheme	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	on	on	Globavg	678	2000	-	-	-	2080	2400	3900	24010	-
1000GtC	on	on	GKWM	677	2000	-	-	-	2080	2350	3500	16010	-
1000GtC	on	off	Globavg	678	2000	-	-	-	2080	2400	4600	-	-
1000GtC	on	off	GKWM	679	2000	-	-	-	2090	2400	4800	490010	-
1000GtC	off	on	Globavg	678	2000	-	-	-	2080	2400	4100	28010	-
1000GtC	off	on	GKWM	677	2000	-	-	-	2080	2350	3500	16010	-
1000GtC	off	off	Globavg	678	2000	-	-	-	2080	2400	4800	-	-
1000GtC	off	off	GKWM	679	2000	-	-	-	2090	2450	5400	-	-
5000GtC	on	on	Globavg	2453	2000	2500	3600	5800	13000	28010	110010	330010	-
5000GtC	on	on	GKWM	2450	2000	2450	3300	4500	9000	17000	48010	180010	-
5000GtC	on	off	Globavg	2453	2000	2550	4200	9000	28010	-	-	-	-
5000GtC	on	off	GKWM	2454	2000	2550	4400	11000	30010	860010	-	-	-
5000GtC	off	on	Globavg	2453	2000	2500	3700	6200	14010	32010	110010	320010	-
5000GtC	off	on	GKWM	2451	2000	2450	3300	4600	9500	18010	50010	180010	-
5000GtC	off	off	Globavg	2453	2000	2550	4400	11000	38010	-	-	-	-
5000GtC	off	off	GKWM	2454	2000	2600	5200	16010	50010	-	-	-	-

variables		Atmospheric pCO_2 (ppm)									
emis.	routing	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	1	681	2000	-	-	-	2090	2450	6200	-	-
1000GtC	2	681	2000	-	-	-	2090	2450	6200	-	-
1000GtC	3	684	2000	-	-	-	2100	2500	9000	-	-
5000GtC	1	2453	2000	2600	4800	14000	48000	-	-	-	-
5000GtC	2	2453	2000	2600	4800	14000	46000	-	-	-	-
5000GtC	3	2457	2000	2600	5800	19000	-	-	-	-	-

variables		Atmospheric pCO_2 (ppm)									
emis.	lith.	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	GKWM	677	2000	-	-	-	2080	2350	3500	16010	-
1000GtC	GEM-CO2	677	2000	-	-	-	2080	2350	3500	16010	-
1000GtC	GKWM av.	678	2000	-	-	-	2080	2350	3700	18010	490010
1000GtC	GEM-CO2 av.	679	2000	-	-	-	2080	2400	4100	26010	620010
1000GtC	mono acid	678	2000	-	-	-	2080	2350	3700	17000	-
1000GtC	mono basalt	677	2000	-	-	-	2070	2300	3200	12010	-
1000GtC	mono carb	673	2000	-	-	-	2060	2260	2950	17000	820010
1000GtC	mono granite	678	2000	-	-	-	2080	2350	3700	17000	-
1000GtC	mono sand	681	2000	-	-	-	2100	2450	6800	70010	-
1000GtC	mono shale	674	2000	-	-	-	2060	2240	2750	9500	-
1000GtC	mono shield	678	2000	-	-	-	2080	2350	3700	17000	-
5000GtC	GKWM	2451	2000	2450	3300	4500	9000	17000	50010	190010	-
5000GtC	GEM-CO2	2450	2000	2450	3300	4500	9000	17000	48010	180010	-
5000GtC	GKWM av.	2452	2000	2450	3400	4900	11000	20010	60010	210010	-
5000GtC	GEM-CO2 av.	2454	2000	2500	3700	6600	15000	30010	95000	290010	-
5000GtC	mono acid	2453	2000	2450	3400	5000	11000	19000	46010	170010	-
5000GtC	mono basalt	2449	2000	2400	3100	4010	7500	12010	24010	110010	-
5000GtC	mono carb	2423	2000	2350	3000	4010	8500	18010	85000	370010	-
5000GtC	mono granite	2453	2000	2450	3400	5000	11000	19000	46010	170010	-
5000GtC	mono sand	2458	2000	2600	6400	16010	34010	75000	230010	640010	-
5000GtC	mono shale	2426	2000	2300	2800	3400	5600	9000	14010	75000	-
5000GtC	mono shield	2453	2000	2450	3400	5000	11000	19000	46010	170010	-

variables		Atmospheric pCO_2 (ppm)									
emis.	clim. sens.	peak	at year	1500	1000	750	500	400	350	300	278
1000GtC	1.5	681	2000	-	-	-	2090	2450	5000	130000	-
1000GtC	2.64	681	2000	-	-	-	2090	2450	4800	75000	1000000
1000GtC	3	681	2000	-	-	-	2090	2450	4900	70000	-
1000GtC	4.5	682	2000	-	-	-	2100	2450	5200	48000	750000
1000GtC	6.	682	2000	-	-	-	2100	2450	5200	30000	750000
5000GtC	1.5	2453	2000	2500	4100	9500	24000	130000	320000	700000	-
5000GtC	2.64	2453	2000	2550	3900	7500	17000	48000	170000	460000	-
5000GtC	3	2454	2000	2550	3900	7500	16000	44000	150000	420000	-
5000GtC	4.5	2457	2000	2600	3900	6800	15000	36000	110000	280000	1000000
5000GtC	6.	2458	2000	2650	3800	6200	13000	28000	75000	240000	800000

Table 7: **Years** that specific fractions of remaining excess **Atmospheric pCO_2** are reached

variables		fraction									
emis.	short-circ.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	yes	2010	2030	2120	2600	9500	2240	6200	32010	210010	410010
1000GtC	no	2010	2030	2120	2600	9000	2240	6010	30010	200010	390010
5000GtC	yes	2030	2140	2650	4800	13000	3300	9500	38010	210010	410010
5000GtC	no	2030	2140	2650	4600	12010	3300	9000	36010	200010	380010

variables			fraction									
emis.	T_Ca	T_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2010	2030	2120	2750	17000	2280	9500	170000	460000	650000
1000GtC	on	off	2010	2030	2120	2800	28000	2280	12000	-	-	-
1000GtC	off	on	2010	2030	2120	2750	19000	2280	10000	200000	600000	900000
1000GtC	off	off	2010	2030	2120	2800	34000	2280	12000	-	-	-
5000GtC	on	on	2030	2160	2750	7500	24000	3700	17000	160000	550000	950000
5000GtC	on	off	2030	2160	2800	10000	44000	3900	26000	-	-	-
5000GtC	off	on	2030	2160	2800	7500	26000	3700	18000	170000	550000	950000
5000GtC	off	off	2030	2160	2850	11000	55000	3900	28000	-	-	-

variables		fraction									
emis.	E_a (kJ/mol)	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	45	2010	2030	2120	2650	13000	2260	7500	130010	560010	960010
1000GtC	63	2010	2030	2120	2650	12010	2240	7500	85000	390010	700010
1000GtC	74	2010	2030	2120	2650	12010	2240	7000	70010	340010	620010
1000GtC	103	2010	2030	2120	2650	11000	2240	6600	42010	240010	460010
5000GtC	45	2030	2140	2750	6400	22010	3600	15000	180010	600010	-
5000GtC	63	2030	2140	2700	6010	19000	3500	14010	120010	410010	740010
5000GtC	74	2030	2140	2700	5800	18010	3500	13000	90010	360010	640010
5000GtC	103	2030	2140	2700	5200	15000	3400	11000	50010	250010	460010

variables				fraction									
emis.	R_Ca	R_Si	R_explicit	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	on	2010	2030	2120	2800	26000	2280	12000	-	-	-
1000GtC	on	on	off	2010	2030	2120	2800	24000	2280	11000	700000	-	-
1000GtC	on	off	on	2010	2030	2120	2800	30000	2280	12000	-	-	-
1000GtC	on	off	off	2010	2030	2120	2800	30000	2280	12000	-	-	-
1000GtC	off	on	on	2010	2030	2120	2800	28000	2280	12000	950000	-	-
1000GtC	off	on	off	2010	2030	2120	2800	26000	2280	11000	650000	-	-
1000GtC	off	off	on	2010	2030	2120	2800	34000	2280	12000	-	-	-
1000GtC	off	off	off	2010	2030	2120	2800	34000	2280	12000	-	-	-
5000GtC	on	on	on	2030	2160	2800	9500	40000	3900	24000	-	-	-
5000GtC	on	on	off	2030	2160	2800	9000	34000	3800	22000	650000	-	-
5000GtC	on	off	on	2030	2160	2800	10000	46000	3900	26000	-	-	-
5000GtC	on	off	off	2030	2160	2800	10000	44000	3900	26000	-	-	-
5000GtC	off	on	on	2030	2160	2800	10000	42000	3900	26000	-	-	-
5000GtC	off	on	off	2030	2160	2800	9500	38000	3900	24000	600000	-	-
5000GtC	off	off	on	2030	2160	2850	11000	55000	3900	28000	-	-	-
5000GtC	off	off	off	2030	2160	2850	11000	55000	3900	28000	-	-	-

variables		fraction									
emis.	beta	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	0.48	2010	2030	2120	2700	15000	2260	8500	780010	-	-
1000GtC	0.65	2010	2030	2120	2700	15000	2260	8500	620010	-	-
1000GtC	0.8	2010	2030	2120	2700	15000	2260	8500	500010	-	-
1000GtC	1.12	2010	2030	2120	2700	15000	2260	8500	370010	-	-
5000GtC	0.48	2030	2140	2800	8010	34010	3700	20010	-	-	-
5000GtC	0.65	2030	2140	2800	8010	32010	3700	19000	-	-	-
5000GtC	0.8	2030	2140	2800	8010	30010	3700	19000	-	-	-
5000GtC	1.12	2030	2140	2750	7500	30010	3700	19000	520010	-	-

variables		fraction									
emis.	k_run	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	0.012	2010	2030	2120	2700	16010	2260	8500	920010	-	-
1000GtC	0.024	2010	2030	2120	2700	15000	2260	8500	470010	-	-
1000GtC	0.028	2010	2030	2120	2700	15000	2260	8500	460010	-	-
1000GtC	0.045	2010	2030	2120	2700	14010	2260	8010	270010	960010	-
5000GtC	0.012	2030	2140	2800	8010	36010	3700	22010	-	-	-
5000GtC	0.024	2030	2140	2750	8010	32010	3700	19000	740010	-	-
5000GtC	0.028	2030	2140	2750	7500	30010	3700	19000	660010	-	-
5000GtC	0.045	2030	2140	2750	7500	26010	3700	17000	400010	-	-

variables			fraction									
emis.	P_Ca	P_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2010	2030	2120	2800	22000	2280	11000	360000	900000	-
1000GtC	on	off	2010	2030	2120	2800	28000	2280	12000	-	-	-
1000GtC	off	on	2010	2030	2120	2800	22000	2280	11000	360000	950000	-
1000GtC	off	off	2010	2030	2120	2800	34000	2280	12000	-	-	-
5000GtC	on	on	2030	2160	2800	9000	32000	3800	22000	360000	900000	-
5000GtC	on	off	2030	2160	2800	10000	44000	3900	26000	-	-	-
5000GtC	off	on	2030	2160	2800	9500	34000	3800	22000	380000	900000	-
5000GtC	off	off	2030	2160	2850	11000	55000	3900	28000	-	-	-

variables			fraction									
emis.	f_Ca	f_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2010	2030	2120	2700	14000	2260	8000	95000	340000	550000
1000GtC	on	off	2010	2030	2120	2800	24000	2280	11000	-	-	-
1000GtC	off	on	2010	2030	2120	2750	15000	2260	8500	100000	320000	550000
1000GtC	off	off	2010	2030	2120	2800	34000	2280	12000	-	-	-
5000GtC	on	on	2030	2160	2750	5800	17000	3500	13000	70000	300000	550000
5000GtC	on	off	2030	2160	2800	8500	36000	3800	22000	-	-	-
5000GtC	off	on	2030	2160	2750	6400	19000	3500	14000	75000	300000	550000
5000GtC	off	off	2030	2160	2850	11000	55000	3900	28000	-	-	-

variables		fraction									
emis.	Scheme	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	Globavg	2010	2030	2120	2600	9500	2240	6200	28010	170010	340010
1000GtC	GKWM	2010	2020	2100	2550	7500	2220	5200	18010	110010	230010
1000GtC	GEM-CO2	2010	2020	2100	2500	7500	2220	5000	16010	95000	210010
5000GtC	Globavg	2030	2140	2650	4700	13000	3300	9500	30010	170010	330010
5000GtC	GKWM	2030	2120	2600	4010	9000	3100	7000	20010	120010	230010
5000GtC	GEM-CO2	2030	2120	2550	3800	8500	3000	6400	18010	110010	210010

variables				fraction									
emis.	f_Ca	f_Si	Scheme	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	Globavg	2010	2030	2120	2600	9500	2240	6200	32010	210010	390010
1000GtC	on	on	GKWM	2010	2020	2100	2550	7500	2220	5200	18010	110010	230010
1000GtC	on	off	Globavg	2010	2030	2120	2650	14010	2260	8010	-	-	-
1000GtC	on	off	GKWM	2010	2030	2120	2700	15000	2260	8500	660010	-	-
1000GtC	off	on	Globavg	2010	2030	2120	2600	10010	2240	6600	36010	210010	410010
1000GtC	off	on	GKWM	2010	2020	2120	2550	8010	2220	5400	19000	110010	220010
1000GtC	off	off	Globavg	2010	2030	2120	2700	16010	2260	9000	-	-	-
1000GtC	off	off	GKWM	2010	2030	2120	2750	19000	2260	10010	-	-	-
5000GtC	on	on	Globavg	2030	2140	2650	4800	13000	3300	9500	38010	210010	410010
5000GtC	on	on	GKWM	2030	2120	2600	4010	9000	3100	7000	20010	120010	230010
5000GtC	on	off	Globavg	2030	2140	2750	7000	28010	3700	17000	-	-	-
5000GtC	on	off	GKWM	2030	2160	2800	8500	32010	3800	20010	-	-	-
5000GtC	off	on	Globavg	2030	2140	2700	5200	15000	3400	11000	44010	210010	390010
5000GtC	off	on	GKWM	2030	2140	2600	4100	9500	3100	7500	22010	110010	210010
5000GtC	off	off	Globavg	2030	2140	2800	8500	40010	3800	22010	-	-	-
5000GtC	off	off	GKWM	2030	2160	2850	12010	55000	4010	30010	-	-	-

variables		fraction									
emis.	routing	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	1	2010	2030	2120	2800	34000	2280	12000	-	-	-
1000GtC	2	2010	2030	2120	2800	34000	2280	12000	-	-	-
1000GtC	3	2010	2030	2140	2950	-	2300	-	-	-	-
5000GtC	1	2030	2160	2850	11000	55000	3900	28000	-	-	-
5000GtC	2	2030	2160	2850	11000	55000	3900	28000	-	-	-
5000GtC	3	2030	2160	2850	15000	-	4200	40000	-	-	-

variables		fraction									
emis.	lith.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	GKWM	2010	2020	2100	2550	8010	2220	5200	18010	110010	230010
1000GtC	GEM-CO2	2010	2020	2100	2550	7500	2220	5200	18010	110010	230010
1000GtC	GKWM av.	2010	2030	2120	2550	8500	2240	5600	22010	120010	240010
1000GtC	GEM-CO2 av.	2010	2030	2120	2650	10010	2260	6600	32010	180010	320010
1000GtC	mono acid	2010	2030	2120	2600	8500	2240	5600	20010	110010	220010
1000GtC	mono basalt	2010	2020	2100	2500	6400	2220	4600	13000	60010	140010
1000GtC	mono carb	2010	2020	2080	2400	8010	2180	5000	20010	200010	410010
1000GtC	mono granite	2010	2030	2120	2600	8500	2240	5600	20010	110010	220010
1000GtC	mono sand	2010	2030	2140	2850	22010	2280	13000	95000	430010	740010
1000GtC	mono shale	2010	2020	2080	2400	5600	2180	3900	10010	28010	100010
1000GtC	mono shield	2010	2030	2120	2600	8500	2240	5600	20010	110010	220010
5000GtC	GKWM	2030	2120	2600	4010	9500	3100	7000	22010	120010	240010
5000GtC	GEM-CO2	2030	2120	2600	4010	9000	3100	7000	20010	120010	220010
5000GtC	GKWM av.	2030	2140	2600	4300	11000	3200	8010	24010	140010	260010
5000GtC	GEM-CO2 av.	2030	2140	2700	5400	15000	3400	11000	38010	190010	370010
5000GtC	mono acid	2030	2140	2600	4400	11000	3200	8010	22010	110010	220010
5000GtC	mono basalt	2030	2120	2500	3600	7500	2900	5800	14010	65000	150010
5000GtC	mono carb	2020	2100	2500	3700	9000	2850	6400	24010	230010	470010
5000GtC	mono granite	2030	2140	2600	4400	11000	3200	8010	22010	110010	220010
5000GtC	mono sand	2030	2160	2850	13000	34010	4400	26010	110010	430010	780010
5000GtC	mono shale	2020	2100	2400	3200	5800	2700	4600	10010	32010	110010
5000GtC	mono shield	2030	2140	2600	4400	11000	3200	8010	22010	110010	220010

variables		fraction									
emis.	clim. sens.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	1.5	2010	2030	2120	2750	16000	2260	9000	170000	500000	850000
1000GtC	2.64	2010	2030	2120	2700	14000	2260	8000	95000	320000	550000
1000GtC	3	2010	2030	2120	2700	14000	2260	8500	90000	320000	550000
1000GtC	4.5	2010	2030	2140	2750	13000	2280	8500	60000	240000	400000
1000GtC	6.	2010	2030	2140	2750	12000	2300	8000	36000	180000	320000
5000GtC	1.5	2030	2140	2650	7500	24000	3500	17000	170000	550000	850000
5000GtC	2.64	2030	2160	2750	5800	17000	3500	13000	70000	320000	600000
5000GtC	3	2030	2160	2750	5800	17000	3500	12000	65000	280000	500000
5000GtC	4.5	2030	2180	2850	5600	15000	3600	11000	46000	190000	340000
5000GtC	6.	2030	2200	2900	5000	14000	3500	10000	36000	150000	300000

Table 8: **Timescale fitting** for excess **Atmospheric pCO$_2$** decay

variables				fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$							
emis.	short-circ.		pCO$_2$ (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	yes	b	278.47±0.02	w_i (%)	12.6±0.2	17.5±0.1	36.6±0.2	9.9±0.6	10.7±0.6	7.3±0.7	5.38±0.04	0.99999998
		h	400±40	τ_i (yr)	5.7±0.1	29.0±0.6	156±2	440±20	3800±100	8800±400	179300±1000	
1000GtC	no	b	278.58±0.02	w_i (%)	12.7±0.2	17.6±0.1	36.4±0.2	10.0±0.6	11.0±0.6	7.1±0.8	5.26±0.04	0.99999998
		h	400±40	τ_i (yr)	5.71±0.1	28.9±0.6	154±2	430±20	3700±100	8600±400	169400±900	
5000GtC	yes	b	279.8±0.5	w_i (%)	7.2±0.2	11.3±0.2	44.8±0.2	29.6±0.3	1.3±0.5	5.7±0.1		0.9999992
		h	2170±217	τ_i (yr)	11.3±0.6	82±3	648±5	5230±100	21000±8000	177000±5000		
5000GtC	no	b	279.9±0.4	w_i (%)	7.3±0.2	11.6±0.2	44.5±0.2	29.0±0.4	2.0±0.7	5.6±0.1		0.9999992
		h	2170±217	τ_i (yr)	11.4±0.5	83±3	646±5	4700±100	16000±4000	166000±4000		

variables					fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$							
emis.	T_Ca	T_Si		pCO$_2$ (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	on	on	b	272.8±0.2	w_i (%)	11.7±0.5	16.8±0.3	31±1	15±2	7±1	9±1	9.4±0.1	0.99999992
			h	408±40	τ_i (yr)	5.8±0.3	29±1	148±7	370±30	4100±400	9400±600	391000±6000	
1000GtC	on	off	b	315.06±0.07	w_i (%)	13.1±0.5	18.9±0.3	35.8±0.9	15±2	9.3±0.9	8±1		0.99999995
			h	365±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4800±300	11700±700		
1000GtC	off	on	b	277.5±0.2	w_i (%)	11.9±0.4	17.1±0.3	32.1±0.8	14±2	9.0±0.9	7±1	8.6±0.1	0.99999995
			h	403±40	τ_i (yr)	5.8±0.2	29±1	150±5	380±20	4600±300	10900±700	371000±5000	
1000GtC	off	off	b	316.02±0.07	w_i (%)	13.2±0.5	19.0±0.3	35.9±0.9	15±2	8.7±0.9	8±1		0.99999995
			h	364±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4600±300	11600±700		
5000GtC	on	on	b	2170±2170	w_i (%)	6.1±0.7	11.6±0.6	44.6±0.2	30.1±0.2	7.6±0.2			0.999995
			h	2170±217	τ_i (yr)	11±2	74±7	666±9	9200±100	350000±20000			
5000GtC	on	off	b	1980±1980	w_i (%)	7±1	13±1	48.6±0.3	31.6±0.3				0.99999
			h	1980±198	τ_i (yr)	11±3	80±10	680±10	12500±200				
5000GtC	off	on	b	2170±2170	w_i (%)	6.1±0.7	11.7±0.6	44.6±0.2	29.9±0.2	7.7±0.2			0.999995
			h	2170±217	τ_i (yr)	11±2	75±7	671±9	9700±100	360000±20000			
5000GtC	off	off	b	1970±1970	w_i (%)	7±2	13±1	48.7±0.3	31.4±0.3				0.99999
			h	1970±197	τ_i (yr)	11±3	80±10	680±10	13300±200				

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$										
emis.	E_a (kJ/mol)		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	45	b	277.88±0.07	w_i (%)	12.6±0.2	17.4±0.1	35.1±0.3	10.8±0.8	8.2±0.4	9.2±0.5	6.77±0.06	0.99999998
		h	400±40	τ_i (yr)	5.7±0.1	28.8±0.6	153±3	410±20	3600±100	9100±200	420000±3000	
1000GtC	63	b	278.04±0.04	w_i (%)	12.6±0.2	17.5±0.1	35.5±0.3	10.5±0.7	8.9±0.4	8.6±0.6	6.44±0.05	0.99999998
		h	400±40	τ_i (yr)	5.7±0.1	28.9±0.6	154±2	420±20	3700±100	9100±300	307000±2000	
1000GtC	74	b	278.29±0.04	w_i (%)	12.6±0.2	17.4±0.2	35.4±0.4	10.6±0.9	8.5±0.5	9.2±0.7	6.27±0.06	0.99999998
		h	400±40	τ_i (yr)	5.7±0.1	28.8±0.7	154±3	410±20	3500±200	8700±300	262000±1000	
1000GtC	103	b	278.60±0.04	w_i (%)	12.6±0.3	17.5±0.2	35.8±0.5	10±1	8.4±0.9	9±1	5.86±0.07	0.99999996
		h	400±40	τ_i (yr)	5.7±0.2	28.9±0.9	154±4	420±30	3500±300	8200±400	188000±1000	
5000GtC	45	b	2168±2168	w_i (%)	7.3±0.3	12.0±0.2	43.38±0.09	29.75±0.09	7.57±0.05			0.999999
		h	2168±216	τ_i (yr)	11.4±0.7	85±4	679±5	7910±50	368000±8000			
5000GtC	63	b	282.4±0.8	w_i (%)	7.4±0.3	11.9±0.2	43.58±0.08	29.97±0.09	7.20±0.04			0.999999
		h	2169±216	τ_i (yr)	11.5±0.7	85±3	675±5	7210±40	271000±4000			
5000GtC	74	b	2172±2172	w_i (%)	7.3±0.3	11.8±0.2	43.72±0.09	29.9±0.1	1.0±0.9	6.3±0.9		0.9999990
		h	2172±217	τ_i (yr)	11.4±0.6	85±3	671±5	6850±60	80000±60000	270000±30000		
5000GtC	103	b	279.9±0.6	w_i (%)	7.3±0.3	11.6±0.2	44.51±0.1	29.6±0.2	1.1±0.2	5.9±0.2		0.9999992
		h	2172±217	τ_i (yr)	11.4±0.6	84±3	660±5	5890±80	30000±10000	198000±7000		

variables				fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	R_Ca	R_Si	R_explicit		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	on	on	on	b	404±404	w_i (%)	11.9±0.4	17.1±0.3	32.2±0.8	14±2	7.8±0.7	7.6±0.9	9.6±0.8	0.99999996
				h	404±40	τ_i (yr)	5.8±0.2	29±1	151±5	390±20	4500±300	11000±500	1900000±200000	
1000GtC	on	on	off	b	403±403	w_i (%)	11.9±0.4	17.1±0.2	32.4±0.8	14±2	8.1±0.8	7.5±1	9.0±0.3	0.99999995
				h	403±40	τ_i (yr)	5.8±0.2	29±1	151±5	380±20	4500±300	10900±600	1110000±50000	
1000GtC	on	off	on	b	315.37±0.07	w_i (%)	13.2±0.5	18.9±0.3	35.9±0.9	15±2	9.2±0.9	8±1		0.99999995
				h	365±36	τ_i (yr)	5.8±0.2	29±1	152±6	390±20	4700±300	11900±700		
1000GtC	on	off	off	b	315.12±0.07	w_i (%)	13.1±0.5	18.9±0.3	35.8±0.9	15±2	9.4±1	8±1		0.99999995
				h	365±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4800±300	11900±800		
1000GtC	off	on	on	b	415±415	w_i (%)	11.6±0.4	16.6±0.3	31.5±0.8	13±1	7.7±0.7	7.3±0.9	12±1	0.99999995
				h	415±41	τ_i (yr)	5.8±0.2	29±1	151±5	390±20	4600±300	11300±600	2200000±200000	
1000GtC	off	on	off	b	405±405	w_i (%)	11.8±0.4	17.0±0.2	32.2±0.8	14±2	7.7±0.8	7.6±0.9	9.7±0.3	0.99999995
				h	405±40	τ_i (yr)	5.8±0.2	29±1	151±5	390±20	4600±300	11000±600	1090000±50000	
1000GtC	off	off	on	b	316.02±0.07	w_i (%)	13.2±0.5	19.0±0.3	35.9±0.9	15±2	8.7±0.9	8±1		0.99999995
				h	364±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4600±300	11600±700		
1000GtC	off	off	off	b	316.02±0.07	w_i (%)	13.2±0.5	19.0±0.3	35.9±0.9	15±2	8.7±0.9	8±1		0.99999995
				h	364±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4600±300	11600±700		
5000GtC	on	on	on	b	2000±2000	w_i (%)	7±4	13±3	48.0±0.8	31.8±0.8				0.9999
				h	2000±200	τ_i (yr)	12±8	80±40	710±40	13600±500				
5000GtC	on	on	off	b	2280±2280	w_i (%)	5.8±0.9	11.2±0.7	42±1	27.9±0.8	13±6			0.999992
				h	2280±228	τ_i (yr)	11±2	75±9	680±10	11400±200	2000000±1000000			
5000GtC	on	off	on	b	1940±1940	w_i (%)	16.9±0.7	50.9±0.3	32.2±0.4					0.99997
				h	1940±194	τ_i (yr)	43±4	650±10	12600±300					
5000GtC	on	off	off	b	1980±1980	w_i (%)	7±1	13±1	48.6±0.3	31.6±0.3				0.99999
				h	1980±198	τ_i (yr)	11±3	80±10	680±10	12700±200				
5000GtC	off	on	on	b	2000±2000	w_i (%)	7±4	13±3	48.0±0.8	31.8±0.8				0.9999
				h	2000±200	τ_i (yr)	12±9	80±40	710±40	14400±600				
5000GtC	off	on	off	b	2300±2300	w_i (%)	6±1	11.1±0.9	41±2	27±1	15±8			0.99999
				h	2300±230	τ_i (yr)	11±3	75±10	680±10	12400±200	2000000±1000000			
5000GtC	off	off	on	b	1970±1970	w_i (%)	7±2	13±1	48.7±0.3	31.4±0.3				0.99999
				h	1970±197	τ_i (yr)	11±3	80±10	680±10	13300±200				
5000GtC	off	off	off	b	1970±1970	w_i (%)	7±2	13±1	48.7±0.3	31.4±0.3				0.99999
				h	1970±197	τ_i (yr)	11±3	80±10	680±10	13300±200				

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	beta		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	0.48	b	401±401	w_i (%)	12.5±0.2	17.4±0.1	34.5±0.3	11.2±0.8	7.7±0.3	9.2±0.4	7.6±0.3	0.99999999
		h	401±40	τ_i (yr)	5.69±0.1	28.7±0.6	152±2	400±10	3600±100	9600±200	2000000±100000	
1000GtC	0.65	b	279.1±0.7	w_i (%)	12.6±0.2	17.5±0.1	34.7±0.3	11.1±0.8	7.7±0.3	9.2±0.4	7.1±0.2	0.99999999
		h	399±39	τ_i (yr)	5.7±0.1	28.7±0.6	152±3	400±20	3600±100	9500±200	1470000±50000	
1000GtC	0.8	b	279.0±0.5	w_i (%)	12.6±0.2	17.5±0.1	34.8±0.3	11.1±0.8	7.8±0.3	9.2±0.4	7.1±0.1	0.99999998
		h	399±39	τ_i (yr)	5.7±0.1	28.7±0.6	152±3	400±20	3600±100	9500±200	1240000±30000	
1000GtC	1.12	b	279.6±0.3	w_i (%)	12.6±0.2	17.5±0.2	34.8±0.4	11.2±0.9	7.6±0.4	9.5±0.5	6.90±0.08	0.99999998
		h	399±39	τ_i (yr)	5.7±0.1	28.7±0.6	152±3	400±20	3500±200	9300±200	890000±20000	
5000GtC	0.48	b	2220±2220	w_i (%)	7.2±0.4	11.9±0.3	42.1±0.5	28.0±0.4	11±3			0.999998
		h	2220±222	τ_i (yr)	11.4±1	86±5	696±6	9810±70	3000000±1000000			
5000GtC	0.65	b	1980±1980	w_i (%)	18±1	49.9±0.6	32.4±0.7					0.9999
		h	1980±198	τ_i (yr)	44±6	670±30	10700±400					
5000GtC	0.8	b	2010±2010	w_i (%)	9±3	14±3	46±1	31.1±0.9				0.9999
		h	2010±201	τ_i (yr)	13±7	110±40	750±50	11200±500				
5000GtC	1.12	b	2163±2163	w_i (%)	7.3±0.4	12.2±0.3	43.2±0.1	29.1±0.1	8.2±0.3			0.999998
		h	2163±216	τ_i (yr)	11.4±0.9	85±5	689±6	9270±60	850000±60000			

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	k_run		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	0.012	b	407±407	w_i (%)	12.3±0.2	17.1±0.1	34.0±0.3	11.0±0.8	7.8±0.3	8.7±0.4	9.0±0.6	0.99999998
		h	407±40	τ_i (yr)	5.7±0.1	28.7±0.6	152±3	410±20	3700±100	9900±200	2800000±200000	
1000GtC	0.024	b	275.9±0.6	w_i (%)	12.5±0.2	17.3±0.2	34.4±0.4	11.1±0.9	7.8±0.4	9.0±0.5	7.9±0.2	0.99999998
		h	402±40	τ_i (yr)	5.7±0.1	28.7±0.7	152±3	400±20	3600±100	9600±200	1270000±30000	
1000GtC	0.028	b	276.6±0.6	w_i (%)	12.5±0.2	17.4±0.1	34.8±0.3	10.8±0.8	8.5±0.4	8.3±0.4	7.7±0.1	0.99999998
		h	402±40	τ_i (yr)	5.7±0.1	28.8±0.6	153±3	410±20	3800±100	10100±200	1250000±30000	
1000GtC	0.045	b	276.3±0.2	w_i (%)	12.5±0.2	17.4±0.2	35.0±0.3	10.7±0.8	9.0±0.4	7.9±0.5	7.53±0.08	0.99999998
		h	402±40	τ_i (yr)	5.7±0.1	28.8±0.6	154±3	420±20	3900±100	10200±300	790000±10000	
5000GtC	0.012	b	1970±1970	w_i (%)	18±1	50.1±0.7	32.0±0.8					0.9998
		h	1970±197	τ_i (yr)	45±7	680±30	11400±500					
5000GtC	0.024	b	2175±2175	w_i (%)	7.3±0.4	12.1±0.3	43.0±0.2	28.7±0.1	8.8±0.7			0.999998
		h	2175±217	τ_i (yr)	11.4±0.9	86±5	692±6	9560±70	1300000±200000			
5000GtC	0.028	b	2177±2177	w_i (%)	7.3±0.4	12.1±0.3	42.9±0.1	28.7±0.1	8.9±0.6			0.999998
		h	2177±217	τ_i (yr)	11.5±0.9	86±5	692±6	9370±70	1200000±100000			
5000GtC	0.045	b	2171±2171	w_i (%)	7.3±0.4	12.1±0.3	43.1±0.1	29.16±0.1	8.3±0.2			0.999998
		h	2171±217	τ_i (yr)	11.4±0.8	85±4	686±5	8810±60	720000±30000			

variables			fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	P_Ca	P_Si		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	on	on	b	273.8±0.6	w_i (%)	11.8±0.5	16.9±0.3	32.0±0.9	14±2	8.8±1	7±1	9.6±0.2	0.99999994
			h	407±40	τ_i (yr)	5.8±0.2	29±1	150±6	380±20	4700±300	11200±800	710000±20000	
1000GtC	on	off	b	315.09±0.07	w_i (%)	13.2±0.5	18.9±0.3	35.8±0.9	15±2	9.1±0.9	8±1		0.99999995
			h	365±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4700±300	11500±700		
1000GtC	off	on	b	275.6±0.6	w_i (%)	11.8±0.5	17.0±0.3	32.1±1	14±2	8±1	7±1	9.5±0.2	0.99999993
			h	405±40	τ_i (yr)	5.8±0.3	29±1	150±6	380±20	4600±400	10900±800	660000±20000	
1000GtC	off	off	b	316.02±0.07	w_i (%)	13.2±0.5	19.0±0.3	35.9±0.9	15±2	8.7±0.9	8±1		0.99999995
			h	364±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4600±300	11600±700		
5000GtC	on	on	b	2260±2260	w_i (%)	5.8±0.9	11.4±0.7	42.6±0.4	28.5±0.3	12±2			0.999992
			h	2260±226	τ_i (yr)	10±2	74±9	670±10	11200±200	1100000±300000			
5000GtC	on	off	b	1980±1980	w_i (%)	7±1	13±1	48.6±0.3	31.6±0.3				0.99999
			h	1980±198	τ_i (yr)	11±3	80±10	680±10	12500±200				
5000GtC	off	on	b	2250±2250	w_i (%)	6±1	11.4±0.8	42.6±0.4	28.4±0.3	12±2			0.999990
			h	2250±225	τ_i (yr)	11±3	75±10	680±10	11900±200	1100000±300000			
5000GtC	off	off	b	1970±1970	w_i (%)	7±2	13±1	48.7±0.3	31.4±0.3				0.99999
			h	1970±197	τ_i (yr)	11±3	80±10	680±10	13300±200				

variables			fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	f_Ca	f_Si		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	on	on	b	277.56±0.09	w_i (%)	11.8±0.4	17.0±0.2	32.0±0.8	15±2	11±1	6±1	7.5±0.1	0.99999996
			h	403±40	τ_i (yr)	5.8±0.2	29±1	148±5	370±20	4500±300	10300±800	237000±2000	
1000GtC	on	off	b	313.89±0.07	w_i (%)	13.1±0.5	18.8±0.3	35.7±0.9	15±2	10±1	7±1		0.99999994
			h	367±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4700±300	11400±800		
1000GtC	off	on	b	277.42±0.09	w_i (%)	11.9±0.4	17.0±0.3	32.1±0.9	15±2	10.0±1	7±1	7.9±0.1	0.99999995
			h	403±40	τ_i (yr)	5.8±0.2	29±1	149±5	370±20	4600±300	10700±800	225000±2000	
1000GtC	off	off	b	316.02±0.07	w_i (%)	13.2±0.5	19.0±0.3	35.9±0.9	15±2	8.7±0.9	8±1		0.99999995
			h	364±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4600±300	11600±700		
5000GtC	on	on	b	2172±2172	w_i (%)	6.1±0.6	11.4±0.4	45.2±0.1	30.7±0.2	6.63±0.08			0.999997
			h	2172±217	τ_i (yr)	11±1	74±5	653±7	7180±70	223000±9000			
5000GtC	on	off	b	1980±1980	w_i (%)	7±1	12.9±0.9	48.4±0.2	32.0±0.3				0.999992
			h	1980±198	τ_i (yr)	11±3	75±10	670±10	10800±200				
5000GtC	off	on	b	2172±2172	w_i (%)	6.2±0.6	11.5±0.4	45.0±0.1	30.5±0.1	6.81±0.09			0.999997
			h	2172±217	τ_i (yr)	11±1	76±6	663±7	8020±80	215000±9000			
5000GtC	off	off	b	1970±1970	w_i (%)	7±2	13±1	48.7±0.3	31.4±0.3				0.99999
			h	1970±197	τ_i (yr)	11±3	80±10	680±10	13300±200				

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$										
emis.	Scheme		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	Globavg	b	278.64±0.02	w_i (%)	12.5±0.2	17.4±0.1	36.5±0.2	10.1±0.6	10.5±0.7	7.8±0.8	5.23±0.04	0.99999999
		h	400±40	τ_i (yr)	5.71±0.1	28.9±0.5	155±2	440±20	3700±100	8500±300	147800±800	
1000GtC	GKWM	b	278.37±0.04	w_i (%)	13.1±0.3	18.0±0.2	37.2±0.2	9.2±0.7	12±1	6±1	4.51±0.06	0.99999998
		h	399±39	τ_i (yr)	5.7±0.1	28.7±0.6	153±2	440±20	3600±200	7800±700	109000±1000	
1000GtC	GEM-CO2	b	278.38±0.04	w_i (%)	13.3±0.3	18.1±0.2	37.0±0.3	9.3±0.8	13±1	5±1	4.28±0.07	0.99999998
		h	398±39	τ_i (yr)	5.7±0.1	28.6±0.6	152±3	420±20	3600±200	7800±800	103000±1000	
5000GtC	Globavg	b	279.9±0.4	w_i (%)	7.1±0.3	11.2±0.2	45.3±0.2	29.8±0.3	1.3±0.5	5.3±0.2		0.9999992
		h	2170±217	τ_i (yr)	11.1±0.6	79±3	642±5	5110±100	20000±8000	147000±4000		
5000GtC	GKWM	b	279.1±0.1	w_i (%)	3.6±0.4	6.2±0.3	9.9±0.2	44.6±0.1	24.9±0.4	5.7±0.7	4.94±0.04	0.99999993
		h	2170±217	τ_i (yr)	6.5±0.6	24±2	105±3	632±3	3220±60	8300±500	108200±800	
5000GtC	GEM-CO2	b	279.17±0.09	w_i (%)	3.8±0.4	6.3±0.2	9.6±0.2	44.94±0.09	22.3±0.5	8.2±0.8	4.75±0.04	0.99999995
		h	2170±217	τ_i (yr)	6.8±0.5	26±2	107±3	616±4	2740±70	6700±300	101200±600	

variables				fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	f_Ca	f_Si	Scheme		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	on	on	Globavg	b	278.41±0.03	w_i (%)	12.6±0.3	17.5±0.2	36.5±0.3	10.0±0.8	10.1±0.9	8±1	5.42±0.06	0.99999997
				h	400±40	τ_i (yr)	5.7±0.1	28.9±0.7	155±3	440±20	3700±200	8400±400	178000±1000	
1000GtC	on	on	GKWM	b	278.37±0.04	w_i (%)	13.1±0.3	18.0±0.2	37.1±0.2	9.2±0.7	12±1	6±1	4.51±0.06	0.99999998
				h	399±39	τ_i (yr)	5.7±0.1	28.7±0.6	153±2	430±20	3600±200	7800±600	109000±1000	
1000GtC	on	off	Globavg	b	306.50±0.03	w_i (%)	6±6	10±4	17.2±1	38.1±0.6	10.4±0.9	9.4±0.5	8.8±0.6	0.99999999
				h	372±37	τ_i (yr)	4±2	9±3	33±2	159±4	440±20	3800±100	9900±300	
1000GtC	on	off	GKWM	b	403±403	w_i (%)	12.3±0.2	17.1±0.1	34.2±0.3	11.6±0.8	7.7±0.3	9.4±0.4	7.8±0.3	0.99999998
				h	403±40	τ_i (yr)	5.7±0.1	28.6±0.6	152±3	410±10	3600±100	9900±200	2000000±100000	
1000GtC	off	on	Globavg	b	278.61±0.02	w_i (%)	12.6±0.2	17.5±0.1	36.3±0.3	10.0±0.7	9.7±0.6	8.2±0.7	5.64±0.04	0.99999998
				h	400±40	τ_i (yr)	5.7±0.1	29.0±0.6	155±2	430±20	3700±200	8900±300	169900±900	
1000GtC	off	on	GKWM	b	278.37±0.04	w_i (%)	13.0±0.2	17.9±0.2	37.1±0.2	9.3±0.7	12.1±1	6±1	4.64±0.06	0.99999998
				h	399±39	τ_i (yr)	5.7±0.1	28.8±0.6	154±2	440±20	3700±200	8100±600	106000±1000	
1000GtC	off	off	Globavg	b	308.31±0.04	w_i (%)	13.6±0.3	18.9±0.2	37.5±0.5	12±1	8.7±0.4	9.4±0.6		0.99999998
				h	370±37	τ_i (yr)	5.7±0.1	28.7±0.8	153±3	410±20	3800±200	10200±300		
1000GtC	off	off	GKWM	b	308.69±0.04	w_i (%)	13.2±0.3	18.5±0.2	36.8±0.5	13±1	7.4±0.3	10.9±0.4		0.99999997
				h	370±37	τ_i (yr)	5.7±0.2	28.6±0.8	151±4	410±20	3600±200	11200±200		
5000GtC	on	on	Globavg	b	279.8±0.5	w_i (%)	7.2±0.2	11.3±0.2	44.8±0.2	29.6±0.3	1.3±0.5	5.7±0.1		0.9999992
				h	2170±217	τ_i (yr)	11.3±0.6	82±3	648±5	5230±100	20000±8000	176000±5000		
5000GtC	on	on	GKWM	b	279.1±0.1	w_i (%)	3.7±0.5	6.3±0.3	9.8±0.2	44.6±0.2	24.7±0.5	5.9±0.8	4.97±0.05	0.99999992
				h	2170±217	τ_i (yr)	6.6±0.6	25±2	107±4	631±4	3220±80	8000±500	107200±900	
5000GtC	on	off	Globavg	b	465.3±0.4	w_i (%)	8.0±0.4	13.2±0.3	47.0±0.1	31.8±0.1				0.999999
				h	1987±198	τ_i (yr)	11.5±0.9	86±4	685±6	8520±50				
5000GtC	on	off	GKWM	b	1990±1990	w_i (%)	17±1	49.8±0.7	33.1±0.8					0.9998
				h	1990±199	τ_i (yr)	43±7	660±30	11600±500					
5000GtC	off	on	Globavg	b	280.8±0.5	w_i (%)	7.4±0.3	11.6±0.2	44.60±0.09	30.1±0.1	6.26±0.04			0.999999
				h	2171±217	τ_i (yr)	11.6±0.7	86±4	667±5	6090±40	156000±3000			
5000GtC	off	on	GKWM	b	279.3±0.2	w_i (%)	3.6±0.7	6.2±0.4	10.0±0.3	44.5±0.3	25.2±0.9	5±1	5.19±0.09	0.9999998
				h	2170±217	τ_i (yr)	6.5±0.9	24±3	105±5	637±5	3500±100	8300±900	98000±1000	
5000GtC	off	off	Globavg	b	1480±1480	w_i (%)	100.0±0.4							0.99
				h	1480±148	τ_i (yr)	1900±200							
5000GtC	off	off	GKWM	b	1980±1980	w_i (%)	7±2	13±1	48.0±0.4	32.1±0.4				0.99998
				h	1980±198	τ_i (yr)	10±4	70±20	670±20	15500±400				

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	routing		pCO$_2$ (ppm)	i	1	2	3	4	5	6	R^2
1000GtC	1	b	315.96±0.07	w_i (%)	13.2±0.5	19.0±0.3	36.0±0.9	15±2	9.0±0.9	8±1	0.99999995
		h	365±36	τ_i (yr)	5.8±0.2	29±1	152±6	390±20	4700±300	11900±700	
1000GtC	2	b	316.02±0.07	w_i (%)	13.2±0.5	19.0±0.3	35.9±0.9	15±2	8.7±0.9	8±1	0.99999995
		h	364±36	τ_i (yr)	5.8±0.2	29±1	151±6	390±20	4600±300	11600±700	
1000GtC	3	b	336.86±0.09	w_i (%)	13.8±0.4	19.9±0.2	39.5±0.4	14±1	12.5±0.1		0.99999997
		h	347±34	τ_i (yr)	5.9±0.2	29.9±1	158±4	440±20	6140±50		
5000GtC	1	b	1970±1970	w_i (%)	7±2	13±1	48.7±0.3	31.5±0.3			0.99999
		h	1970±197	τ_i (yr)	11±3	70±10	680±20	13500±200			
5000GtC	2	b	1970±1970	w_i (%)	7±2	13±1	48.7±0.3	31.4±0.3			0.99999
		h	1970±197	τ_i (yr)	11±3	80±10	680±10	13300±200			
5000GtC	3	b	1940±1940	w_i (%)	17.0±0.8	51.3±0.3	31.7±0.4				0.99997
		h	1940±194	τ_i (yr)	44±4	670±20	19100±800				

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$										
emis.	lith.		pCO$_2$ (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	GKWM	b	278.35±0.04	w_i (%)	13.1±0.2	17.9±0.2	37.2±0.2	9.2±0.7	12.3±1	6±1	4.55±0.06	0.99999998
		h	399±39	τ_i (yr)	5.7±0.1	28.8±0.6	153±2	440±20	3600±200	8000±600	112000±1000	
1000GtC	GEM-CO2	b	278.37±0.04	w_i (%)	13.1±0.3	18.0±0.2	37.2±0.2	9.2±0.7	12±1	6±1	4.51±0.06	0.99999998
		h	399±39	τ_i (yr)	5.7±0.1	28.7±0.6	153±2	440±20	3600±200	7800±700	109000±1000	
1000GtC	GKWM av.	b	277.40±0.04	w_i (%)	12.8±0.4	17.7±0.3	37.2±0.3	9±1	14.1±0.8	4.1±1	4.84±0.09	0.99999994
		h	400±40	τ_i (yr)	5.7±0.2	29±1	155±4	460±30	4100±200	11000±1000	133000±2000	
1000GtC	GEM-CO2 av.	b	277.43±0.03	w_i (%)	12.3±0.3	17.1±0.2	35.2±0.4	11±1	8.9±0.8	9.5±0.9	5.64±0.06	0.99999997
		h	401±40	τ_i (yr)	5.7±0.2	28.7±0.9	152±3	420±20	3600±200	8700±400	165000±1000	
1000GtC	mono acid	b	278.40±0.04	w_i (%)	12.5±0.2	17.3±0.2	36.4±0.2	10.4±0.7	11.8±0.9	7±1	4.59±0.05	0.99999998
		h	400±40	τ_i (yr)	5.7±0.1	28.8±0.6	153±2	430±20	3700±200	8300±500	105000±1000	
1000GtC	mono basalt	b	278.44±0.05	w_i (%)	13.1±0.3	18.0±0.2	37.2±0.3	9.6±0.9	14±1	4±1	3.56±0.09	0.99999998
		h	398±39	τ_i (yr)	5.7±0.1	28.3±0.7	150±3	410±20	3600±200	8000±1000	75000±2000	
1000GtC	mono carb	b	277.55±0.04	w_i (%)	14.7±0.4	19.4±0.2	31±1	15±2	7±3	9±3	4.59±0.07	0.99999996
		h	395±39	τ_i (yr)	5.6±0.1	27.2±0.9	133±6	300±20	4100±600	7200±700	229000±2000	
1000GtC	mono granite	b	278.40±0.04	w_i (%)	12.5±0.2	17.3±0.2	36.4±0.2	10.4±0.7	11.9±0.9	7±1	4.58±0.06	0.99999998
		h	400±40	τ_i (yr)	5.7±0.1	28.8±0.6	153±2	430±20	3700±200	8400±500	105000±1000	
1000GtC	mono sand	b	277.64±0.08	w_i (%)	11.2±0.4	15.9±0.2	31.5±0.6	17±1	2.7±0.2	15.2±0.3	6.67±0.04	0.99999996
		h	403±40	τ_i (yr)	5.6±0.2	27.5±1	142±4	380±10	3800±400	13300±200	339000±3000	
1000GtC	mono shale	b	278.57±0.06	w_i (%)	6±10	11±8	18±1	36±1	10±2	16.7±0.5	2.61±0.08	0.99999996
		h	390±39	τ_i (yr)	4±3	9±5	31±3	144±6	350±20	4230±20	60000±2000	
1000GtC	mono shield	b	278.40±0.04	w_i (%)	12.5±0.2	17.3±0.2	36.4±0.2	10.4±0.7	11.9±0.9	7±1	4.58±0.06	0.99999998
		h	400±40	τ_i (yr)	5.7±0.1	28.8±0.6	153±2	430±20	3700±200	8400±500	105000±1000	

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	lith.		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
5000GtC	GKWM	b	279.2±0.1	w_i (%)	3.7±0.5	6.3±0.3	10.0±0.2	44.5±0.2	25.2±0.5	5.4±0.7	4.98±0.05	0.99999992
		h	2170±217	τ_i (yr)	6.6±0.6	25±2	108±4	638±4	3320±70	8500±600	110200±900	
5000GtC	GEM-CO2	b	279.0±0.3	w_i (%)	7.6±0.2	11.2±0.2	44.6±0.4	23±2	9±3	5.1±0.1		0.9999995
		h	2170±217	τ_i (yr)	11.7±0.5	83±3	610±8	2900±200	6800±800	105000±2000		
5000GtC	GKWM av.	b	278.8±0.3	w_i (%)	7.5±0.2	11.4±0.2	44.9±0.4	27.3±1	4±2	5.2±0.1		0.9999994
		h	2170±217	τ_i (yr)	11.5±0.5	83±3	637±6	4000±200	11000±2000	124000±3000		
5000GtC	GEM-CO2 av.	b	279.5±0.6	w_i (%)	6.7±0.4	11.3±0.3	45.01±0.1	31.1±0.1	5.90±0.05			0.999998
		h	2173±217	τ_i (yr)	10.7±0.9	76±4	646±5	6470±50	155000±3000			
5000GtC	mono acid	b	279.1±0.3	w_i (%)	7.0±0.3	11.1±0.2	46.1±0.2	29.3±0.5	1.8±0.7	4.7±0.2		0.9999992
		h	2170±217	τ_i (yr)	11.1±0.6	79±3	634±5	4600±100	16000±6000	106000±4000		
5000GtC	mono basalt	b	279.22±0.1	w_i (%)	3.6±0.4	6.0±0.2	9.3±0.2	47.34±0.09	22.4±0.4	7.4±0.7	3.93±0.04	0.99999996
		h	2169±216	τ_i (yr)	6.6±0.5	24±2	97±3	594±3	2590±60	6300±300	74700±600	
5000GtC	mono carb	b	279.1±0.2	w_i (%)	3.8±0.7	6.5±0.4	9.1±0.4	45.1±0.1	19.0±0.2	11.7±0.5	4.71±0.02	0.9999999
		h	2144±214	τ_i (yr)	5.7±0.8	22±3	84±5	517±5	2120±60	6900±100	230000±2000	
5000GtC	mono granite	b	279.1±0.3	w_i (%)	7.0±0.3	11.1±0.2	46.1±0.2	29.3±0.5	1.8±0.7	4.7±0.2		0.9999992
		h	2170±217	τ_i (yr)	11.1±0.6	79±3	634±5	4600±100	16000±6000	106000±4000		
5000GtC	mono sand	b	2170±2170	w_i (%)	13.5±0.6	44.8±0.3	35.5±0.3	6.3±0.4				0.99996
		h	2170±217	τ_i (yr)	34±3	570±10	16600±400	430000±80000				
5000GtC	mono shale	b	279.0±0.3	w_i (%)	6.5±0.2	10.1±0.2	53.8±0.1	17.7±0.8	9±1	2.61±0.06		0.9999997
		h	2150±215	τ_i (yr)	8.8±0.4	53±1	479±4	2000±100	5300±300	71000±2000		
5000GtC	mono shield	b	279.1±0.3	w_i (%)	7.0±0.3	11.1±0.2	46.1±0.2	29.3±0.5	1.8±0.7	4.7±0.2		0.9999992
		h	2170±217	τ_i (yr)	11.1±0.6	79±3	634±5	4600±100	16000±6000	106000±4000		

variables		fit to $pCO_2(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$									
emis.	clim. sens.		pCO_2 (ppm)	i	1	2	3	4	5	6	7	R^2
1000GtC	1.5	b	277.4±0.1	w_i (%)	11.9±0.3	17.6±0.2	31.2±0.6	15±1	6.5±0.4	10.1±0.5	8.06±0.07	0.99999998
		h	404±40	τ_i (yr)	5.9±0.1	29.7±0.9	146±4	380±20	3200±200	9200±200	353000±3000	
1000GtC	2.64	b	277.4±0.1	w_i (%)	11.8±0.6	17.0±0.3	32±1	15±3	8±2	9±2	7.6±0.1	0.99999990
		h	403±40	τ_i (yr)	5.8±0.3	29±2	147±8	360±30	4100±500	8800±900	227000±3000	
1000GtC	3	b	277.70±0.09	w_i (%)	12.0±0.4	17.0±0.3	33.9±0.6	13±1	12.7±1	4±1	7.4±0.1	0.99999995
		h	403±40	τ_i (yr)	5.8±0.2	29±1	156±5	400±20	5200±200	12000±1000	222000±3000	
1000GtC	4.5	b	277.7±0.1	w_i (%)	12.0±0.7	17.1±0.5	32±2	15±4	17.1±0.5	7.2±0.2		0.9999998
		h	404±40	τ_i (yr)	5.9±0.4	30±2	160±10	370±30	6680±60	166000±3000		
1000GtC	6.	b	277.7±0.2	w_i (%)	12±2	16±2	18±7	29±7	18.4±0.9	6.1±0.3		0.9999994
		h	400±40	τ_i (yr)	5.9±0.8	29±5	130±40	290±30	6900±90	152000±5000		
5000GtC	1.5	b	2180±2180	w_i (%)	6.5±0.6	11.5±0.4	43.8±0.1	30.1±0.1	8.0±0.1			0.999997
		h	2180±218	τ_i (yr)	12±1	75±6	569±6	9100±80	370000±20000			
5000GtC	2.64	b	2172±2172	w_i (%)	6.1±0.6	11.4±0.4	45.2±0.1	30.7±0.2	6.59±0.08			0.999997
		h	2172±217	τ_i (yr)	11±1	74±5	652±7	7180±70	224000±9000			
5000GtC	3	b	2174±2174	w_i (%)	6.0±0.7	11.2±0.5	45.3±0.2	30.9±0.2	6.56±0.1			0.999996
		h	2174±217	τ_i (yr)	11±2	74±7	680±9	6980±90	203000±9000			
5000GtC	4.5	b	2150±2150	w_i (%)	14.0±0.5	47.7±0.4	31.5±0.7	6.8±0.3				0.99997
		h	2150±215	τ_i (yr)	40±3	740±20	6300±200	140000±10000				
5000GtC	6.	b	2160±2160	w_i (%)	13.2±0.7	52.3±0.6	28±1	6.2±0.4				0.99995
		h	2160±216	τ_i (yr)	36±4	840±30	6300±400	120000±20000				

Table 9: **Surface warming** (°C) reached at specific calendar years

variables		**year**								
emis.	short-circ.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	yes	1.010	0.769	0.479	0.306	0.218	0.166	0.098	0.022	0.006
1000GtC	no	1.010	0.760	0.466	0.297	0.212	0.159	0.092	0.021	0.007
5000GtC	yes	5.380	4.060	2.670	1.620	1.160	0.877	0.518	0.119	0.026
5000GtC	no	5.340	3.980	2.550	1.560	1.120	0.839	0.482	0.104	0.025

variables			**year**								
emis.	T_Ca	T_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	1.090	0.892	0.645	0.466	0.364	0.314	0.230	0.073	0.000
1000GtC	on	off	1.110	0.929	0.714	0.545	0.470	0.463	0.459	0.448	0.427
1000GtC	off	on	1.090	0.902	0.666	0.483	0.382	0.331	0.254	0.112	0.020
1000GtC	off	off	1.110	0.935	0.724	0.557	0.481	0.475	0.472	0.465	0.452
5000GtC	on	on	5.590	4.590	3.640	2.430	1.650	1.440	1.140	0.518	0.142
5000GtC	on	off	5.670	4.780	4.090	3.070	2.150	2.100	2.100	2.090	2.070
5000GtC	off	on	5.600	4.620	3.710	2.510	1.670	1.460	1.140	0.516	0.137
5000GtC	off	off	5.680	4.820	4.170	3.200	2.210	2.150	2.140	2.140	2.130

variables		**year**								
emis.	E_a (kJ/mol)	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	45	1.060	0.829	0.563	0.393	0.308	0.272	0.216	0.106	0.030
1000GtC	63	1.040	0.816	0.544	0.372	0.283	0.240	0.174	0.066	0.012
1000GtC	74	1.040	0.810	0.535	0.361	0.272	0.225	0.155	0.052	0.009
1000GtC	103	1.030	0.792	0.508	0.333	0.241	0.188	0.113	0.029	0.007
5000GtC	45	5.560	4.490	3.430	2.290	1.660	1.480	1.190	0.599	0.205
5000GtC	63	5.520	4.400	3.250	2.110	1.520	1.300	0.944	0.376	0.089
5000GtC	74	5.500	4.350	3.160	2.020	1.440	1.200	0.838	0.298	0.064
5000GtC	103	5.430	4.180	2.880	1.770	1.250	0.971	0.604	0.159	0.032

variables				**year**								
emis.	R_Ca	R_Si	R_explicit	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	on	1.110	0.926	0.708	0.538	0.457	0.441	0.419	0.359	0.268
1000GtC	on	on	off	1.100	0.920	0.697	0.524	0.440	0.417	0.383	0.295	0.182
1000GtC	on	off	on	1.110	0.931	0.718	0.550	0.474	0.467	0.462	0.448	0.422
1000GtC	on	off	off	1.110	0.931	0.716	0.547	0.471	0.464	0.460	0.449	0.429
1000GtC	off	on	on	1.110	0.930	0.715	0.543	0.459	0.441	0.415	0.344	0.237
1000GtC	off	on	off	1.100	0.926	0.707	0.533	0.446	0.421	0.383	0.288	0.165
1000GtC	off	off	on	1.110	0.935	0.724	0.557	0.481	0.475	0.472	0.465	0.452
1000GtC	off	off	off	1.110	0.935	0.724	0.557	0.481	0.475	0.472	0.465	0.452
5000GtC	on	on	on	5.660	4.770	4.060	3.010	2.090	1.990	1.910	1.660	1.320
5000GtC	on	on	off	5.650	4.740	3.980	2.880	2.010	1.890	1.730	1.380	0.846
5000GtC	on	off	on	5.670	4.800	4.130	3.130	2.180	2.120	2.110	2.100	2.080
5000GtC	on	off	off	5.670	4.800	4.110	3.090	2.160	2.100	2.100	2.100	2.080
5000GtC	off	on	on	5.670	4.800	4.120	3.100	2.120	2.010	1.920	1.660	1.280
5000GtC	off	on	off	5.670	4.780	4.070	3.020	2.050	1.910	1.750	1.370	0.817
5000GtC	off	off	on	5.680	4.820	4.170	3.200	2.210	2.150	2.140	2.140	2.130
5000GtC	off	off	off	5.680	4.820	4.170	3.200	2.210	2.150	2.140	2.140	2.130

variables		year								
emis.	beta	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.48	1.070	0.856	0.606	0.442	0.369	0.356	0.340	0.293	0.228
1000GtC	0.65	1.070	0.853	0.602	0.438	0.364	0.350	0.329	0.273	0.199
1000GtC	0.8	1.070	0.852	0.600	0.436	0.360	0.344	0.319	0.255	0.175
1000GtC	1.12	1.070	0.849	0.595	0.430	0.352	0.332	0.301	0.222	0.133
5000GtC	0.48	5.620	4.660	3.800	2.730	2.030	1.970	1.870	1.670	1.370
5000GtC	0.65	5.620	4.650	3.770	2.690	2.010	1.930	1.820	1.560	-
5000GtC	0.8	5.620	4.640	3.750	2.670	1.980	1.880	1.770	1.460	-
5000GtC	1.12	5.610	4.630	3.720	2.610	1.940	1.820	1.660	1.270	0.796

variables		year								
emis.	k_run	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.012	1.070	0.859	0.611	0.448	0.374	0.363	0.348	0.306	0.245
1000GtC	0.024	1.070	0.853	0.602	0.438	0.361	0.344	0.317	0.247	0.159
1000GtC	0.028	1.070	0.852	0.601	0.436	0.359	0.342	0.315	0.246	0.160
1000GtC	0.045	1.070	0.845	0.589	0.423	0.343	0.318	0.279	0.186	0.089
5000GtC	0.012	5.630	4.680	3.830	2.780	2.070	2.000	1.940	1.750	1.480
5000GtC	0.024	5.620	4.640	3.760	2.670	1.990	1.890	1.760	1.460	1.030
5000GtC	0.028	5.610	4.630	3.730	2.640	1.970	1.860	1.730	1.400	0.947
5000GtC	0.045	5.590	4.590	3.630	2.520	1.860	1.740	1.560	1.110	0.598

variables			year								
emis.	P_Ca	P_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	1.100	0.911	0.683	0.504	0.413	0.379	0.324	0.195	0.070
1000GtC	on	off	1.110	0.927	0.712	0.544	0.470	0.464	0.461	0.452	0.436
1000GtC	off	on	1.100	0.918	0.694	0.516	0.423	0.387	0.331	0.205	0.077
1000GtC	off	off	1.110	0.935	0.724	0.557	0.481	0.475	0.472	0.465	0.452
5000GtC	on	on	5.650	4.730	3.940	2.810	1.910	1.740	1.540	1.010	0.400
5000GtC	on	off	5.670	4.790	4.100	3.070	2.160	2.100	2.100	2.090	2.070
5000GtC	off	on	5.660	4.760	4.020	2.920	1.960	1.770	1.560	1.010	0.396
5000GtC	off	off	5.680	4.820	4.170	3.200	2.210	2.150	2.140	2.140	2.130

variables			year								
emis.	f_Ca	f_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	1.070	0.861	0.596	0.415	0.313	0.251	0.165	0.043	0.000
1000GtC	on	off	1.100	0.918	0.696	0.527	0.455	0.450	0.446	0.437	0.422
1000GtC	off	on	1.080	0.876	0.617	0.434	0.323	0.256	0.163	0.039	0.000
1000GtC	off	off	1.110	0.935	0.724	0.557	0.481	0.475	0.472	0.465	0.451
5000GtC	on	on	5.510	4.370	3.190	1.980	1.370	1.120	0.749	0.227	0.038
5000GtC	on	off	5.650	4.720	3.930	2.840	2.070	2.040	2.040	2.030	2.020
5000GtC	off	on	5.540	4.460	3.370	2.130	1.400	1.130	0.738	0.215	0.032
5000GtC	off	off	5.680	4.820	4.170	3.200	2.210	2.150	2.140	2.140	2.130

variables		year								
emis.	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	Globavg	1.020	0.770	0.473	0.297	0.204	0.147	0.079	0.017	0.007
1000GtC	GKWM	0.959	0.697	0.394	0.235	0.155	0.100	0.042	0.006	0.003
1000GtC	GEM-CO2	0.939	0.673	0.373	0.220	0.144	0.090	0.037	0.005	0.004
5000GtC	Globavg	5.360	4.020	2.590	1.530	1.040	0.751	0.401	0.075	0.023
5000GtC	GKWM	5.130	3.540	2.050	1.250	0.848	0.547	0.234	0.027	0.012
5000GtC	GEM-CO2	5.040	3.380	1.890	1.170	0.793	0.500	0.198	0.023	0.011

variables				year								
emis.	f_Ca	f_Si	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	Globavg	1.010	0.769	0.479	0.306	0.218	0.166	0.098	0.021	0.006
1000GtC	on	on	GKWM	0.959	0.697	0.394	0.235	0.155	0.100	0.042	0.006	0.003
1000GtC	on	off	Globavg	1.070	0.843	0.589	0.428	0.363	0.358	0.355	0.345	0.328
1000GtC	on	off	GKWM	1.080	0.861	0.608	0.438	0.359	0.346	0.328	0.278	0.209
1000GtC	off	on	Globavg	1.030	0.789	0.503	0.324	0.228	0.171	0.099	0.022	0.007
1000GtC	off	on	GKWM	0.971	0.711	0.408	0.244	0.157	0.100	0.041	0.006	0.003
1000GtC	off	off	Globavg	1.080	0.863	0.619	0.457	0.386	0.380	0.376	0.365	0.345
1000GtC	off	off	GKWM	1.100	0.892	0.658	0.485	0.393	0.385	0.380	0.367	0.345
5000GtC	on	on	Globavg	5.380	4.060	2.670	1.620	1.160	0.877	0.518	0.119	0.025
5000GtC	on	on	GKWM	5.130	3.540	2.050	1.250	0.848	0.547	0.227	0.026	0.012
5000GtC	on	off	Globavg	5.590	4.580	3.610	2.540	2.000	1.970	1.970	1.960	1.950
5000GtC	on	off	GKWM	5.640	4.700	3.860	2.730	1.970	1.880	1.800	1.600	1.290
5000GtC	off	on	Globavg	5.430	4.180	2.860	1.730	1.190	0.887	0.511	0.111	0.026
5000GtC	off	on	GKWM	5.180	3.630	2.140	1.290	0.856	0.525	0.204	0.023	0.012
5000GtC	off	off	Globavg	5.640	4.700	3.900	2.870	2.140	2.100	2.100	2.090	2.070
5000GtC	off	off	GKWM	5.710	4.900	4.320	3.400	2.240	2.130	2.130	2.130	2.120

variables		year								
emis.	routing	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1	1.110	0.936	0.725	0.558	0.481	0.474	0.471	0.462	0.446
1000GtC	2	1.110	0.935	0.724	0.557	0.481	0.475	0.472	0.465	0.452
1000GtC	3	1.150	1.020	0.840	0.734	0.745	0.879	1.140	1.960	3.270
5000GtC	1	5.680	4.830	4.190	3.220	2.220	2.150	2.140	2.140	2.120
5000GtC	2	5.680	4.820	4.170	3.200	2.210	2.150	2.140	2.140	2.130
5000GtC	3	5.730	4.960	4.480	3.710	2.550	2.510	2.750	3.500	4.610

variables		year								
emis.	lith.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	GKWM	0.963	0.701	0.398	0.239	0.157	0.102	0.044	0.006	0.003
1000GtC	GEM-CO2	0.959	0.697	0.394	0.235	0.155	0.100	0.042	0.006	-
1000GtC	GKWM av.	0.986	0.730	0.427	0.257	0.169	0.112	0.048	0.000	0.000
1000GtC	GEM-CO2 av.	1.040	0.796	0.504	0.316	0.212	0.155	0.081	0.007	0.000
1000GtC	mono acid	1.000	0.737	0.426	0.249	0.156	0.098	0.040	0.006	0.004
1000GtC	mono basalt	0.919	0.630	0.323	0.175	0.103	0.055	0.018	0.005	0.005
1000GtC	mono carb	0.864	0.663	0.409	0.250	0.184	0.148	0.093	0.020	0.000
1000GtC	mono granite	1.000	0.737	0.426	0.249	0.156	0.098	0.040	0.006	0.004
1000GtC	mono sand	1.140	0.961	0.747	0.511	0.313	0.253	0.188	0.076	0.012
1000GtC	mono shale	0.809	0.547	0.256	0.119	0.067	0.034	0.011	0.005	0.005
1000GtC	mono shield	1.000	0.737	0.426	0.249	0.156	0.098	0.040	0.006	0.004
5000GtC	GKWM	5.150	3.570	2.080	1.270	0.862	0.560	0.244	0.029	0.012
5000GtC	GEM-CO2	5.130	3.540	2.050	1.250	0.848	0.547	0.219	0.025	0.012
5000GtC	GKWM av.	5.260	3.790	2.300	1.370	0.931	0.633	0.302	0.036	0.009
5000GtC	GEM-CO2 av.	5.450	4.240	2.940	1.710	1.130	0.835	0.460	0.089	0.012
5000GtC	mono acid	5.270	3.830	2.320	1.300	0.819	0.517	0.215	0.025	0.013
5000GtC	mono basalt	4.910	3.150	1.630	0.932	0.569	0.307	0.094	0.015	0.013
5000GtC	mono carb	4.790	3.260	2.000	1.310	0.984	0.816	0.540	0.166	0.024
5000GtC	mono granite	5.270	3.830	2.320	1.300	0.819	0.517	0.215	0.025	0.013
5000GtC	mono sand	5.740	5.050	4.440	3.310	1.630	1.260	0.940	0.397	0.095
5000GtC	mono shale	4.360	2.580	1.230	0.630	0.373	0.195	0.056	0.014	0.014
5000GtC	mono shield	5.270	3.830	2.320	1.300	0.819	0.517	0.215	0.025	0.013

variables		year								
emis.	clim. sens.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1.5	0.608	0.491	0.357	0.260	0.204	0.176	0.133	0.054	0.008
1000GtC	2.64	1.070	0.861	0.596	0.415	0.313	0.251	0.162	0.040	0.000
1000GtC	3	1.220	1.010	0.681	0.467	0.348	0.275	0.175	0.043	0.000
1000GtC	4.5	1.810	1.530	1.060	0.660	0.461	0.341	0.188	0.027	0.001
1000GtC	6.	2.360	2.020	1.350	0.774	0.499	0.351	0.182	0.019	0.000
5000GtC	1.5	3.120	2.600	2.080	1.390	0.948	0.828	0.640	0.293	0.055
5000GtC	2.64	5.510	4.370	3.200	1.980	1.370	1.120	0.748	0.234	0.041
5000GtC	3	6.310	4.970	3.580	2.200	1.510	1.210	0.772	0.208	0.020
5000GtC	4.5	9.800	7.520	5.180	3.070	2.090	1.510	0.773	0.121	0.001
5000GtC	6.	15.100	10.100	6.500	3.720	2.460	1.610	0.756	0.091	0.002

Table 10: **Percentages** of remaining excess **Surface warming** reached at specific calendar years

variables		year								
emis.	short-circ.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	yes	56.4	42.8	26.7	17.0	12.1	9.2	5.5	1.2	0.3
1000GtC	no	56.2	42.4	26.0	16.6	11.8	8.9	5.1	1.2	0.4
5000GtC	yes	85.2	64.3	42.3	25.6	18.3	13.9	8.2	1.9	0.4
5000GtC	no	84.8	63.1	40.5	24.7	17.8	13.3	7.6	1.7	0.4

variables			year								
emis.	T_Ca	T_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	60.9	49.9	36.1	26.1	20.4	17.6	12.9	4.1	0.0
1000GtC	on	off	61.9	52.0	39.9	30.5	26.3	25.9	25.7	25.1	23.9
1000GtC	off	on	61.2	50.5	37.3	27.0	21.4	18.5	14.2	6.3	1.1
1000GtC	off	off	62.0	52.3	40.5	31.2	26.9	26.6	26.4	26.0	25.3
5000GtC	on	on	88.0	72.1	57.2	38.2	25.9	22.7	17.9	8.1	2.2
5000GtC	on	off	89.0	75.1	64.3	48.1	33.8	33.0	32.9	32.8	32.5
5000GtC	off	on	88.1	72.6	58.3	39.5	26.3	22.9	17.9	8.1	2.2
5000GtC	off	off	89.2	75.6	65.5	50.2	34.7	33.7	33.6	33.5	33.4

variables		year								
emis.	E_a (kJ/mol)	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	45	59.0	46.1	31.3	21.9	17.1	15.1	12.0	5.9	1.7
1000GtC	63	58.0	45.4	30.3	20.7	15.7	13.4	9.7	3.7	0.7
1000GtC	74	57.8	45.1	29.8	20.1	15.1	12.5	8.6	2.9	0.5
1000GtC	103	57.2	44.1	28.3	18.5	13.4	10.5	6.3	1.6	0.4
5000GtC	45	87.7	70.9	54.1	36.1	26.2	23.3	18.8	9.4	3.2
5000GtC	63	87.2	69.5	51.3	33.4	24.0	20.4	14.9	5.9	1.4
5000GtC	74	86.9	68.7	49.9	32.0	22.8	19.0	13.2	4.7	1.0
5000GtC	103	85.8	66.1	45.5	28.0	19.8	15.4	9.6	2.5	0.5

variables				year								
emis.	R_Ca	R_Si	R_explicit	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	on	61.8	51.8	39.6	30.1	25.6	24.7	23.4	20.1	15.0
1000GtC	on	on	off	61.6	51.5	39.0	29.3	24.6	23.3	21.4	16.5	10.2
1000GtC	on	off	on	61.9	52.1	40.2	30.8	26.5	26.1	25.8	25.1	23.6
1000GtC	on	off	off	61.9	52.0	40.0	30.6	26.3	25.9	25.7	25.1	24.0
1000GtC	off	on	on	61.9	52.0	40.0	30.4	25.7	24.7	23.2	19.2	13.2
1000GtC	off	on	off	61.7	51.8	39.5	29.8	24.9	23.5	21.4	16.1	9.2
1000GtC	off	off	on	62.0	52.3	40.5	31.2	26.9	26.6	26.4	26.0	25.3
1000GtC	off	off	off	62.0	52.3	40.5	31.2	26.9	26.6	26.4	26.0	25.3
5000GtC	on	on	on	88.9	74.9	63.8	47.3	32.8	31.3	29.9	26.1	20.7
5000GtC	on	on	off	88.8	74.5	62.5	45.3	31.5	29.7	27.3	21.7	13.3
5000GtC	on	off	on	89.0	75.3	64.8	49.1	34.2	33.3	33.2	33.0	32.6
5000GtC	on	off	off	89.0	75.3	64.6	48.5	34.0	33.0	33.0	32.9	32.7
5000GtC	off	on	on	89.0	75.3	64.7	48.7	33.2	31.6	30.1	26.1	20.1
5000GtC	off	on	off	88.9	75.0	63.9	47.3	32.2	30.1	27.5	21.5	12.8
5000GtC	off	off	on	89.2	75.6	65.5	50.2	34.7	33.7	33.6	33.5	33.4
5000GtC	off	off	off	89.2	75.6	65.5	50.2	34.7	33.7	33.6	33.5	33.4

variables		year								
emis.	beta	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.48	59.7	47.6	33.7	24.6	20.5	19.8	18.9	16.3	12.7
1000GtC	0.65	59.6	47.4	33.5	24.3	20.2	19.5	18.3	15.2	11.1
1000GtC	0.8	59.6	47.4	33.4	24.2	20.0	19.1	17.7	14.2	9.7
1000GtC	1.12	59.5	47.2	33.1	23.9	19.6	18.5	16.7	12.3	7.4
5000GtC	0.48	88.5	73.3	59.7	42.9	32.0	31.0	29.4	26.3	21.5
5000GtC	0.65	88.5	73.3	59.3	42.3	31.6	30.4	28.6	24.5	-
5000GtC	0.8	88.4	73.1	59.1	42.0	31.2	29.6	27.8	22.9	-
5000GtC	1.12	88.3	72.8	58.5	41.2	30.5	28.6	26.1	20.0	12.5

variables		year								
emis.	k_run	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.012	59.8	47.7	34.0	24.9	20.8	20.2	19.3	17.0	13.6
1000GtC	0.024	59.6	47.4	33.5	24.3	20.1	19.1	17.6	13.7	8.8
1000GtC	0.028	59.6	47.4	33.4	24.2	20.0	19.0	17.5	13.7	8.9
1000GtC	0.045	59.4	47.0	32.8	23.5	19.1	17.7	15.5	10.3	4.9
5000GtC	0.012	88.6	73.6	60.4	43.7	32.6	31.6	30.6	27.5	23.3
5000GtC	0.024	88.4	73.1	59.2	42.1	31.3	29.7	27.7	23.0	16.2
5000GtC	0.028	88.3	72.9	58.7	41.6	31.0	29.3	27.3	22.0	14.9
5000GtC	0.045	88.1	72.3	57.2	39.7	29.3	27.4	24.5	17.4	9.4

variables			year								
emis.	P_Ca	P_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	61.4	51.0	38.2	28.2	23.1	21.2	18.1	10.9	3.9
1000GtC	on	off	61.8	51.8	39.8	30.4	26.3	26.0	25.8	25.3	24.4
1000GtC	off	on	61.6	51.3	38.8	28.9	23.7	21.6	18.5	11.5	4.3
1000GtC	off	off	62.0	52.3	40.5	31.2	26.9	26.6	26.4	26.0	25.3
5000GtC	on	on	88.7	74.3	62.0	44.1	30.1	27.4	24.2	15.8	6.3
5000GtC	on	off	89.0	75.1	64.3	48.2	33.8	33.0	32.9	32.8	32.6
5000GtC	off	on	88.8	74.7	63.1	45.8	30.7	27.8	24.5	15.9	6.2
5000GtC	off	off	89.2	75.6	65.5	50.2	34.7	33.7	33.6	33.5	33.4

variables			year								
emis.	f_Ca	f_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	60.0	48.2	33.4	23.2	17.5	14.1	9.2	2.4	0.0
1000GtC	on	off	61.6	51.3	38.9	29.5	25.4	25.2	24.9	24.4	23.6
1000GtC	off	on	60.4	49.0	34.5	24.3	18.1	14.3	9.1	2.2	0.0
1000GtC	off	off	62.0	52.3	40.5	31.2	26.9	26.6	26.4	26.0	25.2
5000GtC	on	on	86.8	68.9	50.3	31.2	21.5	17.6	11.8	3.6	0.6
5000GtC	on	off	88.7	74.2	61.8	44.6	32.6	32.1	32.0	31.9	31.7
5000GtC	off	on	87.3	70.2	53.0	33.5	22.1	17.8	11.6	3.4	0.5
5000GtC	off	off	89.2	75.6	65.5	50.2	34.7	33.7	33.6	33.5	33.3

variables		year								
emis.	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	Globavg	56.6	42.7	26.2	16.5	11.3	8.2	4.4	0.9	0.4
1000GtC	GKWM	54.2	39.4	22.3	13.3	8.8	5.6	2.4	0.3	0.2
1000GtC	GEM-CO2	53.4	38.3	21.2	12.5	8.2	5.1	2.1	0.3	0.2
5000GtC	Globavg	84.8	63.6	41.0	24.2	16.4	11.9	6.3	1.2	0.4
5000GtC	GKWM	82.1	56.6	32.8	20.0	13.6	8.7	3.7	0.4	0.2
5000GtC	GEM-CO2	80.9	54.2	30.4	18.8	12.7	8.0	3.2	0.4	0.2

variables				year								
emis.	f_Ca	f_Si	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	Globavg	56.4	42.8	26.7	17.0	12.1	9.2	5.5	1.2	0.3
1000GtC	on	on	GKWM	54.2	39.4	22.3	13.3	8.8	5.6	2.4	0.3	0.2
1000GtC	on	off	Globavg	59.3	46.9	32.8	23.8	20.2	19.9	19.7	19.2	18.2
1000GtC	on	off	GKWM	59.9	47.6	33.6	24.2	19.9	19.1	18.1	15.4	11.6
1000GtC	off	on	Globavg	57.1	43.9	28.0	18.0	12.7	9.5	5.5	1.2	0.4
1000GtC	off	on	GKWM	54.7	40.1	23.0	13.7	8.8	5.6	2.3	0.3	0.2
1000GtC	off	off	Globavg	59.9	48.0	34.4	25.4	21.5	21.1	20.9	20.3	19.2
1000GtC	off	off	GKWM	60.6	49.1	36.2	26.7	21.6	21.2	20.9	20.2	19.0
5000GtC	on	on	Globavg	85.2	64.3	42.3	25.6	18.3	13.9	8.2	1.9	0.4
5000GtC	on	on	GKWM	82.1	56.6	32.8	20.0	13.6	8.7	3.6	0.4	0.2
5000GtC	on	off	Globavg	88.1	72.1	56.9	40.0	31.5	31.1	31.0	30.9	30.7
5000GtC	on	off	GKWM	88.5	73.9	60.6	42.9	30.9	29.5	28.3	25.1	20.3
5000GtC	off	on	Globavg	85.9	66.1	45.3	27.4	18.8	14.0	8.1	1.8	0.4
5000GtC	off	on	GKWM	82.7	58.0	34.1	20.6	13.7	8.4	3.3	0.4	0.2
5000GtC	off	off	Globavg	88.7	74.0	61.3	45.1	33.7	33.1	33.0	32.9	32.6
5000GtC	off	off	GKWM	89.4	76.9	67.8	53.4	35.0	33.4	33.4	33.4	33.2

variables		year								
emis.	routing	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1	62.0	52.3	40.5	31.2	26.9	26.5	26.3	25.8	24.9
1000GtC	2	62.0	52.3	40.5	31.2	26.9	26.6	26.4	26.0	25.3
1000GtC	3	63.7	56.3	46.6	40.7	41.3	48.7	63.4	109.0	181.0
5000GtC	1	89.2	75.8	65.8	50.6	34.8	33.7	33.6	33.5	33.3
5000GtC	2	89.2	75.6	65.5	50.2	34.7	33.7	33.6	33.5	33.4
5000GtC	3	89.8	77.7	70.2	58.1	39.9	39.3	43.1	54.9	72.2

variables		year								
emis.	lith.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	GKWM	54.3	39.6	22.5	13.5	8.9	5.8	2.5	0.3	0.2
1000GtC	GEM-CO2	54.2	39.4	22.3	13.3	8.8	5.6	2.4	0.3	-
1000GtC	GKWM av.	55.3	40.9	23.9	14.4	9.5	6.3	2.7	-0.1	-0.1
1000GtC	GEM-CO2 av.	57.5	44.1	27.9	17.5	11.7	8.6	4.5	0.4	-0.1
1000GtC	mono acid	55.7	41.0	23.7	13.9	8.7	5.5	2.2	0.3	0.2
1000GtC	mono basalt	52.2	35.8	18.4	9.9	5.9	3.1	1.0	0.3	0.3
1000GtC	mono carb	51.2	39.3	24.2	14.8	10.9	8.8	5.5	1.2	-0.1
1000GtC	mono granite	55.7	41.0	23.7	13.9	8.7	5.5	2.2	0.3	0.2
1000GtC	mono sand	61.7	52.0	40.4	27.6	16.9	13.7	10.2	4.1	0.6
1000GtC	mono shale	47.8	32.3	15.1	7.0	4.0	2.0	0.7	0.3	0.3
1000GtC	mono shield	55.7	41.0	23.7	13.9	8.7	5.5	2.2	0.3	0.2
5000GtC	GKWM	82.3	57.0	33.2	20.3	13.8	8.9	3.9	0.5	0.2
5000GtC	GEM-CO2	82.1	56.6	32.8	20.0	13.6	8.7	3.5	0.4	0.2
5000GtC	GKWM av.	83.7	60.3	36.6	21.8	14.8	10.1	4.8	0.6	0.1
5000GtC	GEM-CO2 av.	86.0	67.0	46.4	27.1	17.8	13.2	7.3	1.4	0.2
5000GtC	mono acid	83.7	60.8	36.9	20.7	13.0	8.2	3.4	0.4	0.2
5000GtC	mono basalt	79.0	50.6	26.2	15.0	9.2	4.9	1.5	0.2	0.2
5000GtC	mono carb	78.5	53.5	32.7	21.5	16.1	13.4	8.8	2.7	0.4
5000GtC	mono granite	83.7	60.8	36.9	20.7	13.0	8.2	3.4	0.4	0.2
5000GtC	mono sand	89.5	78.7	69.2	51.6	25.4	19.7	14.7	6.2	1.5
5000GtC	mono shale	71.9	42.7	20.3	10.4	6.2	3.2	0.9	0.2	0.2
5000GtC	mono shield	83.7	60.8	36.9	20.7	13.0	8.2	3.4	0.4	0.2

variables		year								
emis.	clim. sens.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1.5	51.6	41.6	30.3	22.1	17.3	14.9	11.3	4.6	0.7
1000GtC	2.64	60.0	48.2	33.4	23.2	17.5	14.1	9.1	2.2	0.0
1000GtC	3	62.4	51.4	34.9	23.9	17.8	14.1	9.0	2.2	0.0
1000GtC	4.5	69.3	58.3	40.6	25.2	17.6	13.0	7.2	1.0	0.0
1000GtC	6.	73.6	62.9	42.1	24.1	15.6	10.9	5.7	0.6	0.0
5000GtC	1.5	83.3	69.4	55.4	37.0	25.3	22.1	17.1	7.8	1.5
5000GtC	2.64	86.8	68.9	50.4	31.2	21.5	17.6	11.8	3.7	0.6
5000GtC	3	88.2	69.5	50.1	30.7	21.1	16.9	10.8	2.9	0.3
5000GtC	4.5	92.4	70.9	48.8	28.9	19.7	14.2	7.3	1.1	0.0
5000GtC	6.	96.3	64.3	41.6	23.8	15.7	10.3	4.8	0.6	0.0

Table 11: **Years** that specific values of **Surface warming** are reached

variables		Surface warming (°C)									
emis.	short-circ.	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	yes	1.80	2060	-	-	-	-	2260	3100	9500	-
1000GtC	no	1.79	2060	-	-	-	-	2240	3100	9500	-
5000GtC	yes	6.32	2220	3400	5200	9000	15000	24010	75000	210010	-
5000GtC	no	6.30	2220	3400	5000	8500	14010	22010	70010	200010	-

variables			Surface warming (°C)									
emis.	T_Ca	T_Si	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	on	on	1.79	2060	-	-	-	-	2260	3700	17000	800000
1000GtC	on	off	1.79	2060	-	-	-	-	2260	4100	30000	-
1000GtC	off	on	1.79	2060	-	-	-	-	2260	3800	19000	-
1000GtC	off	off	1.79	2060	-	-	-	-	2260	4200	34000	-
5000GtC	on	on	6.36	2240	3900	8000	15000	28000	85000	260000	550000	-
5000GtC	on	off	6.37	2240	4200	11000	22000	-	-	-	-	-
5000GtC	off	on	6.36	2240	3900	8500	16000	30000	90000	260000	550000	-
5000GtC	off	off	6.37	2240	4300	12000	24000	-	-	-	-	-

variables		Surface warming (°C)									
emis.	E_a (kJ/mol)	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	45	1.80	2060	-	-	-	-	2260	3300	13000	-
1000GtC	63	1.80	2060	-	-	-	-	2260	3200	12010	-
1000GtC	74	1.80	2060	-	-	-	-	2260	3200	12010	-
1000GtC	103	1.80	2060	-	-	-	-	2260	3200	11000	-
5000GtC	45	6.34	2240	3800	7500	13000	28010	95000	270010	600010	-
5000GtC	63	6.33	2240	3700	6600	12010	24010	55000	190010	410010	-
5000GtC	74	6.33	2220	3600	6400	11000	22010	44010	150010	350010	-
5000GtC	103	6.32	2220	3500	5600	9500	17000	28010	95000	250010	-

variables				Surface warming (°C)									
emis.	R_Ca	R_Si	R_explicit	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	on	on	on	1.79	2060	-	-	-	-	2260	4100	28000	-
1000GtC	on	on	off	1.79	2060	-	-	-	-	2260	4000	24000	-
1000GtC	on	off	on	1.79	2060	-	-	-	-	2260	4100	30000	-
1000GtC	on	off	off	1.79	2060	-	-	-	-	2260	4100	30000	-
1000GtC	off	on	on	1.79	2060	-	-	-	-	2260	4100	28000	-
1000GtC	off	on	off	1.79	2060	-	-	-	-	2260	4100	26000	-
1000GtC	off	off	on	1.79	2060	-	-	-	-	2260	4200	34000	-
1000GtC	off	off	off	1.79	2060	-	-	-	-	2260	4200	34000	-
5000GtC	on	on	on	6.37	2240	4200	11000	22000	95000	750000	-	-	-
5000GtC	on	on	off	6.37	2240	4100	10000	19000	55000	400000	900000	-	-
5000GtC	on	off	on	6.37	2240	4200	12000	22000	-	-	-	-	-
5000GtC	on	off	off	6.37	2240	4200	11000	22000	-	-	-	-	-
5000GtC	off	on	on	6.37	2240	4200	12000	22000	120000	750000	-	-	-
5000GtC	off	on	off	6.37	2240	4200	11000	22000	60000	400000	850000	-	-
5000GtC	off	off	on	6.37	2240	4300	12000	24000	-	-	-	-	-
5000GtC	off	off	off	6.37	2240	4300	12000	24000	-	-	-	-	-

variables		Surface warming (°C)									
emis.	beta	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	0.48	1.80	2060	-	-	-	-	2260	3400	15000	-
1000GtC	0.65	1.80	2060	-	-	-	-	2260	3400	15000	-
1000GtC	0.8	1.80	2060	-	-	-	-	2260	3400	15000	-
1000GtC	1.12	1.80	2060	-	-	-	-	2260	3400	15000	-
5000GtC	0.48	6.35	2240	4010	9000	17000	70010	780010	-	-	-
5000GtC	0.65	6.35	2240	4010	9000	17000	55000	580010	-	-	-
5000GtC	0.8	6.35	2240	4010	8500	17000	48010	460010	-	-	-
5000GtC	1.12	6.35	2240	3900	8500	16010	42010	310010	760010	-	-

variables		Surface warming (°C)									
emis.	k_run	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	0.012	1.80	2060	-	-	-	-	2260	3400	16010	-
1000GtC	0.024	1.80	2060	-	-	-	-	2260	3400	15000	-
1000GtC	0.028	1.80	2060	-	-	-	-	2260	3400	15000	-
1000GtC	0.045	1.80	2060	-	-	-	-	2260	3400	14010	-
5000GtC	0.012	6.35	2240	4010	9000	18010	110010	980010	-	-	-
5000GtC	0.024	6.35	2240	4010	8500	17000	48010	460010	-	-	-
5000GtC	0.028	6.35	2240	4010	8500	16010	44010	400010	940010	-	-
5000GtC	0.045	6.35	2240	3900	8010	15000	36010	240010	580010	-	-

variables			Surface warming (°C)									
emis.	P_Ca	P_Si	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	on	on	1.79	2060	-	-	-	-	2260	3900	22000	-
1000GtC	on	off	1.79	2060	-	-	-	-	2260	4100	30000	-
1000GtC	off	on	1.79	2060	-	-	-	-	2260	4000	22000	-
1000GtC	off	off	1.79	2060	-	-	-	-	2260	4200	34000	-
5000GtC	on	on	6.37	2240	4100	10000	18000	42000	220000	550000	850000	-
5000GtC	on	off	6.37	2240	4200	11000	22000	-	-	-	-	-
5000GtC	off	on	6.37	2240	4100	11000	20000	46000	240000	550000	900000	-
5000GtC	off	off	6.37	2240	4300	12000	24000	-	-	-	-	-

variables			Surface warming (°C)									
emis.	f_Ca	f_Si	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	on	on	1.79	2060	-	-	-	-	2260	3500	14000	1000000
1000GtC	on	off	1.79	2060	-	-	-	-	2260	4000	26000	-
1000GtC	off	on	1.79	2060	-	-	-	-	2260	3600	15000	900000
1000GtC	off	off	1.79	2060	-	-	-	-	2260	4200	34000	-
5000GtC	on	on	6.35	2220	3600	6600	12000	20000	36000	130000	300000	-
5000GtC	on	off	6.37	2240	4100	10000	19000	-	-	-	-	-
5000GtC	off	on	6.35	2240	3700	7000	13000	22000	40000	130000	300000	-
5000GtC	off	off	6.37	2240	4300	12000	24000	-	-	-	-	-

variables		Surface warming (°C)									
emis.	Scheme	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	Globavg	1.80	2060	-	-	-	-	2260	3100	9500	-
1000GtC	GKWM	1.77	2060	-	-	-	-	2220	2850	8010	-
1000GtC	GEM-CO2	1.76	2060	-	-	-	-	2220	2800	7500	-
5000GtC	Globavg	6.32	2220	3400	5200	8500	14010	22010	60010	170010	-
5000GtC	GKWM	6.25	2200	3200	4200	6400	11000	15000	34010	120010	-
5000GtC	GEM-CO2	6.23	2200	3100	4010	6010	9500	14010	28010	100010	-

variables				Surface warming (°C)									
emis.	f_Ca	f_Si	Scheme	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	on	on	Globavg	1.80	2060	-	-	-	-	2260	3100	9500	-
1000GtC	on	on	GKWM	1.77	2060	-	-	-	-	2220	2850	8010	-
1000GtC	on	off	Globavg	1.80	2060	-	-	-	-	2260	3400	14010	-
1000GtC	on	off	GKWM	1.81	2060	-	-	-	-	2280	3500	15000	-
1000GtC	off	on	Globavg	1.80	2060	-	-	-	-	2260	3200	11000	-
1000GtC	off	on	GKWM	1.78	2060	-	-	-	-	2220	2900	8010	-
1000GtC	off	off	Globavg	1.80	2060	-	-	-	-	2260	3400	16010	-
1000GtC	off	off	GKWM	1.82	2060	-	-	-	-	2280	3700	19000	-
5000GtC	on	on	Globavg	6.32	2220	3400	5200	9000	15000	24010	75000	210010	-
5000GtC	on	on	GKWM	6.25	2200	3200	4200	6400	11000	15000	34010	120010	-
5000GtC	on	off	Globavg	6.35	2240	3900	8010	15000	50010	-	-	-	-
5000GtC	on	off	GKWM	6.36	2240	4010	9500	17000	44010	660010	-	-	-
5000GtC	off	on	Globavg	6.32	2220	3500	5600	9500	17000	28010	80010	210010	-
5000GtC	off	on	GKWM	6.26	2220	3200	4400	6600	11000	16010	36010	110010	-
5000GtC	off	off	Globavg	6.35	2240	4100	9500	19000	-	-	-	-	-
5000GtC	off	off	GKWM	6.38	2240	4500	14010	26010	-	-	-	-	-

variables		Surface warming (°C)									
emis.	routing	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	1	1.79	2060	-	-	-	-	2280	4200	34000	-
1000GtC	2	1.79	2060	-	-	-	-	2260	4200	34000	-
1000GtC	3	1.80	2070	-	-	-	-	2300	5400	-	-
5000GtC	1	6.37	2240	4300	12000	24000	-	-	-	-	-
5000GtC	2	6.37	2240	4300	12000	24000	-	-	-	-	-
5000GtC	3	6.38	2260	4800	16000	32000	-	-	-	-	-

variables		Surface warming (°C)									
emis.	lith.	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	GKWM	1.77	2060	-	-	-	-	2220	2900	8010	-
1000GtC	GEM-CO2	1.77	2060	-	-	-	-	2220	2850	8010	-
1000GtC	GKWM av.	1.78	2060	-	-	-	-	2240	2950	8500	470010
1000GtC	GEM-CO2 av.	1.81	2060	-	-	-	-	2260	3200	11000	600010
1000GtC	mono acid	1.80	2060	-	-	-	-	2240	3000	8500	-
1000GtC	mono basalt	1.76	2060	-	-	-	-	2220	2750	6600	-
1000GtC	mono carb	1.69	2050	-	-	-	-	2160	2600	8010	780010
1000GtC	mono granite	1.80	2060	-	-	-	-	2240	3000	8500	-
1000GtC	mono sand	1.85	2070	-	-	-	-	2350	4300	22010	-
1000GtC	mono shale	1.69	2050	-	-	-	-	2160	2550	5600	-
1000GtC	mono shield	1.80	2060	-	-	-	-	2240	3000	8500	-
5000GtC	GKWM	6.26	2200	3200	4300	6400	11000	16010	36010	120010	-
5000GtC	GEM-CO2	6.25	2200	3200	4200	6400	11000	15000	34010	120010	-
5000GtC	GKWM av.	6.28	2220	3300	4600	7500	12010	18010	42010	140010	-
5000GtC	GEM-CO2 av.	6.33	2220	3500	5800	10010	17000	26010	70010	190010	-
5000GtC	mono acid	6.30	2220	3300	4700	7500	12010	17000	32010	110010	-
5000GtC	mono basalt	6.21	2200	2950	3800	5400	8500	11000	18010	65000	-
5000GtC	mono carb	6.10	2180	2900	3800	5800	10010	16010	48010	220010	-
5000GtC	mono granite	6.30	2220	3300	4700	7500	12010	17000	32010	110010	-
5000GtC	mono sand	6.42	2240	5400	14010	24010	40010	60010	180010	430010	-
5000GtC	mono shale	6.06	2180	2700	3300	4300	6600	8500	12010	30010	-
5000GtC	mono shield	6.30	2220	3300	4700	7500	12010	17000	32010	110010	-

variables		Surface warming (°C)									
emis.	clim. sens.	peak	at year	5	4	3	2	1.5	1	0.5	0
1000GtC	1.5	1.18	2040	-	-	-	-	-	2160	4800	-
1000GtC	2.64	1.79	2060	-	-	-	-	2260	3500	14000	950000
1000GtC	3	1.95	2070	-	-	-	-	2400	5200	18000	1000000
1000GtC	4.5	2.62	2120	-	-	-	2650	5400	11000	40000	-
1000GtC	6.	3.21	2140	-	-	2350	5200	9000	15000	50000	750000
5000GtC	1.5	3.75	2140	-	-	3300	11000	18000	40000	300000	-
5000GtC	2.64	6.35	2220	3600	6600	12000	20000	36000	130000	320000	-
5000GtC	3	7.15	2260	5000	8500	13000	24000	55000	150000	300000	-
5000GtC	4.5	10.61	2400	11000	14000	22000	60000	110000	160000	260000	-
5000GtC	6.	15.64	2600	14000	18000	32000	80000	110000	170000	280000	-

Table 12: **Years** that specific fractions of remaining excess **Surface warming** are reached

variables		fraction									
emis.	short-circ.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	yes	2180	2400	3800	11000	90010	6400	36010	220010	420010	660010
1000GtC	no	2180	2350	3700	11000	80010	6200	34010	210010	410010	660010
5000GtC	yes	2800	3700	8010	22010	170010	13000	110010	300010	520010	760010
5000GtC	no	2750	3700	7500	20010	160010	12010	100010	290010	480010	720010

variables			fraction									
emis.	T_Ca	T_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2200	2400	5000	24000	280000	10000	190000	460000	650000	750000
1000GtC	on	off	2200	2450	5800	550000	-	13000	-	-	-	-
1000GtC	off	on	2200	2400	5200	26000	340000	11000	220000	600000	950000	-
1000GtC	off	off	2200	2450	5800	-	-	13000	-	-	-	-
5000GtC	on	on	2900	4400	14000	65000	420000	22000	300000	750000	-	-
5000GtC	on	off	2950	5200	19000	-	-	36000	-	-	-	-
5000GtC	off	on	2900	4500	14000	70000	420000	24000	320000	700000	-	-
5000GtC	off	off	2950	5400	22000	-	-	40000	-	-	-	-

variables		fraction									
emis.	E_a (kJ/mol)	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	45	2180	2400	4200	16010	280010	8010	150010	580010	980010	-
1000GtC	63	2180	2400	4100	14010	200010	7500	95000	410010	720010	1000010
1000GtC	74	2180	2400	4010	14010	160010	7500	80010	350010	640010	900010
1000GtC	103	2180	2400	3900	13000	110010	6800	50010	250010	480010	740010
5000GtC	45	2900	4300	12010	70010	480010	20010	350010	800010	-	-
5000GtC	63	2850	4100	11000	42010	330010	18010	230010	560010	920010	-
5000GtC	74	2850	4010	10010	36010	280010	17000	200010	490010	800010	-
5000GtC	103	2800	3900	9000	26010	190010	14010	130010	350010	580010	880010

variables				fraction									
emis.	R_Ca	R_Si	R_explicit	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	on	2200	2400	5600	75000	-	12000	-	-	-	-
1000GtC	on	on	off	2200	2400	5600	44000	-	12000	750000	-	-	-
1000GtC	on	off	on	2200	2450	5800	550000	-	13000	-	-	-	-
1000GtC	on	off	off	2200	2450	5800	550000	-	13000	-	-	-	-
1000GtC	off	on	on	2200	2450	5800	80000	-	13000	1000000	-	-	-
1000GtC	off	on	off	2200	2400	5600	50000	1000000	12000	700000	-	-	-
1000GtC	off	off	on	2200	2450	5800	-	-	13000	-	-	-	-
1000GtC	off	off	off	2200	2450	5800	-	-	13000	-	-	-	-
5000GtC	on	on	on	2950	5000	19000	650000	-	34000	-	-	-	-
5000GtC	on	on	off	2950	4900	17000	320000	-	30000	1000000	-	-	-
5000GtC	on	off	on	2950	5200	20000	-	-	38000	-	-	-	-
5000GtC	on	off	off	2950	5200	19000	-	-	36000	-	-	-	-
5000GtC	off	on	on	2950	5200	20000	600000	-	36000	-	-	-	-
5000GtC	off	on	off	2950	5200	19000	340000	-	32000	1000000	-	-	-
5000GtC	off	off	on	2950	5400	22000	-	-	40000	-	-	-	-
5000GtC	off	off	off	2950	5400	22000	-	-	40000	-	-	-	-

variables		fraction									
emis.	beta	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	0.48	2200	2400	4500	20010	-	8500	880010	-	-	-
1000GtC	0.65	2200	2400	4400	19000	-	8500	700010	-	-	-
1000GtC	0.8	2200	2400	4400	19000	980010	8500	580010	-	-	-
1000GtC	1.12	2200	2400	4400	18010	720010	8500	410010	-	-	-
5000GtC	0.48	2950	4600	15000	640010	-	28010	-	-	-	-
5000GtC	0.65	2900	4600	15000	470010	-	28010	-	-	-	-
5000GtC	0.8	2900	4600	15000	370010	-	28010	-	-	-	-
5000GtC	1.12	2900	4600	15000	250010	-	26010	940010	-	-	-

variables		fraction									
emis.	k_run	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	0.012	2200	2400	4500	20010	-	9000	-	-	-	-
1000GtC	0.024	2200	2400	4400	19000	880010	8500	520010	-	-	-
1000GtC	0.028	2200	2400	4400	19000	880010	8500	520010	-	-	-
1000GtC	0.045	2200	2400	4400	18010	540010	8500	310010	1000010	-	-
5000GtC	0.012	2950	4700	16010	800010	-	30010	-	-	-	-
5000GtC	0.024	2900	4600	15000	370010	-	28010	-	-	-	-
5000GtC	0.028	2900	4600	15000	320010	-	26010	-	-	-	-
5000GtC	0.045	2900	4500	14010	190010	960010	24010	720010	-	-	-

variables			fraction									
emis.	P_Ca	P_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2200	2400	5400	32000	600000	11000	400000	950000	-	-
1000GtC	on	off	2200	2400	5600	700000	-	13000	-	-	-	-
1000GtC	off	on	2200	2400	5400	36000	600000	12000	400000	1000000	-	-
1000GtC	off	off	2200	2450	5800	-	-	13000	-	-	-	-
5000GtC	on	on	2950	4800	17000	180000	800000	28000	650000	-	-	-
5000GtC	on	off	2950	5200	19000	-	-	36000	-	-	-	-
5000GtC	off	on	2950	5000	18000	190000	750000	30000	600000	-	-	-
5000GtC	off	off	2950	5400	22000	-	-	40000	-	-	-	-

variables			fraction									
emis.	f_Ca	f_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2200	2400	4600	18000	190000	9000	110000	360000	600000	750000
1000GtC	on	off	2200	2400	5400	170000	-	12000	-	-	-	-
1000GtC	off	on	2200	2400	4800	19000	190000	9500	120000	340000	550000	700000
1000GtC	off	off	2200	2450	5800	-	-	13000	-	-	-	-
5000GtC	on	on	2850	4000	11000	30000	260000	16000	170000	420000	700000	1000000
5000GtC	on	off	2950	4800	17000	-	-	30000	-	-	-	-
5000GtC	off	on	2850	4200	12000	34000	240000	18000	170000	420000	700000	1000000
5000GtC	off	off	2950	5400	22000	-	-	40000	-	-	-	-

variables		fraction									
emis.	Scheme	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	Globavg	2180	2400	3800	11000	70010	6400	32010	180010	350010	580010
1000GtC	GKWM	2180	2350	3400	9000	38010	5600	20010	120010	240010	370010
1000GtC	GEM-CO2	2180	2350	3300	8500	32010	5400	18010	110010	220010	350010
5000GtC	Globavg	2750	3700	8010	19000	130010	12010	80010	250010	420010	660010
5000GtC	GKWM	2700	3400	6010	14010	85000	9000	55000	170010	290010	430010
5000GtC	GEM-CO2	2650	3300	5600	13000	80010	8500	44010	160010	270010	400010

variables				fraction									
emis.	f_Ca	f_Si	Scheme	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	Globavg	2180	2400	3800	11000	90010	6400	36010	220010	410010	640010
1000GtC	on	on	GKWM	2180	2350	3400	9000	38010	5600	20010	120010	240010	370010
1000GtC	on	off	Globavg	2180	2400	4300	18010	-	8500	-	-	-	-
1000GtC	on	off	GKWM	2200	2400	4500	19000	-	8500	740010	-	-	-
1000GtC	off	on	Globavg	2180	2400	3900	12010	95000	6800	42010	220010	420010	680010
1000GtC	off	on	GKWM	2180	2350	3500	9500	40010	5600	22010	120010	230010	370010
1000GtC	off	off	Globavg	2200	2400	4600	22010	-	9000	-	-	-	-
1000GtC	off	off	GKWM	2200	2400	4800	26010	-	10010	-	-	-	-
5000GtC	on	on	Globavg	2800	3700	8010	22010	170010	13000	110010	300010	520010	780010
5000GtC	on	on	GKWM	2700	3400	6010	14010	85000	9000	55000	170010	290010	420010
5000GtC	on	off	Globavg	2900	4400	14010	-	-	24010	-	-	-	-
5000GtC	on	off	GKWM	2950	4700	16010	520010	-	28010	-	-	-	-
5000GtC	off	on	Globavg	2800	3900	9000	24010	170010	14010	110010	300010	500010	760010
5000GtC	off	on	GKWM	2700	3500	6400	15000	80010	9500	55000	160010	270010	400010
5000GtC	off	off	Globavg	2950	4800	17000	-	-	32010	-	-	-	-
5000GtC	off	off	GKWM	3000	6010	24010	-	-	42010	-	-	-	-

variables		fraction									
emis.	routing	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	1	2200	2450	5800	1000000	-	13000	-	-	-	-
1000GtC	2	2200	2450	5800	-	-	13000	-	-	-	-
1000GtC	3	2200	2450	8000	-	-	-	-	-	-	-
5000GtC	1	2950	5400	22000	-	-	40000	-	-	-	-
5000GtC	2	2950	5400	22000	-	-	40000	-	-	-	-
5000GtC	3	3000	6800	30000	-	-	-	-	-	-	-

variables		fraction									
emis.	lith.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	GKWM	2180	2350	3400	9000	38010	5600	20010	120010	240010	380010
1000GtC	GEM-CO2	2180	2350	3400	9000	38010	5600	20010	120010	240010	370010
1000GtC	GKWM av.	2180	2350	3600	9500	46010	5800	24010	130010	250010	340010
1000GtC	GEM-CO2 av.	2180	2400	3900	12010	75000	6800	34010	190010	330010	450010
1000GtC	mono acid	2180	2350	3600	9500	38010	5800	22010	110010	230010	350010
1000GtC	mono basalt	2180	2350	3200	7500	20010	4900	14010	65000	150010	250010
1000GtC	mono carb	2160	2300	3200	10010	75000	5600	24010	220010	430010	600010
1000GtC	mono granite	2180	2350	3600	9500	38010	5800	22010	110010	230010	350010
1000GtC	mono sand	2200	2450	5800	24010	210010	13000	110010	440010	760010	1000010
1000GtC	mono shale	2160	2280	2900	6600	15000	4300	11000	34010	110010	200010
1000GtC	mono shield	2180	2350	3600	9500	38010	5800	22010	110010	230010	350010
5000GtC	GKWM	2700	3400	6200	15000	90010	9000	55000	180010	300010	440010
5000GtC	GEM-CO2	2700	3400	6010	14010	85000	9000	55000	160010	280010	410010
5000GtC	GKWM av.	2750	3600	6800	17000	110010	10010	65000	200010	330010	480010
5000GtC	GEM-CO2 av.	2800	3900	9000	24010	150010	14010	100010	270010	460010	660010
5000GtC	mono acid	2750	3600	7000	16010	80010	11000	46010	160010	280010	410010
5000GtC	mono basalt	2650	3200	5200	11000	44010	7500	26010	100010	190010	290010
5000GtC	mono carb	2600	3200	5600	15000	170010	8500	100010	350010	620010	860010
5000GtC	mono granite	2750	3600	7000	16010	80010	11000	46010	160010	280010	410010
5000GtC	mono sand	3000	7500	22010	55000	340010	32010	230010	580010	940010	-
5000GtC	mono shale	2500	2900	4300	8500	22010	6010	15000	70010	150010	230010
5000GtC	mono shield	2750	3600	7000	16010	80010	11000	46010	160010	280010	410010

variables		fraction									
emis.	clim. sens.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	1.5	2120	2260	3200	15000	260000	6800	140000	480000	800000	-
1000GtC	2.64	2200	2400	4600	18000	180000	9000	110000	340000	550000	700000
1000GtC	3	2220	2450	5400	19000	180000	9500	110000	340000	550000	700000
1000GtC	4.5	2350	2700	7500	22000	150000	12000	95000	280000	420000	600000
1000GtC	6.	2400	2900	8000	19000	120000	12000	70000	220000	360000	500000
5000GtC	1.5	2650	3900	13000	55000	420000	22000	300000	650000	1000000	-
5000GtC	2.64	2850	4000	11000	30000	260000	16000	170000	440000	700000	1000000
5000GtC	3	2900	4200	11000	30000	220000	16000	150000	380000	650000	850000
5000GtC	4.5	3200	4400	10000	28000	160000	15000	110000	260000	440000	600000
5000GtC	6.	3400	4100	8000	19000	110000	12000	70000	200000	360000	480000

Table 13: **Timescale fitting** for excess **Surface warming** decay

variables		fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$					
emis.	short-circ.		warming (°C)	i	1	2	3	R^2
1000GtC	yes	b	0.11±0.01	w_i (%)	51±2	49±2		0.996
		h	1.69±0.02	τ_i (yr)	460±60	12000±1000		
1000GtC	no	b	0.012±0.007	w_i (%)	40.4±0.4	44.3±0.4	15.3±0.3	0.99994
		h	1.817±0.007	τ_i (yr)	324±8	5500±100	160000±10000	
5000GtC	yes	b	0.02±0.01	w_i (%)	18±1	59.0±0.5	22.6±0.3	0.99993
		h	6.41±0.05	τ_i (yr)	950±80	7100±200	187000±7000	
5000GtC	no	b	0.02±0.01	w_i (%)	19±1	58.8±0.6	22.4±0.3	0.99994
		h	6.39±0.06	τ_i (yr)	990±80	6700±200	175000±6000	

variables			fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$					
emis.	T_Ca	T_Si		warming (°C)	i	1	2	R^2
1000GtC	on	on	b	0.375±0.006	w_i (%)	48.4±0.7	51.6±0.6	0.99990
			h	1.452±0.006	τ_i (yr)	330±10	8000±300	
1000GtC	on	off	b	0.472±0.004	w_i (%)	50.6±0.6	49.4±0.5	0.99994
			h	1.358±0.005	τ_i (yr)	320±10	7800±200	
1000GtC	off	on	b	0.30±0.04	w_i (%)	100±4		0.97
			h	1.19±0.01	τ_i (yr)	4600±700		
1000GtC	off	off	b	0.484±0.005	w_i (%)	50.9±0.6	49.1±0.5	0.99994
			h	1.346±0.006	τ_i (yr)	320±10	7900±200	
5000GtC	on	on	b	1.1±0.1	w_i (%)	100±3		0.990
			h	4.76±0.04	τ_i (yr)	13000±2000		
5000GtC	on	off	-	-	-	-	-	-
5000GtC	off	on	b	1.0±0.1	w_i (%)	100±2		0.990
			h	4.74±0.06	τ_i (yr)	14000±2000		
5000GtC	off	off	-	-	-	-	-	-

variables		fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	E_a (kJ/mol)		warming (°C)	i	1	2	3	4	R^2
1000GtC	45	b	-0.007±0.01	w_i (%)	39±3	32±9	10±10	19±2	0.99995
		h	1.8±0.2	τ_i (yr)	325±9	5000±1000	12000±7000	440000±30000	
1000GtC	63	b	0.17±0.03	w_i (%)	100±4				0.97
		h	1.32±0.01	τ_i (yr)	4200±500				
1000GtC	74	b	0.11±0.01	w_i (%)	53±2	47±3			0.993
		h	1.68±0.04	τ_i (yr)	550±80	18000±2000			
1000GtC	103	b	0.010±0.004	w_i (%)	40.3±0.4	42.9±0.3	16.8±0.3		0.99994
		h	1.825±0.007	τ_i (yr)	332±8	6000±100	179000±9000		
5000GtC	45	b	0.1±0.1	w_i (%)	68.9±0.8	31±2			0.999
		h	5.91±0.09	τ_i (yr)	6700±400	340000±60000			
5000GtC	63	b	0.10±0.08	w_i (%)	69.6±0.7	30±1			0.999
		h	5.98±0.08	τ_i (yr)	6200±300	260000±40000			
5000GtC	74	b	0.09±0.07	w_i (%)	70.3±0.7	30±1			0.999
		h	6.02±0.08	τ_i (yr)	5900±300	220000±30000			
5000GtC	103	b	0.02±0.01	w_i (%)	19±1	57.7±0.5	23.7±0.3		0.99993
		h	6.42±0.05	τ_i (yr)	950±80	7900±200	208000±8000		

variables				fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	R_Ca	R_Si	R_explicit		warming (°C)	i	1	2	3	R^2
1000GtC	on	on	on	b	0.408±0.009	w_i (%)	51±2	49±2		0.999
				h	1.42±0.02	τ_i (yr)	350±40	10200±900		
1000GtC	on	on	off	b	0.06±0.06	w_i (%)	38.8±0.7	38.4±0.7	23±3	0.99994
				h	1.77±0.03	τ_i (yr)	322±9	7600±200	900000±200000	
1000GtC	on	off	on	b	0.476±0.004	w_i (%)	50.7±0.6	49.3±0.5		0.99994
				h	1.353±0.007	τ_i (yr)	320±10	7900±200		
1000GtC	on	off	off	b	0.473±0.004	w_i (%)	50.6±0.6	49.4±0.5		0.99994
				h	1.358±0.005	τ_i (yr)	320±10	7900±200		
1000GtC	off	on	on	b	0.40±0.01	w_i (%)	51±2	49±2		0.998
				h	1.42±0.02	τ_i (yr)	360±40	11000±1000		
1000GtC	off	on	off	b	0.36±0.01	w_i (%)	51±3	49±2		0.997
				h	1.46±0.03	τ_i (yr)	380±60	13000±2000		
1000GtC	off	off	on	b	0.484±0.005	w_i (%)	50.9±0.6	49.1±0.5		0.99994
				h	1.346±0.006	τ_i (yr)	320±10	7900±200		
1000GtC	off	off	off	b	0.484±0.005	w_i (%)	50.9±0.6	49.1±0.5		0.99994
				h	1.346±0.006	τ_i (yr)	320±10	7900±200		
5000GtC	on	on	on	-	-	-	-	-	-	-
5000GtC	on	on	off	-	-	-	-	-	-	-
5000GtC	on	off	on	-	-	-	-	-	-	-
5000GtC	on	off	off	-	-	-	-	-	-	-
5000GtC	off	on	on	-	-	-	-	-	-	-
5000GtC	off	on	off	-	-	-	-	-	-	-
5000GtC	off	off	on	-	-	-	-	-	-	-
5000GtC	off	off	off	-	-	-	-	-	-	-

variables		fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$					
emis.	beta		warming (°C)	i	1	2	3	R^2
1000GtC	0.48	b	0.11±0.06	w_i (%)	42.2±0.5	42.2±0.5	16±3	0.99993
		h	1.72±0.02	τ_i (yr)	339±8	6900±100	1200000±400000	
1000GtC	0.65	b	0.09±0.05	w_i (%)	41.6±0.5	41.7±0.5	17±2	0.99994
		h	1.75±0.02	τ_i (yr)	339±8	6900±100	1100000±300000	
1000GtC	0.8	b	0.32±0.02	w_i (%)	100.0±0.3			0.98
		h	1.21±0.05	τ_i (yr)	3500±400			
1000GtC	1.12	b	0.29±0.02	w_i (%)	100±4			0.98
		h	1.2282±0.0004	τ_i (yr)	3600±400			
5000GtC	0.48	b	1.78±0.05	w_i (%)	100.0±0.8			0.996
		h	4.14±0.06	τ_i (yr)	10200±800			
5000GtC	0.65	b	1.82±0.05	w_i (%)	100.0±0.8			0.997
		h	4.12±0.06	τ_i (yr)	9700±700			
5000GtC	0.8	b	1.76±0.05	w_i (%)	100±2			0.997
		h	4.17±0.03	τ_i (yr)	9900±700			
5000GtC	1.12	b	-0.4±0.5	w_i (%)	16.6±1	49±2	34±5	0.99993
		h	6.9±0.4	τ_i (yr)	890±70	11700±300	1500000±400000	

variables		fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$					
emis.	k_run		warming (°C)	i	1	2	3	R^2
1000GtC	0.012	b	0.364±0.008	w_i (%)	48±2	40±8	10±10	0.99995
		h	1.47±0.08	τ_i (yr)	330±10	5600±1000	17000±10000	
1000GtC	0.024	b	0.31±0.02	w_i (%)	100±1			0.98
		h	1.21±0.04	τ_i (yr)	3500±400			
1000GtC	0.028	b	0.31±0.02	w_i (%)	100±1			0.98
		h	1.22±0.04	τ_i (yr)	3500±400			
1000GtC	0.045	b	0.27±0.02	w_i (%)	100±3			0.98
		h	1.25±0.02	τ_i (yr)	3800±500			
5000GtC	0.012	b	1.85±0.04	w_i (%)	100±2			0.997
		h	4.07±0.03	τ_i (yr)	10200±700			
5000GtC	0.024	b	7.±7.	w_i (%)	16±2	47±6	40±10	0.99992
		h	7.2±7.	τ_i (yr)	890±70	11900±300	2000000±1000000	
5000GtC	0.028	b	1.56±0.06	w_i (%)	100±2			0.994
		h	4.31±0.04	τ_i (yr)	11000±1000			
5000GtC	0.045	b	0.3±0.3	w_i (%)	69±1	31±5		0.998
		h	5.7±0.2	τ_i (yr)	7400±500	600000±200000		

variables			fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$					
emis.	P_Ca	P_Si		warming (°C)	i	1	2	R^2
1000GtC	on	on	b	0.35±0.03	w_i (%)	100±3		0.98
			h	1.15±0.03	τ_i (yr)	4200±600		
1000GtC	on	off	b	0.473±0.005	w_i (%)	50.6±0.6	49.4±0.5	0.99994
			h	1.357±0.006	τ_i (yr)	320±10	7700±200	
1000GtC	off	on	b	0.30±0.02	w_i (%)	51±3	49±3	0.995
			h	1.51±0.04	τ_i (yr)	430±80	16000±2000	
1000GtC	off	off	b	0.484±0.005	w_i (%)	50.9±0.6	49.1±0.5	0.99994
			h	1.346±0.006	τ_i (yr)	320±10	7900±200	
5000GtC	on	on	b	1.42±0.1	w_i (%)	100±2		0.993
			h	4.41±0.06	τ_i (yr)	14000±2000		
5000GtC	on	off	-	-	-	-	-	-
5000GtC	off	on	-	-	-	-	-	-
5000GtC	off	off	-	-	-	-	-	-

variables			fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$					
emis.	f_Ca	f_Si		warming (°C)	i	1	2	R^2
1000GtC	on	on	b	0.14±0.02	w_i (%)	51±3	49±3	0.994
			h	1.64±0.04	τ_i (yr)	520±90	19000±3000	
1000GtC	on	off	b	0.458±0.004	w_i (%)	50.2±0.6	49.8±0.5	0.99994
			h	1.371±0.005	τ_i (yr)	320±10	7500±200	
1000GtC	off	on	b	0.23±0.04	w_i (%)	100.00±0.06		0.97
			h	1.25±0.07	τ_i (yr)	4900±800		
1000GtC	off	off	b	0.484±0.005	w_i (%)	50.9±0.6	49.1±0.5	0.99994
			h	1.346±0.006	τ_i (yr)	320±10	7900±200	
5000GtC	on	on	b	0.1±0.1	w_i (%)	71±1	29±2	0.998
			h	6.01±0.1	τ_i (yr)	6100±400	190000±40000	
5000GtC	on	off	-	-	-	-	-	-
5000GtC	off	on	b	0.8±0.1	w_i (%)	100.0±0.4		0.99
			h	5.0±0.1	τ_i (yr)	12000±1000		
5000GtC	off	off	-	-	-	-	-	-

variables		fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	Scheme		warming (°C)	i	1	2	3	4	R^2
1000GtC	Globavg	b	0.005±0.01	w_i (%)	40±3	40±6	6±10	15±2	0.99994
		h	1.8±0.2	τ_i (yr)	324±10	5100±700	10000±20000	150000±20000	
1000GtC	GKWM	b	0.007±0.005	w_i (%)	41.1±0.4	45.4±0.4	13.5±0.4		0.99994
		h	1.802±0.007	τ_i (yr)	310±8	4900±100	101000±9000		
1000GtC	GEM-CO2	b	0.13±0.03	w_i (%)	100±2				0.98
		h	1.36±0.03	τ_i (yr)	2900±300				
5000GtC	Globavg	b	0.02±0.01	w_i (%)	19±1	59.9±0.5	21.4±0.4		0.99993
		h	6.41±0.06	τ_i (yr)	950±80	7000±200	155000±7000		
5000GtC	GKWM	b	0.01±0.01	w_i (%)	25±3	55±1	20.1±0.4		0.99994
		h	6.36±0.09	τ_i (yr)	1200±100	5500±300	113000±5000		
5000GtC	GEM-CO2	b	0.01±0.01	w_i (%)	28±3	53±2	19.3±0.4		0.99994
		h	6.34±0.09	τ_i (yr)	1300±100	5300±300	106000±5000		

variables				fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	f_Ca	f_Si	Scheme		warming (°C)	i	1	2	3	R^2
1000GtC	on	on	Globavg	b	0.008±0.007	w_i (%)	40.5±0.4	43.8±0.4	15.7±0.3	0.99993
				h	1.827±0.007	τ_i (yr)	329±8	5700±100	170000±10000	
1000GtC	on	on	GKWM	b	0.13±0.03	w_i (%)	100±2			0.98
				h	1.36±0.03	τ_i (yr)	3100±400			
1000GtC	on	off	Globavg	b	0.36±0.02	w_i (%)	48±5	40±20	10±20	0.99995
				h	1.5±0.2	τ_i (yr)	330±10	6000±1000	10000±20000	
1000GtC	on	off	GKWM	b	0.35±0.01	w_i (%)	48±3	40±10	10±10	0.99995
				h	1.50±0.1	τ_i (yr)	330±10	6000±1000	20000±10000	
1000GtC	off	on	Globavg	b	0.15±0.03	w_i (%)	100±3			0.97
				h	1.35±0.02	τ_i (yr)	4000±500			
1000GtC	off	on	GKWM	b	0.008±0.006	w_i (%)	40.9±0.4	45.2±0.4	13.9±0.4	0.99994
				h	1.805±0.007	τ_i (yr)	313±8	5100±100	95000±9000	
1000GtC	off	off	Globavg	b	0.38±0.01	w_i (%)	49±4	40±20	10±20	0.99995
				h	1.5±0.1	τ_i (yr)	330±10	6000±2000	10000±10000	
1000GtC	off	off	GKWM	b	0.385±0.009	w_i (%)	48.7±0.8	30±20	30±20	0.99995
				h	1.471±0.008	τ_i (yr)	340±10	5000±2000	12000±5000	
5000GtC	on	on	Globavg	b	0.06±0.04	w_i (%)	73.3±0.6	27±1		0.999
				h	6.09±0.07	τ_i (yr)	4800±200	150000±20000		
5000GtC	on	on	GKWM	b	0.01±0.01	w_i (%)	25±3	55±1	20.1±0.4	0.99994
				h	6.36±0.09	τ_i (yr)	1200±100	5500±300	112000±5000	
5000GtC	on	off	Globavg	-	-	-	-	-	-	-
5000GtC	on	off	GKWM	b	1.70±0.05	w_i (%)	100±2			0.996
				h	4.21±0.03	τ_i (yr)	11000±800			
5000GtC	off	on	Globavg	b	0.06±0.04	w_i (%)	71.7±0.9	28±1		0.999
				h	6.07±0.06	τ_i (yr)	5200±300	140000±20000		
5000GtC	off	on	GKWM	b	0.01±0.01	w_i (%)	22±2	56.9±1	20.9±0.4	0.99995
				h	6.36±0.08	τ_i (yr)	1120±90	5600±200	104000±5000	
5000GtC	off	off	Globavg	-	-	-	-	-	-	-
5000GtC	off	off	GKWM	-	-	-	-	-	-	-

variables		fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	routing		warming (°C)	i	1	2	R^2
1000GtC	1	b	0.483±0.004	w_i (%)	50.9±0.6	49.1±0.5	0.99994
		h	1.348±0.005	τ_i (yr)	320±10	8000±200	
1000GtC	2	b	0.484±0.005	w_i (%)	50.9±0.6	49.1±0.5	0.99994
		h	1.346±0.006	τ_i (yr)	320±10	7900±200	
1000GtC	3	b	0.703±0.008	w_i (%)	57.7±0.6	42.3±0.7	0.99996
		h	1.134±0.006	τ_i (yr)	310±10	6500±400	
5000GtC	1	-	-	-	-	-	-
5000GtC	2	-	-	-	-	-	-
5000GtC	3	-	-	-	-	-	-

variables		fit to $T(t) = b + h \sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	lith.		warming (°C)	i	1	2	3	4	R^2
1000GtC	GKWM	b	0.08±0.01	w_i (%)	50±2	50±2			0.997
		h	1.71±0.02	τ_i (yr)	410±50	9000±900			
1000GtC	GEM-CO2	b	0.007±0.005	w_i (%)	41.1±0.4	45.4±0.4	13.5±0.4		0.99994
		h	1.802±0.007	τ_i (yr)	310±8	4900±100	101000±9000		
1000GtC	GKWM av.	b	0.14±0.03	w_i (%)	100.0±0.5				0.98
		h	1.37±0.05	τ_i (yr)	3300±400				
1000GtC	GEM-CO2 av.	b	-0.009±0.009	w_i (%)	39±4	30±10	10±20	16±2	0.99994
		h	1.9±0.2	τ_i (yr)	330±10	5000±1000	10000±10000	170000±20000	
1000GtC	mono acid	b	0.010±0.007	w_i (%)	40.3±0.5	45.9±0.4	13.8±0.4		0.99994
		h	1.825±0.008	τ_i (yr)	325±9	5300±100	91000±10000		
1000GtC	mono basalt	b	0.12±0.03	w_i (%)	100±2				0.98
		h	1.38±0.02	τ_i (yr)	2600±300				
1000GtC	mono carb	b	-0.007±0.006	w_i (%)	45.6±0.4	40.8±0.4	13.5±0.3		0.9999
		h	1.743±0.008	τ_i (yr)	283±7	6100±200	230000±20000		
1000GtC	mono granite	b	0.010±0.007	w_i (%)	40.4±0.4	45.9±0.4	13.8±0.4		0.99994
		h	1.825±0.009	τ_i (yr)	325±9	5300±100	91000±10000		
1000GtC	mono sand	b	-0.007±0.006	w_i (%)	38±1	3±2	40±1	18.3±0.3	0.99996
		h	1.89±0.03	τ_i (yr)	340±10	3000±2000	13000±600	350000±20000	
1000GtC	mono shale	b	0.10±0.03	w_i (%)	100±2				0.98
		h	1.33±0.03	τ_i (yr)	2200±300				
1000GtC	mono shield	b	0.010±0.007	w_i (%)	40.4±0.4	45.9±0.4	13.8±0.4		0.99994
		h	1.825±0.009	τ_i (yr)	325±9	5300±100	91000±10000		
5000GtC	GKWM	b	0.01±0.01	w_i (%)	25±3	55±1	20.2±0.4		0.99994
		h	6.37±0.09	τ_i (yr)	1200±100	5600±300	115000±5000		
5000GtC	GEM-CO2	b	0.01±0.01	w_i (%)	24±3	55±1	20.3±0.4		0.99994
		h	6.37±0.1	τ_i (yr)	1200±100	5500±300	111000±5000		
5000GtC	GKWM av.	b	0.01±0.01	w_i (%)	20±2	58.7±0.7	20.8±0.4		0.99994
		h	6.38±0.07	τ_i (yr)	1050±90	6100±200	131000±6000		
5000GtC	GEM-CO2 av.	b	0.05±0.05	w_i (%)	72.6±0.8	27±2			0.999
		h	6.07±0.08	τ_i (yr)	5600±300	130000±20000			
5000GtC	mono acid	b	0.01±0.01	w_i (%)	20±2	61.1±0.6	19.2±0.5		0.99993
		h	6.40±0.07	τ_i (yr)	980±90	6500±200	111000±6000		
5000GtC	mono basalt	b	0.01±0.02	w_i (%)	31±4	53±2	16.3±0.6		0.99993
		h	6.32±0.1	τ_i (yr)	1200±100	5000±300	78000±7000		
5000GtC	mono carb	b	0.01±0.02	w_i (%)	34±2	47±1	19.2±0.3		0.99993
		h	6.22±0.03	τ_i (yr)	1180±60	6300±200	240000±10000		
5000GtC	mono granite	b	0.01±0.01	w_i (%)	20±2	61.1±0.6	19.2±0.5		0.99993
		h	6.40±0.07	τ_i (yr)	980±90	6500±200	111000±6000		
5000GtC	mono sand	b	-0.2±0.1	w_i (%)	14±1	62.4±0.5	23±1		0.9997
		h	6.7±0.1	τ_i (yr)	600±100	22200±1000	500000±100000		
5000GtC	mono shale	b	0.12±0.03	w_i (%)	72±1	28±3			0.999
		h	6.0±0.1	τ_i (yr)	1800±100	18000±3000			
5000GtC	mono shield	b	0.01±0.01	w_i (%)	20±2	61.1±0.6	19.2±0.5		0.99993
		h	6.40±0.07	τ_i (yr)	980±90	6500±200	111000±6000		

variables		fit to $T(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	clim. sens.		warming (°C)	i	1	2	3	4	R^2
1000GtC	1.5	b	-0.007±0.004	w_i (%)	44.6±0.8	11±3	25±3	19.9±0.3	0.99999
		h	1.20±0.01	τ_i (yr)	268±4	2900±600	8900±700	370000±10000	
1000GtC	2.64	b	-0.006±0.007	w_i (%)	38.1±0.4	40.3±0.4	21.6±0.3		0.99994
		h	1.834±0.007	τ_i (yr)	322±9	6700±200	230000±10000		
1000GtC	3	b	0.16±0.02	w_i (%)	47±3	53±3			0.994
		h	1.80±0.04	τ_i (yr)	500±100	18000±3000			
1000GtC	4.5	b	0.27±0.05	w_i (%)	100±2				0.98
		h	1.92±0.05	τ_i (yr)	8000±1000				
1000GtC	6.	b	-0.02±0.02	w_i (%)	23.4±0.9	57.0±0.5	19.6±0.9		0.9998
		h	3.33±0.03	τ_i (yr)	320±30	8600±300	170000±20000		
5000GtC	1.5	b	0.1±0.1	w_i (%)	68±2	32±3			0.997
		h	3.41±0.07	τ_i (yr)	6900±600	270000±90000			
5000GtC	2.64	b	0.1±0.1	w_i (%)	71±1	29±2			0.998
		h	6.00±0.1	τ_i (yr)	6100±400	190000±40000			
5000GtC	3	b	0.1±0.1	w_i (%)	71.0±0.8	29±2			0.999
		h	6.8±0.1	τ_i (yr)	6200±400	180000±30000			
5000GtC	4.5	-	-	-	-	-	-	-	-
5000GtC	6.	-	-	-	-	-	-	-	-

Table 14: **Surface ocean acidification** (pH units below 8.15 baseline) reached at specific calendar years

variables		**year**								
emis.	short-circ.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	yes	0.092	0.063	0.033	0.015	0.008	0.005	0.002	0.000	0.000
1000GtC	no	0.091	0.062	0.032	0.014	0.007	0.005	0.001	0.000	0.000
5000GtC	yes	0.520	0.352	0.196	0.088	0.050	0.036	0.018	0.000	0.000
5000GtC	no	0.515	0.342	0.183	0.083	0.047	0.034	0.016	0.000	0.000

variables			**year**								
emis.	T_Ca	T_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	0.100	0.076	0.049	0.030	0.021	0.018	0.013	0.004	0.000
1000GtC	on	off	0.102	0.079	0.055	0.037	0.029	0.028	0.028	0.027	0.026
1000GtC	off	on	0.100	0.077	0.050	0.032	0.022	0.019	0.015	0.006	0.001
1000GtC	off	off	0.102	0.080	0.056	0.039	0.030	0.030	0.029	0.029	0.028
5000GtC	on	on	0.550	0.415	0.302	0.167	0.089	0.076	0.058	0.024	0.003
5000GtC	on	off	0.560	0.438	0.351	0.232	0.129	0.122	0.122	0.122	0.121
5000GtC	off	on	0.552	0.419	0.311	0.177	0.093	0.078	0.059	0.025	0.002
5000GtC	off	off	0.562	0.443	0.362	0.248	0.135	0.128	0.128	0.127	0.127

variables		**year**								
emis.	E_a (kJ/mol)	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	45	0.095	0.069	0.041	0.023	0.015	0.013	0.009	0.003	0.000
1000GtC	63	0.095	0.068	0.040	0.021	0.013	0.010	0.007	0.000	0.000
1000GtC	74	0.094	0.067	0.039	0.020	0.012	0.009	0.005	0.000	0.000
1000GtC	103	0.093	0.066	0.036	0.018	0.010	0.007	0.003	0.000	0.000
5000GtC	45	0.545	0.403	0.278	0.151	0.089	0.077	0.060	0.027	0.004
5000GtC	63	0.540	0.392	0.258	0.134	0.078	0.064	0.045	0.013	0.000
5000GtC	74	0.537	0.386	0.249	0.126	0.073	0.058	0.038	0.008	0.000
5000GtC	103	0.527	0.367	0.219	0.104	0.059	0.044	0.024	0.000	0.000

variables				**year**								
emis.	R_Ca	R_Si	R_explicit	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	on	0.102	0.079	0.054	0.037	0.028	0.027	0.026	0.022	0.016
1000GtC	on	on	off	0.101	0.078	0.053	0.035	0.027	0.025	0.023	0.018	0.011
1000GtC	on	off	on	0.102	0.080	0.055	0.038	0.029	0.029	0.028	0.028	0.026
1000GtC	on	off	off	0.102	0.079	0.055	0.037	0.029	0.028	0.028	0.027	0.026
1000GtC	off	on	on	0.102	0.080	0.055	0.037	0.028	0.027	0.025	0.021	0.015
1000GtC	off	on	off	0.102	0.079	0.054	0.036	0.027	0.026	0.023	0.017	0.010
1000GtC	off	off	on	0.102	0.080	0.056	0.039	0.030	0.030	0.029	0.029	0.028
1000GtC	off	off	off	0.102	0.080	0.056	0.039	0.030	0.030	0.029	0.029	0.028
5000GtC	on	on	on	0.559	0.437	0.348	0.227	0.124	0.115	0.110	0.095	0.074
5000GtC	on	on	off	0.558	0.433	0.339	0.213	0.117	0.107	0.099	0.077	0.045
5000GtC	on	off	on	0.561	0.440	0.356	0.239	0.132	0.125	0.124	0.124	0.122
5000GtC	on	off	off	0.560	0.440	0.354	0.235	0.129	0.123	0.123	0.122	0.122
5000GtC	off	on	on	0.561	0.441	0.356	0.238	0.127	0.118	0.112	0.096	0.072
5000GtC	off	on	off	0.560	0.438	0.350	0.229	0.122	0.110	0.101	0.077	0.044
5000GtC	off	off	on	0.562	0.443	0.362	0.248	0.135	0.128	0.128	0.127	0.127
5000GtC	off	off	off	0.562	0.443	0.362	0.248	0.135	0.128	0.128	0.127	0.127

variables		year								
emis.	beta	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.48	0.097	0.072	0.046	0.028	0.020	0.019	0.018	0.015	0.011
1000GtC	0.65	0.097	0.072	0.045	0.027	0.019	0.018	0.017	0.013	0.009
1000GtC	0.8	0.097	0.072	0.045	0.027	0.019	0.018	0.016	0.012	0.007
1000GtC	1.12	0.097	0.072	0.045	0.026	0.018	0.017	0.015	0.010	0.005
5000GtC	0.48	0.554	0.422	0.317	0.195	0.119	0.113	0.108	0.095	0.075
5000GtC	0.65	0.553	0.422	0.314	0.191	0.116	0.110	0.104	0.087	-
5000GtC	0.8	0.552	0.420	0.313	0.189	0.115	0.108	0.100	0.081	-
5000GtC	1.12	0.552	0.418	0.309	0.184	0.111	0.103	0.093	0.068	0.040

variables		year								
emis.	k_run	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.012	0.097	0.073	0.046	0.028	0.020	0.019	0.018	0.016	0.012
1000GtC	0.024	0.097	0.072	0.045	0.027	0.019	0.018	0.016	0.012	0.006
1000GtC	0.028	0.097	0.072	0.045	0.027	0.019	0.018	0.016	0.012	0.007
1000GtC	0.045	0.096	0.071	0.044	0.026	0.017	0.016	0.013	0.008	0.002
5000GtC	0.012	0.554	0.424	0.322	0.200	0.122	0.116	0.112	0.101	0.083
5000GtC	0.024	0.552	0.420	0.313	0.190	0.115	0.108	0.100	0.081	0.055
5000GtC	0.028	0.552	0.419	0.310	0.186	0.113	0.106	0.098	0.077	0.050
5000GtC	0.045	0.549	0.414	0.299	0.174	0.105	0.097	0.085	0.057	0.028

variables			year								
emis.	P_Ca	P_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	0.101	0.077	0.052	0.034	0.024	0.022	0.019	0.011	0.004
1000GtC	on	off	0.102	0.079	0.055	0.037	0.029	0.028	0.028	0.028	0.027
1000GtC	off	on	0.101	0.078	0.053	0.035	0.026	0.023	0.020	0.012	0.005
1000GtC	off	off	0.102	0.080	0.056	0.039	0.030	0.030	0.029	0.029	0.028
5000GtC	on	on	0.557	0.432	0.335	0.206	0.109	0.097	0.085	0.054	0.018
5000GtC	on	off	0.560	0.439	0.352	0.232	0.129	0.123	0.122	0.122	0.121
5000GtC	off	on	0.559	0.436	0.344	0.218	0.114	0.101	0.088	0.055	0.018
5000GtC	off	off	0.562	0.443	0.362	0.248	0.135	0.128	0.128	0.127	0.127

variables			year								
emis.	f_Ca	f_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	0.098	0.072	0.044	0.025	0.016	0.013	0.008	0.002	0.000
1000GtC	on	off	0.101	0.078	0.053	0.035	0.027	0.027	0.026	0.026	0.025
1000GtC	off	on	0.099	0.074	0.047	0.028	0.018	0.014	0.009	0.002	0.000
1000GtC	off	off	0.102	0.080	0.056	0.039	0.030	0.030	0.029	0.029	0.028
5000GtC	on	on	0.538	0.389	0.253	0.122	0.066	0.052	0.033	0.006	0.000
5000GtC	on	off	0.556	0.430	0.332	0.205	0.119	0.116	0.115	0.115	0.114
5000GtC	off	on	0.543	0.400	0.274	0.139	0.072	0.055	0.035	0.006	0.000
5000GtC	off	off	0.562	0.443	0.362	0.248	0.135	0.128	0.128	0.127	0.127

variables		year								
emis.	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	Globavg	0.092	0.063	0.032	0.014	0.007	0.004	0.001	0.000	0.000
1000GtC	GKWM	0.085	0.055	0.025	0.009	0.004	0.001	0.000	0.000	0.000
1000GtC	GEM-CO2	0.083	0.053	0.023	0.008	0.003	0.000	0.000	0.000	0.000
5000GtC	Globavg	0.517	0.347	0.188	0.081	0.043	0.028	0.012	0.000	0.000
5000GtC	GKWM	0.487	0.291	0.133	0.057	0.031	0.018	0.003	0.000	0.000
5000GtC	GEM-CO2	0.475	0.273	0.119	0.051	0.027	0.015	0.001	0.000	0.000

variables				year								
emis.	f_Ca	f_Si	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	Globavg	0.092	0.063	0.033	0.015	0.008	0.005	0.002	0.000	0.000
1000GtC	on	on	GKWM	0.085	0.055	0.025	0.009	0.004	0.001	0.000	0.000	0.000
1000GtC	on	off	Globavg	0.096	0.071	0.044	0.026	0.019	0.018	0.018	0.017	0.016
1000GtC	on	off	GKWM	0.098	0.073	0.046	0.027	0.018	0.017	0.016	0.013	0.009
1000GtC	off	on	Globavg	0.093	0.065	0.036	0.017	0.009	0.006	0.002	0.000	0.000
1000GtC	off	on	GKWM	0.087	0.057	0.027	0.010	0.004	0.001	0.000	0.000	0.000
1000GtC	off	off	Globavg	0.097	0.073	0.047	0.029	0.021	0.021	0.020	0.020	0.018
1000GtC	off	off	GKWM	0.100	0.076	0.051	0.032	0.022	0.021	0.021	0.020	0.019
5000GtC	on	on	Globavg	0.520	0.352	0.196	0.088	0.050	0.036	0.018	0.000	0.000
5000GtC	on	on	GKWM	0.487	0.291	0.133	0.057	0.031	0.018	0.003	0.000	0.000
5000GtC	on	off	Globavg	0.548	0.411	0.295	0.172	0.112	0.109	0.109	0.109	0.108
5000GtC	on	off	GKWM	0.554	0.427	0.324	0.194	0.110	0.104	0.099	0.086	0.068
5000GtC	off	on	Globavg	0.528	0.367	0.218	0.102	0.055	0.039	0.019	0.000	0.000
5000GtC	off	on	GKWM	0.494	0.303	0.143	0.062	0.033	0.017	0.002	0.000	0.000
5000GtC	off	off	Globavg	0.555	0.428	0.329	0.210	0.128	0.124	0.124	0.123	0.122
5000GtC	off	off	GKWM	0.565	0.453	0.380	0.271	0.137	0.126	0.126	0.125	0.125

variables		year								
emis.	routing	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1	0.102	0.080	0.056	0.039	0.030	0.029	0.029	0.029	0.028
1000GtC	2	0.102	0.080	0.056	0.039	0.030	0.030	0.029	0.029	0.028
1000GtC	3	0.106	0.087	0.068	0.055	0.052	0.060	0.077	0.129	0.216
5000GtC	1	0.562	0.444	0.364	0.250	0.136	0.128	0.128	0.127	0.126
5000GtC	2	0.562	0.443	0.362	0.248	0.135	0.128	0.128	0.127	0.127
5000GtC	3	0.568	0.460	0.397	0.304	0.167	0.158	0.174	0.225	0.302

variables		year								
emis.	lith.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	GKWM	0.086	0.056	0.025	0.010	0.004	0.001	0.000	0.000	0.000
1000GtC	GEM-CO2	0.085	0.055	0.025	0.009	0.004	0.001	0.000	0.000	-
1000GtC	GKWM av.	0.089	0.059	0.028	0.011	0.004	0.002	0.000	0.000	0.000
1000GtC	GEM-CO2 av.	0.094	0.066	0.036	0.016	0.007	0.004	0.001	0.000	0.000
1000GtC	mono acid	0.090	0.060	0.028	0.011	0.004	0.001	0.000	0.000	0.000
1000GtC	mono basalt	0.081	0.050	0.019	0.005	0.000	0.000	0.000	0.000	0.000
1000GtC	mono carb	0.076	0.054	0.027	0.010	0.005	0.003	0.000	0.000	0.000
1000GtC	mono granite	0.090	0.060	0.028	0.011	0.004	0.001	0.000	0.000	0.000
1000GtC	mono sand	0.104	0.085	0.061	0.036	0.016	0.011	0.008	0.002	0.000
1000GtC	mono shale	0.070	0.043	0.014	0.001	0.000	0.000	0.000	0.000	0.000
1000GtC	mono shield	0.090	0.060	0.028	0.011	0.004	0.001	0.000	0.000	0.000
5000GtC	GKWM	0.490	0.294	0.135	0.059	0.032	0.018	0.004	0.000	0.000
5000GtC	GEM-CO2	0.487	0.291	0.133	0.057	0.031	0.018	0.002	0.000	0.000
5000GtC	GKWM av.	0.505	0.321	0.158	0.067	0.036	0.022	0.006	0.000	0.000
5000GtC	GEM-CO2 av.	0.530	0.375	0.227	0.100	0.049	0.034	0.015	0.000	0.000
5000GtC	mono acid	0.506	0.327	0.163	0.063	0.029	0.015	0.002	0.000	0.000
5000GtC	mono basalt	0.459	0.249	0.096	0.034	0.014	0.004	0.000	0.000	0.000
5000GtC	mono carb	0.443	0.261	0.126	0.058	0.033	0.025	0.015	0.000	0.000
5000GtC	mono granite	0.506	0.327	0.163	0.063	0.029	0.015	0.002	0.000	0.000
5000GtC	mono sand	0.570	0.475	0.399	0.272	0.092	0.061	0.044	0.015	0.000
5000GtC	mono shale	0.392	0.193	0.062	0.011	0.000	0.000	0.000	0.000	0.000
5000GtC	mono shield	0.506	0.327	0.163	0.063	0.029	0.015	0.002	0.000	0.000

variables		year								
emis.	clim. sens.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1.5	0.098	0.073	0.047	0.029	0.019	0.017	0.013	0.005	0.001
1000GtC	2.64	0.098	0.072	0.044	0.025	0.016	0.013	0.008	0.002	0.000
1000GtC	3	0.098	0.073	0.044	0.025	0.016	0.013	0.008	0.002	0.000
1000GtC	4.5	0.100	0.074	0.044	0.023	0.014	0.010	0.005	0.000	0.000
1000GtC	6.	0.100	0.074	0.042	0.019	0.010	0.007	0.003	0.000	0.000
5000GtC	1.5	0.534	0.415	0.304	0.169	0.091	0.078	0.061	0.028	0.005
5000GtC	2.64	0.538	0.390	0.253	0.122	0.066	0.052	0.033	0.007	0.000
5000GtC	3	0.541	0.387	0.246	0.117	0.064	0.049	0.030	0.004	0.000
5000GtC	4.5	0.550	0.378	0.228	0.108	0.060	0.042	0.020	0.001	0.000
5000GtC	6.	0.540	0.355	0.206	0.099	0.056	0.035	0.016	0.001	0.000

Table 15: **Percentages** of remaining excess **Surface ocean acidification** reached at specific calendar years

variables		year								
emis.	short-circ.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	yes	36.0	24.8	13.0	6.0	3.1	2.0	0.6	-0.9	-1.2
1000GtC	no	35.8	24.4	12.5	5.6	2.9	1.8	0.5	-0.9	-1.2
5000GtC	yes	66.5	45.0	25.1	11.3	6.4	4.6	2.4	-0.2	-0.8
5000GtC	no	66.0	43.8	23.4	10.6	6.1	4.3	2.1	-0.4	-0.8

variables			year								
emis.	T_Ca	T_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	38.6	29.3	19.0	11.7	8.0	6.8	4.9	1.5	-1.2
1000GtC	on	off	39.4	30.7	21.3	14.5	11.2	11.0	10.9	10.6	10.2
1000GtC	off	on	38.9	29.7	19.6	12.4	8.7	7.5	5.7	2.5	0.4
1000GtC	off	off	39.6	31.0	21.7	15.0	11.7	11.5	11.4	11.3	11.0
5000GtC	on	on	70.4	53.2	38.6	21.4	11.4	9.7	7.4	3.1	0.3
5000GtC	on	off	71.6	56.1	45.0	29.7	16.5	15.7	15.6	15.6	15.4
5000GtC	off	on	70.6	53.7	39.8	22.7	11.9	10.0	7.6	3.1	0.3
5000GtC	off	off	71.9	56.7	46.3	31.7	17.3	16.4	16.3	16.3	16.2

variables		year								
emis.	E_a (kJ/mol)	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	45	37.4	27.2	16.3	9.1	5.8	4.9	3.6	1.1	-0.6
1000GtC	63	37.2	26.7	15.6	8.3	5.1	4.1	2.6	0.2	-1.0
1000GtC	74	37.0	26.5	15.2	8.0	4.8	3.7	2.1	-0.2	-1.1
1000GtC	103	36.6	25.7	14.2	7.0	3.9	2.7	1.1	-0.7	-1.1
5000GtC	45	69.6	51.5	35.5	19.3	11.4	9.9	7.7	3.4	0.5
5000GtC	63	69.0	50.1	33.0	17.1	10.0	8.2	5.8	1.7	-0.4
5000GtC	74	68.7	49.4	31.8	16.1	9.3	7.4	4.9	1.1	-0.6
5000GtC	103	67.4	46.9	28.0	13.3	7.5	5.6	3.1	0.0	-0.8

variables				year								
emis.	R_Ca	R_Si	R_explicit	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	on	39.4	30.6	21.1	14.3	10.9	10.4	9.9	8.5	6.4
1000GtC	on	on	off	39.2	30.3	20.6	13.7	10.3	9.7	8.9	6.9	4.2
1000GtC	on	off	on	39.5	30.9	21.5	14.7	11.4	11.1	11.0	10.7	10.1
1000GtC	on	off	off	39.5	30.8	21.4	14.5	11.2	11.0	10.9	10.6	10.2
1000GtC	off	on	on	39.5	30.8	21.4	14.5	11.0	10.5	9.9	8.2	5.6
1000GtC	off	on	off	39.4	30.6	21.1	14.1	10.6	9.9	9.0	6.8	3.9
1000GtC	off	off	on	39.6	31.0	21.7	15.0	11.7	11.5	11.4	11.3	11.0
1000GtC	off	off	off	39.6	31.0	21.7	15.0	11.7	11.5	11.4	11.3	11.0
5000GtC	on	on	on	71.6	56.0	44.6	29.1	15.9	14.8	14.1	12.2	9.4
5000GtC	on	on	off	71.4	55.4	43.4	27.2	14.9	13.7	12.6	9.8	5.8
5000GtC	on	off	on	71.8	56.3	45.6	30.6	16.9	16.0	15.9	15.8	15.7
5000GtC	on	off	off	71.7	56.3	45.3	30.1	16.6	15.7	15.7	15.7	15.6
5000GtC	off	on	on	71.8	56.4	45.5	30.4	16.3	15.0	14.3	12.3	9.2
5000GtC	off	on	off	71.7	56.1	44.8	29.3	15.6	14.1	13.0	9.8	5.6
5000GtC	off	off	on	71.9	56.7	46.3	31.7	17.3	16.4	16.3	16.3	16.2
5000GtC	off	off	off	71.9	56.7	46.3	31.7	17.3	16.4	16.3	16.3	16.2

variables		year								
emis.	beta	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.48	38.1	28.4	17.9	10.8	7.7	7.3	6.9	5.8	4.2
1000GtC	0.65	38.0	28.3	17.8	10.7	7.6	7.2	6.7	5.3	3.5
1000GtC	0.8	38.0	28.2	17.7	10.6	7.5	7.0	6.4	4.8	2.9
1000GtC	1.12	37.9	28.1	17.5	10.4	7.2	6.7	5.9	4.0	1.9
5000GtC	0.48	70.8	54.0	40.6	24.9	15.2	14.4	13.8	12.1	9.6
5000GtC	0.65	70.7	53.9	40.2	24.4	14.9	14.1	13.3	11.2	-
5000GtC	0.8	70.6	53.7	40.0	24.1	14.6	13.8	12.8	10.3	-
5000GtC	1.12	70.5	53.5	39.4	23.5	14.2	13.2	11.9	8.7	5.1

variables		year								
emis.	k_run	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	0.012	38.2	28.5	18.1	11.1	7.9	7.6	7.2	6.2	4.7
1000GtC	0.024	38.0	28.3	17.8	10.7	7.5	7.0	6.3	4.6	2.5
1000GtC	0.028	38.0	28.2	17.7	10.6	7.4	6.9	6.3	4.6	2.6
1000GtC	0.045	37.8	27.9	17.2	10.1	6.9	6.2	5.3	3.1	0.8
5000GtC	0.012	70.8	54.3	41.1	25.6	15.6	14.9	14.3	12.9	10.7
5000GtC	0.024	70.6	53.7	40.0	24.2	14.7	13.8	12.8	10.3	7.0
5000GtC	0.028	70.5	53.5	39.6	23.8	14.5	13.6	12.5	9.8	6.3
5000GtC	0.045	70.2	52.9	38.2	22.2	13.5	12.4	10.9	7.3	3.6

variables			year								
emis.	P_Ca	P_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	39.0	30.0	20.1	13.0	9.5	8.6	7.3	4.4	1.6
1000GtC	on	off	39.4	30.7	21.2	14.4	11.2	11.0	10.9	10.7	10.4
1000GtC	off	on	39.2	30.3	20.6	13.5	9.9	9.0	7.7	4.7	1.8
1000GtC	off	off	39.6	31.0	21.7	15.0	11.7	11.5	11.4	11.3	11.0
5000GtC	on	on	71.3	55.3	42.9	26.4	14.0	12.5	10.8	6.9	2.3
5000GtC	on	off	71.7	56.1	45.0	29.7	16.5	15.7	15.7	15.6	15.5
5000GtC	off	on	71.5	55.8	44.0	27.9	14.6	12.9	11.2	7.0	2.3
5000GtC	off	off	71.9	56.7	46.3	31.7	17.3	16.4	16.3	16.3	16.2

variables			year								
emis.	f_Ca	f_Si	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	37.8	27.9	17.1	9.8	6.4	5.0	3.3	0.8	-0.1
1000GtC	on	off	39.1	30.2	20.5	13.6	10.5	10.3	10.3	10.1	9.7
1000GtC	off	on	38.3	28.6	18.0	10.7	7.0	5.4	3.4	0.8	-0.1
1000GtC	off	off	39.6	31.0	21.7	15.0	11.7	11.5	11.4	11.2	11.0
5000GtC	on	on	68.8	49.8	32.3	15.6	8.4	6.6	4.3	0.8	-0.5
5000GtC	on	off	71.2	55.0	42.5	26.3	15.3	14.8	14.8	14.7	14.6
5000GtC	off	on	69.5	51.3	35.1	17.8	9.2	7.1	4.4	0.8	-0.5
5000GtC	off	off	71.9	56.7	46.3	31.7	17.3	16.4	16.3	16.3	16.2

variables		year								
emis.	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	Globavg	36.0	24.6	12.7	5.6	2.7	1.5	0.2	-1.0	-1.1
1000GtC	GKWM	34.1	22.1	10.0	3.7	1.4	0.4	-0.7	-1.4	-1.5
1000GtC	GEM-CO2	33.5	21.4	9.2	3.2	1.1	0.1	-0.8	-1.4	-1.6
5000GtC	Globavg	66.2	44.4	24.1	10.4	5.5	3.6	1.5	-0.6	-0.9
5000GtC	GKWM	62.7	37.4	17.0	7.4	4.0	2.3	0.4	-0.8	-1.0
5000GtC	GEM-CO2	61.2	35.1	15.3	6.5	3.5	1.9	0.2	-0.8	-0.9

variables				year								
emis.	f_Ca	f_Si	Scheme	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	on	on	Globavg	36.0	24.8	13.0	6.0	3.1	2.0	0.6	-0.9	-1.2
1000GtC	on	on	GKWM	34.1	22.1	10.0	3.7	1.4	0.4	-0.7	-1.4	-1.5
1000GtC	on	off	Globavg	37.7	27.8	17.1	10.1	7.3	7.1	7.0	6.8	6.4
1000GtC	on	off	GKWM	38.2	28.3	17.8	10.5	7.2	6.7	6.3	5.2	3.6
1000GtC	off	on	Globavg	36.6	25.7	14.1	6.8	3.6	2.3	0.8	-0.8	-1.1
1000GtC	off	on	GKWM	34.6	22.7	10.6	4.1	1.6	0.5	-0.7	-1.4	-1.4
1000GtC	off	off	Globavg	38.3	28.7	18.5	11.4	8.3	8.1	8.0	7.7	7.3
1000GtC	off	off	GKWM	38.9	29.7	19.9	12.4	8.4	8.1	8.0	7.7	7.2
5000GtC	on	on	Globavg	66.5	45.0	25.1	11.3	6.4	4.6	2.4	-0.2	-0.8
5000GtC	on	on	GKWM	62.7	37.5	17.1	7.4	4.0	2.3	0.4	-0.8	-1.0
5000GtC	on	off	Globavg	70.1	52.6	37.7	22.0	14.3	14.0	14.0	13.9	13.8
5000GtC	on	off	GKWM	70.8	54.5	41.4	24.8	14.0	13.2	12.7	11.0	8.6
5000GtC	off	on	Globavg	67.5	47.0	27.9	13.1	7.0	5.0	2.5	-0.3	-0.9
5000GtC	off	on	GKWM	63.5	38.9	18.3	8.0	4.2	2.2	0.3	-0.8	-0.9
5000GtC	off	off	Globavg	71.0	54.7	42.1	26.8	16.3	15.9	15.8	15.7	15.6
5000GtC	off	off	GKWM	72.0	57.8	48.4	34.6	17.5	16.0	16.0	16.0	15.9

variables		year								
emis.	routing	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1	39.6	31.1	21.8	15.0	11.7	11.4	11.3	11.2	10.8
1000GtC	2	39.6	31.0	21.7	15.0	11.7	11.5	11.4	11.3	11.0
1000GtC	3	41.0	33.4	26.1	21.0	19.9	23.1	29.6	49.8	83.2
5000GtC	1	71.9	56.8	46.5	32.0	17.4	16.4	16.3	16.3	16.2
5000GtC	2	71.9	56.7	46.3	31.7	17.3	16.4	16.3	16.3	16.2
5000GtC	3	72.7	58.9	50.8	38.9	21.4	20.2	22.2	28.8	38.6

variables		year								
emis.	lith.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	GKWM	34.3	22.3	10.1	3.8	1.5	0.4	-0.6	-1.4	-1.5
1000GtC	GEM-CO2	34.1	22.1	10.0	3.7	1.4	0.4	-0.7	-1.4	-
1000GtC	GKWM av.	35.1	23.3	11.1	4.4	1.8	0.6	-0.6	-1.5	-1.8
1000GtC	GEM-CO2 av.	36.7	25.7	14.0	6.4	2.9	1.7	0.2	-1.2	-1.6
1000GtC	mono acid	35.3	23.4	11.1	4.2	1.5	0.4	-0.6	-1.2	-1.2
1000GtC	mono basalt	32.6	20.0	7.5	1.9	0.1	-0.6	-1.2	-1.5	-1.6
1000GtC	mono carb	32.0	22.7	11.3	4.3	2.0	1.3	0.2	-1.5	-2.5
1000GtC	mono granite	35.3	23.4	11.2	4.2	1.5	0.4	-0.6	-1.2	-1.2
1000GtC	mono sand	39.8	32.3	23.3	13.9	6.1	4.4	3.0	0.7	-0.5
1000GtC	mono shale	29.2	17.9	5.7	0.3	-0.7	-1.1	-1.4	-1.7	-2.1
1000GtC	mono shield	35.3	23.4	11.2	4.2	1.5	0.4	-0.6	-1.2	-1.2
5000GtC	GKWM	62.9	37.9	17.4	7.6	4.1	2.4	0.5	-0.8	-0.9
5000GtC	GEM-CO2	62.7	37.5	17.1	7.4	4.0	2.3	0.3	-0.8	-1.0
5000GtC	GKWM av.	64.7	41.1	20.3	8.6	4.6	2.8	0.8	-0.9	-1.0
5000GtC	GEM-CO2 av.	67.7	47.9	29.0	12.7	6.2	4.3	1.9	-0.5	-1.0
5000GtC	mono acid	64.7	41.8	20.8	8.1	3.7	2.0	0.2	-0.9	-1.0
5000GtC	mono basalt	59.1	32.1	12.4	4.4	1.8	0.5	-0.5	-0.9	-1.0
5000GtC	mono carb	58.0	34.1	16.5	7.6	4.3	3.3	1.9	-0.2	-1.1
5000GtC	mono granite	64.7	41.8	20.8	8.1	3.7	2.0	0.2	-0.9	-1.0
5000GtC	mono sand	72.2	60.2	50.6	34.5	11.7	7.8	5.6	1.9	-0.2
5000GtC	mono shale	51.2	25.2	8.0	1.5	0.0	-0.4	-0.8	-1.0	-1.1
5000GtC	mono shield	64.7	41.8	20.8	8.1	3.7	2.0	0.2	-0.9	-1.0

variables		year								
emis.	clim. sens.	3000	5000	10000	20000	50000	100k	200k	500k	1000k
1000GtC	1.5	38.1	28.4	18.3	11.1	7.6	6.4	4.9	2.1	0.4
1000GtC	2.64	37.8	27.9	17.1	9.8	6.4	5.0	3.2	0.7	-0.1
1000GtC	3	38.1	28.1	17.2	9.7	6.2	4.9	3.1	0.7	-0.0
1000GtC	4.5	38.5	28.6	17.1	9.0	5.4	3.9	2.1	0.2	-0.2
1000GtC	6.	38.3	28.3	16.1	7.3	3.9	2.5	1.0	-0.5	-0.6
5000GtC	1.5	68.5	53.2	39.0	21.7	11.7	10.0	7.8	3.5	0.7
5000GtC	2.64	68.8	49.9	32.4	15.6	8.4	6.6	4.2	0.9	-0.4
5000GtC	3	69.4	49.6	31.6	15.0	8.2	6.2	3.8	0.5	-0.6
5000GtC	4.5	70.3	48.4	29.2	13.8	7.7	5.3	2.5	0.1	-0.4
5000GtC	6.	69.0	45.3	26.3	12.6	7.2	4.5	2.0	0.1	-0.2

Table 16: **Years** that specific values of **Surface ocean acidification** are reached

variables		**Surface ocean acidification (pH units below 8.15 baseline)**									
emis.	short-circ.	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	yes	0.25	2010	-	-	-	-	-	2090	2750	280010
1000GtC	no	0.25	2010	-	-	-	-	-	2090	2750	260010
5000GtC	yes	0.78	2010	2180	2600	3200	4200	6400	10010	18010	450010
5000GtC	no	0.78	2010	2180	2550	3200	4100	6010	9500	17000	420010

variables			**Surface ocean acidification (pH units below 8.15 baseline)**									
emis.	T_Ca	T_Si	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	on	on	0.26	2010	-	-	-	-	-	2100	3000	800000
1000GtC	on	off	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	on	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	off	0.26	2010	-	-	-	-	-	2100	3100	-
5000GtC	on	on	0.78	2010	2220	2700	3500	5600	11000	17000	38000	-
5000GtC	on	off	0.78	2010	2220	2750	3700	7000	14000	24000	-	-
5000GtC	off	on	0.78	2010	2220	2700	3500	5800	11000	18000	42000	-
5000GtC	off	off	0.78	2010	2220	2750	3700	7500	16000	28000	-	-

variables		**Surface ocean acidification (pH units below 8.15 baseline)**									
emis.	E_a (kJ/mol)	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	45	0.25	2010	-	-	-	-	-	2090	2850	760010
1000GtC	63	0.25	2010	-	-	-	-	-	2090	2850	540010
1000GtC	74	0.25	2010	-	-	-	-	-	2090	2800	470010
1000GtC	103	0.25	2010	-	-	-	-	-	2090	2800	330010
5000GtC	45	0.78	2010	2200	2650	3400	5200	9000	15000	36010	-
5000GtC	63	0.78	2010	2200	2650	3400	4900	8500	14010	30010	840010
5000GtC	74	0.78	2010	2200	2650	3300	4700	8010	13000	26010	720010
5000GtC	103	0.78	2010	2200	2600	3200	4400	7000	11000	22010	520010

variables				Surface ocean acidification (pH units below 8.15 baseline)									
emis.	R_Ca	R_Si	R_explicit	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	on	on	on	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	on	on	off	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	on	off	on	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	on	off	off	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	on	on	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	on	off	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	off	on	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	off	off	0.26	2010	-	-	-	-	-	2100	3100	-
5000GtC	on	on	on	0.78	2010	2220	2750	3600	7000	14000	24000	400000	-
5000GtC	on	on	off	0.78	2010	2220	2700	3600	6600	13000	22000	190000	-
5000GtC	on	off	on	0.78	2010	2220	2750	3700	7500	15000	26000	-	-
5000GtC	on	off	off	0.78	2010	2220	2750	3700	7500	15000	26000	-	-
5000GtC	off	on	on	0.78	2010	2220	2750	3700	7500	15000	26000	440000	-
5000GtC	off	on	off	0.78	2010	2220	2750	3700	7000	14000	24000	220000	-
5000GtC	off	off	on	0.78	2010	2220	2750	3700	7500	16000	28000	-	-
5000GtC	off	off	off	0.78	2010	2220	2750	3700	7500	16000	28000	-	-

variables		Surface ocean acidification (pH units below 8.15 baseline)									
emis.	beta	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	0.48	0.25	2010	-	-	-	-	-	2090	2900	-
1000GtC	0.65	0.25	2010	-	-	-	-	-	2090	2900	-
1000GtC	0.8	0.25	2010	-	-	-	-	-	2090	2900	-
1000GtC	1.12	0.25	2010	-	-	-	-	-	2090	2900	-
5000GtC	0.48	0.78	2010	2220	2700	3600	6010	12010	20010	380010	-
5000GtC	0.65	0.78	2010	2200	2700	3500	5800	11000	19000	270010	-
5000GtC	0.8	0.78	2010	2200	2700	3500	5800	11000	19000	210010	-
5000GtC	1.12	0.78	2010	2200	2700	3500	5800	11000	19000	130010	-

variables		Surface ocean acidification (pH units below 8.15 baseline)									
emis.	k_run	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	0.012	0.25	2010	-	-	-	-	-	2090	2900	-
1000GtC	0.024	0.25	2010	-	-	-	-	-	2090	2900	-
1000GtC	0.028	0.25	2010	-	-	-	-	-	2090	2900	-
1000GtC	0.045	0.25	2010	-	-	-	-	-	2090	2900	-
5000GtC	0.012	0.78	2010	2220	2700	3600	6010	12010	22010	520010	-
5000GtC	0.024	0.78	2010	2200	2700	3500	5800	11000	19000	210010	-
5000GtC	0.028	0.78	2010	2200	2700	3500	5800	11000	19000	180010	-
5000GtC	0.045	0.78	2010	2200	2700	3500	5600	10010	18010	80010	-

variables			Surface ocean acidification (pH units below 8.15 baseline)									
emis.	P_Ca	P_Si	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	on	on	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	on	off	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	on	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	off	0.26	2010	-	-	-	-	-	2100	3100	-
5000GtC	on	on	0.78	2010	2220	2700	3600	6400	13000	22000	85000	-
5000GtC	on	off	0.78	2010	2220	2750	3700	7000	14000	24000	-	-
5000GtC	off	on	0.78	2010	2220	2750	3600	6800	14000	24000	110000	-
5000GtC	off	off	0.78	2010	2220	2750	3700	7500	16000	28000	-	-

variables			Surface ocean acidification (pH units below 8.15 baseline)									
emis.	f_Ca	f_Si	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	on	on	0.26	2010	-	-	-	-	-	2100	2950	950000
1000GtC	on	off	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	off	on	0.26	2010	-	-	-	-	-	2100	2950	850000
1000GtC	off	off	0.26	2010	-	-	-	-	-	2100	3100	-
5000GtC	on	on	0.78	2010	2200	2650	3300	4800	8000	13000	26000	750000
5000GtC	on	off	0.78	2010	2220	2700	3600	6400	13000	22000	-	-
5000GtC	off	on	0.78	2010	2200	2650	3400	5200	9000	15000	28000	700000
5000GtC	off	off	0.78	2010	2220	2750	3700	7500	16000	28000	-	-

variables		Surface ocean acidification (pH units below 8.15 baseline)									
emis.	Scheme	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	Globavg	0.25	2010	-	-	-	-	-	2090	2750	230010
1000GtC	GKWM	0.25	2010	-	-	-	-	-	2080	2600	130010
1000GtC	GEM-CO2	0.25	2010	-	-	-	-	-	2080	2600	110010
5000GtC	Globavg	0.78	2010	2180	2550	3200	4100	6200	9500	17000	350010
5000GtC	GKWM	0.78	2010	2160	2500	2950	3700	4900	7500	13000	250010
5000GtC	GEM-CO2	0.78	2010	2160	2450	2900	3500	4600	6800	12010	220010

variables				Surface ocean acidification (pH units below 8.15 baseline)									
emis.	f_Ca	f_Si	Scheme	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	on	on	Globavg	0.25	2010	-	-	-	-	-	2090	2750	280010
1000GtC	on	on	GKWM	0.25	2010	-	-	-	-	-	2080	2600	130010
1000GtC	on	off	Globavg	0.25	2010	-	-	-	-	-	2090	2850	-
1000GtC	on	off	GKWM	0.26	2010	-	-	-	-	-	2090	2950	-
1000GtC	off	on	Globavg	0.25	2010	-	-	-	-	-	2090	2800	290010
1000GtC	off	on	GKWM	0.25	2010	-	-	-	-	-	2080	2650	140010
1000GtC	off	off	Globavg	0.25	2010	-	-	-	-	-	2090	2900	-
1000GtC	off	off	GKWM	0.26	2010	-	-	-	-	-	2100	3000	-
5000GtC	on	on	Globavg	0.78	2010	2180	2600	3200	4200	6400	10010	18010	450010
5000GtC	on	on	GKWM	0.78	2010	2160	2500	2950	3700	4900	7500	13000	240010
5000GtC	on	off	Globavg	0.78	2010	2200	2700	3500	5400	10010	17000	-	-
5000GtC	on	off	GKWM	0.78	2010	2220	2700	3600	6200	12010	20010	190010	-
5000GtC	off	on	Globavg	0.78	2010	2200	2600	3300	4400	7000	11000	22010	430010
5000GtC	off	on	GKWM	0.78	2010	2160	2500	3000	3800	5200	8010	14010	230010
5000GtC	off	off	Globavg	0.78	2010	2220	2700	3600	6200	12010	22010	-	-
5000GtC	off	off	GKWM	0.78	2010	2220	2750	3800	8500	18010	30010	-	-

variables		Surface ocean acidification (pH units below 8.15 baseline)									
emis.	routing	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	1	0.26	2010	-	-	-	-	-	2100	3200	-
1000GtC	2	0.26	2010	-	-	-	-	-	2100	3100	-
1000GtC	3	0.26	2010	-	-	-	-	-	2120	3400	-
5000GtC	1	0.78	2010	2220	2750	3700	7500	16000	28000	-	-
5000GtC	2	0.78	2010	2220	2750	3700	7500	16000	28000	-	-
5000GtC	3	0.78	2010	2220	2800	3900	10000	22000	38000	-	-

variables		Surface ocean acidification (pH units below 8.15 baseline)									
emis.	lith.	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	GKWM	0.25	2010	-	-	-	-	-	2080	2650	140010
1000GtC	GEM-CO2	0.25	2010	-	-	-	-	-	2080	2600	130010
1000GtC	GKWM av.	0.25	2010	-	-	-	-	-	2080	2700	150010
1000GtC	GEM-CO2 av.	0.26	2010	-	-	-	-	-	2090	2800	230010
1000GtC	mono acid	0.25	2010	-	-	-	-	-	2090	2700	140010
1000GtC	mono basalt	0.25	2010	-	-	-	-	-	2070	2550	60010
1000GtC	mono carb	0.24	2010	-	-	-	-	-	2060	2450	220010
1000GtC	mono granite	0.25	2010	-	-	-	-	-	2090	2700	140010
1000GtC	mono sand	0.26	2010	-	-	-	-	-	2120	3300	700010
1000GtC	mono shale	0.24	2010	-	-	-	-	-	2060	2400	24010
1000GtC	mono shield	0.25	2010	-	-	-	-	-	2090	2700	140010
5000GtC	GKWM	0.78	2010	2160	2500	2950	3700	5000	7500	13000	250010
5000GtC	GEM-CO2	0.78	2010	2160	2500	2950	3700	4900	7500	13000	240010
5000GtC	GKWM av.	0.78	2010	2180	2550	3100	3900	5600	8500	15000	280010
5000GtC	GEM-CO2 av.	0.78	2010	2200	2600	3300	4500	7500	12010	20010	390010
5000GtC	mono acid	0.78	2010	2180	2550	3100	3900	5600	8500	15000	230010
5000GtC	mono basalt	0.78	2010	2140	2450	2800	3400	4300	6010	10010	140010
5000GtC	mono carb	0.76	2010	2120	2350	2750	3300	4400	6600	13000	460010
5000GtC	mono granite	0.78	2010	2180	2550	3100	3900	5600	8500	15000	230010
5000GtC	mono sand	0.79	2010	2240	2800	4100	10010	18010	28010	48010	940010
5000GtC	mono shale	0.77	2010	2100	2300	2600	3000	3700	4900	8010	55000
5000GtC	mono shield	0.78	2010	2180	2550	3100	3900	5600	8500	15000	230010

variables		Surface ocean acidification (pH units below 8.15 baseline)									
emis.	clim. sens.	peak	at year	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.
1000GtC	1.5	0.26	2010	-	-	-	-	-	2100	2950	-
1000GtC	2.64	0.26	2010	-	-	-	-	-	2100	2950	900000
1000GtC	3	0.26	2010	-	-	-	-	-	2100	2950	1000000
1000GtC	4.5	0.26	2010	-	-	-	-	-	2120	3000	650000
1000GtC	6.	0.26	2010	-	-	-	-	-	2120	3000	340000
5000GtC	1.5	0.78	2010	2200	2600	3400	5600	11000	17000	40000	-
5000GtC	2.64	0.78	2010	2200	2650	3300	4800	8000	13000	26000	750000
5000GtC	3	0.78	2010	2200	2650	3400	4700	8000	13000	24000	650000
5000GtC	4.5	0.78	2010	2220	2700	3400	4600	7500	12000	22000	550000
5000GtC	6.	0.78	2010	2220	2700	3300	4200	6600	11000	20000	600000

Table 17: **Years** that specific fractions of remaining excess **Surface ocean acidification** are reached

variables		fraction									
emis.	short-circ.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	yes	2040	2120	2400	5000	13000	2950	10010	26010	110010	200010
1000GtC	no	2040	2120	2350	4900	13000	2950	9500	24010	100010	190010
5000GtC	yes	2180	2650	4300	11000	24010	6800	18010	90010	240010	340010
5000GtC	no	2180	2650	4200	9500	22010	6400	16010	80010	220010	320010

variables			fraction									
emis.	T_Ca	T_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2050	2120	2400	6600	28000	3300	17000	200000	460000	650000
1000GtC	on	off	2050	2120	2450	8000	-	3400	24000	-	-	-
1000GtC	off	on	2050	2120	2450	7000	32000	3300	18000	260000	650000	950000
1000GtC	off	off	2050	2120	2450	8000	-	3400	26000	-	-	-
5000GtC	on	on	2200	2800	6000	18000	90000	11000	34000	340000	700000	950000
5000GtC	on	off	2200	2850	7500	26000	-	15000	-	-	-	-
5000GtC	off	on	2200	2800	6200	19000	110000	12000	38000	360000	700000	950000
5000GtC	off	off	2200	2850	8000	28000	-	17000	-	-	-	-

variables		fraction									
emis.	E_a (kJ/mol)	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	45	2040	2120	2400	5800	18010	3100	13000	100010	390010	600010
1000GtC	63	2040	2120	2400	5600	17000	3100	12010	55000	270010	410010
1000GtC	74	2040	2120	2400	5600	16010	3100	12010	46010	230010	350010
1000GtC	103	2040	2120	2400	5400	15000	3000	11000	32010	150010	240010
5000GtC	45	2200	2750	5400	16010	95000	9500	32010	370010	720010	960010
5000GtC	63	2180	2700	5200	14010	55000	9000	28010	240010	490010	660010
5000GtC	74	2180	2700	4900	14010	42010	8500	26010	200010	420010	580010
5000GtC	103	2180	2650	4500	12010	28010	7500	20010	130010	290010	400010

variables				fraction									
emis.	R_Ca	R_Si	R_explicit	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	on	2050	2120	2450	7500	190000	3400	24000	-	-	-
1000GtC	on	on	off	2050	2120	2450	7500	70000	3400	22000	900000	-	-
1000GtC	on	off	on	2050	2120	2450	8000	-	3400	26000	-	-	-
1000GtC	on	off	off	2050	2120	2450	8000	-	3400	24000	-	-	-
1000GtC	off	on	on	2050	2120	2450	8000	180000	3400	24000	-	-	-
1000GtC	off	on	off	2050	2120	2450	7500	95000	3400	22000	850000	-	-
1000GtC	off	off	on	2050	2120	2450	8000	-	3400	26000	-	-	-
1000GtC	off	off	off	2050	2120	2450	8000	-	3400	26000	-	-	-
5000GtC	on	on	on	2200	2850	7500	24000	950000	15000	300000	-	-	-
5000GtC	on	on	off	2200	2800	7000	24000	480000	14000	120000	-	-	-
5000GtC	on	off	on	2200	2850	8000	26000	-	16000	-	-	-	-
5000GtC	on	off	off	2200	2850	8000	26000	-	16000	-	-	-	-
5000GtC	off	on	on	2200	2850	8000	26000	900000	16000	320000	-	-	-
5000GtC	off	on	off	2200	2850	7500	24000	500000	15000	150000	-	-	-
5000GtC	off	off	on	2200	2850	8000	28000	-	17000	-	-	-	-
5000GtC	off	off	off	2200	2850	8000	28000	-	17000	-	-	-	-

variables		fraction									
emis.	beta	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	0.48	2040	2120	2400	6200	24010	3200	15000	760010	-	-
1000GtC	0.65	2040	2120	2400	6200	24010	3200	15000	580010	-	-
1000GtC	0.8	2040	2120	2400	6200	22010	3200	15000	480010	-	-
1000GtC	1.12	2040	2120	2400	6200	22010	3200	14010	340010	-	-
5000GtC	0.48	2200	2800	6400	20010	940010	12010	250010	-	-	-
5000GtC	0.65	2200	2800	6200	20010	-	12010	170010	-	-	-
5000GtC	0.8	2200	2800	6200	20010	560010	12010	130010	-	-	-
5000GtC	1.12	2200	2800	6010	19000	370010	12010	75000	-	-	-

variables		fraction									
emis.	k_run	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	0.012	2040	2120	2400	6400	24010	3200	15000	900010	-	-
1000GtC	0.024	2040	2120	2400	6200	24010	3200	15000	440010	-	-
1000GtC	0.028	2040	2120	2400	6200	24010	3200	15000	430010	-	-
1000GtC	0.045	2040	2120	2400	6010	22010	3200	14010	240010	740010	-
5000GtC	0.012	2200	2800	6400	22010	-	13000	360010	-	-	-
5000GtC	0.024	2200	2800	6200	20010	560010	12010	130010	-	-	-
5000GtC	0.028	2200	2800	6200	19000	480010	12010	110010	-	-	-
5000GtC	0.045	2200	2750	5800	18010	270010	11000	50010	780010	-	-

variables			fraction									
emis.	P_Ca	P_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2050	2120	2450	7500	40000	3300	19000	440000	1000000	-
1000GtC	on	off	2050	2120	2450	7500	-	3400	24000	-	-	-
1000GtC	off	on	2050	2120	2450	7500	48000	3400	22000	480000	1000000	-
1000GtC	off	off	2050	2120	2450	8000	-	3400	26000	-	-	-
5000GtC	on	on	2200	2800	7000	22000	260000	14000	60000	700000	-	-
5000GtC	on	off	2200	2850	7500	26000	-	15000	-	-	-	-
5000GtC	off	on	2200	2800	7500	24000	280000	14000	75000	650000	-	-
5000GtC	off	off	2200	2850	8000	28000	-	17000	-	-	-	-

variables			fraction									
emis.	f_Ca	f_Si	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	2050	2120	2400	6000	20000	3200	14000	110000	340000	550000
1000GtC	on	off	2050	2120	2450	7500	650000	3400	22000	-	-	-
1000GtC	off	on	2050	2120	2400	6400	24000	3200	15000	120000	340000	550000
1000GtC	off	off	2050	2120	2450	8000	-	3400	26000	-	-	-
5000GtC	on	on	2200	2700	5000	14000	34000	8500	24000	170000	380000	550000
5000GtC	on	off	2200	2800	6800	22000	-	13000	-	-	-	-
5000GtC	off	on	2200	2750	5400	15000	42000	9500	28000	180000	380000	550000
5000GtC	off	off	2200	2850	8000	28000	-	17000	-	-	-	-

variables		fraction									
emis.	Scheme	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	Globavg	2040	2120	2400	4900	13000	2950	9500	24010	85000	160010
1000GtC	GKWM	2040	2100	2350	4400	10010	2800	8010	17000	40010	85000
1000GtC	GEM-CO2	2040	2100	2350	4300	9500	2750	8010	15000	32010	70010
5000GtC	Globavg	2180	2650	4300	10010	22010	6600	17000	65000	180010	270010
5000GtC	GKWM	2160	2550	3800	7500	16010	5200	12010	34010	120010	180010
5000GtC	GEM-CO2	2160	2550	3600	7000	14010	4800	11000	28010	110010	170010

variables				fraction									
emis.	f_Ca	f_Si	Scheme	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	on	on	Globavg	2040	2120	2400	5000	13000	2950	10010	26010	110010	200010
1000GtC	on	on	GKWM	2040	2100	2350	4400	10010	2800	8010	17000	40010	85000
1000GtC	on	off	Globavg	2040	2120	2400	6010	22010	3200	14010	-	-	-
1000GtC	on	off	GKWM	2050	2120	2400	6200	22010	3200	15000	580010	-	-
1000GtC	off	on	Globavg	2040	2120	2400	5200	14010	3000	11000	30010	130010	220010
1000GtC	off	on	GKWM	2040	2100	2350	4500	11000	2850	8500	18010	44010	90010
1000GtC	off	off	Globavg	2040	2120	2400	6400	26010	3200	16010	-	-	-
1000GtC	off	off	GKWM	2050	2120	2400	7000	30010	3300	18010	-	-	-
5000GtC	on	on	Globavg	2180	2650	4300	11000	24010	6800	18010	90010	240010	340010
5000GtC	on	on	GKWM	2160	2550	3800	7500	16010	5200	12010	34010	120010	180010
5000GtC	on	off	Globavg	2200	2750	5800	18010	-	11000	-	-	-	-
5000GtC	on	off	GKWM	2200	2800	6600	20010	720010	13000	70010	-	-	-
5000GtC	off	on	Globavg	2180	2700	4600	12010	28010	7500	20010	110010	240010	340010
5000GtC	off	on	GKWM	2160	2550	3900	8010	17000	5400	13000	38010	120010	180010
5000GtC	off	off	Globavg	2200	2800	6600	22010	-	13000	-	-	-	-
5000GtC	off	off	GKWM	2200	2850	9500	30010	-	19000	-	-	-	-

variables		fraction									
emis.	routing	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	1	2050	2120	2450	8000	-	3500	26000	-	-	-
1000GtC	2	2050	2120	2450	8000	-	3400	26000	-	-	-
1000GtC	3	2050	2120	2450	12000	-	3800	-	-	-	-
5000GtC	1	2200	2850	8500	28000	-	17000	-	-	-	-
5000GtC	2	2200	2850	8000	28000	-	17000	-	-	-	-
5000GtC	3	2220	2900	11000	38000	-	24000	-	-	-	-

variables		fraction									
emis.	lith.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	GKWM	2040	2100	2350	4400	11000	2800	8010	17000	40010	90010
1000GtC	GEM-CO2	2040	2100	2350	4400	10010	2800	8010	17000	40010	85000
1000GtC	GKWM av.	2040	2100	2350	4700	11000	2900	9000	19000	48010	100010
1000GtC	GEM-CO2 av.	2040	2120	2400	5200	14010	3000	11000	26010	95000	170010
1000GtC	mono acid	2040	2120	2350	4700	11000	2900	9000	18010	42010	90010
1000GtC	mono basalt	2040	2100	2350	4010	8500	2700	7000	13000	22010	34010
1000GtC	mono carb	2040	2090	2280	4400	12010	2600	9000	19000	60010	150010
1000GtC	mono granite	2040	2120	2350	4700	11000	2900	9000	18010	42010	90010
1000GtC	mono sand	2050	2120	2450	9000	30010	3500	22010	75000	330010	520010
1000GtC	mono shale	2040	2090	2260	3600	8010	2550	6400	11000	15000	19000
1000GtC	mono shield	2040	2120	2350	4700	11000	2900	9000	18010	42010	90010
5000GtC	GKWM	2160	2550	3800	7500	16010	5200	13000	36010	130010	190010
5000GtC	GEM-CO2	2160	2550	3800	7500	16010	5200	12010	34010	120010	180010
5000GtC	GKWM av.	2180	2600	4010	8500	18010	5800	14010	44010	140010	210010
5000GtC	GEM-CO2 av.	2180	2700	4700	12010	26010	8010	20010	80010	210010	300010
5000GtC	mono acid	2180	2600	4010	9000	18010	6010	14010	34010	110010	170010
5000GtC	mono basalt	2160	2500	3500	6200	12010	4500	9500	19000	55000	95000
5000GtC	mono carb	2140	2450	3500	7000	16010	4700	12010	34010	220010	340010
5000GtC	mono granite	2180	2600	4010	9000	18010	6010	14010	34010	110010	170010
5000GtC	mono sand	2220	2850	11000	28010	60010	19000	46010	240010	520010	740010
5000GtC	mono shale	2120	2400	3100	5200	9000	3800	8010	13000	19000	26010
5000GtC	mono shield	2180	2600	4010	9000	18010	6010	14010	34010	110010	170010

variables		fraction									
emis.	clim. sens.	90%	75%	50%	25%	10%	e^{-1}	e^{-2}	e^{-3}	e^{-4}	e^{-5}
1000GtC	1.5	2040	2120	2400	6400	24000	3200	16000	200000	550000	900000
1000GtC	2.64	2050	2120	2400	6000	20000	3200	14000	110000	320000	550000
1000GtC	3	2050	2120	2400	6200	20000	3200	14000	100000	320000	550000
1000GtC	4.5	2050	2120	2450	6400	18000	3300	13000	65000	220000	380000
1000GtC	6.	2050	2120	2450	6200	16000	3200	12000	32000	150000	240000
5000GtC	1.5	2180	2700	6000	18000	110000	11000	36000	380000	750000	-
5000GtC	2.64	2200	2700	5000	14000	34000	8500	24000	170000	380000	550000
5000GtC	3	2200	2750	5000	13000	32000	8500	24000	150000	340000	480000
5000GtC	4.5	2220	2800	4800	12000	30000	8000	22000	110000	240000	380000
5000GtC	6.	2200	2750	4400	11000	28000	7000	19000	90000	220000	360000

Table 18: **Timescale fitting** for excess **Surface ocean acidification** decay

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	short-circ.	acidification (pH)	i	1	2	3	4	R^2
1000GtC	yes	b 0.007±0.003	w_i (%)	100±4				0.95
		h 0.180±0.001	τ_i (yr)	1900±200				
1000GtC	no	b 0.006±0.003	w_i (%)	100±3				0.95
		h 0.179±0.004	τ_i (yr)	1900±200				
5000GtC	yes	b -0.0070±0.0005	w_i (%)	3.5±0.3	32.0±0.3	55.4±0.3	9.1±0.1	0.999990
		h 0.7916±0.0006	τ_i (yr)	70±10	810±20	6750±70	190000±6000	
5000GtC	no	b -0.007±0.001	w_i (%)	32.8±0.7	57.9±0.6	9.3±0.2		0.99995
		h 0.777±0.001	τ_i (yr)	710±20	6100±100	170000±10000		

variables			fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$								
emis.	T_Ca	T_Si	acidification (pH)	i	1	2	3	4	5	6	R^2
1000GtC	on	on	b -0.0042±0.0006	w_i (%)	14±2	41±1	8.4±0.7	26.2±0.9	10.7±0.2		0.999991
			h 0.2629±0.0001	τ_i (yr)	68±7	240±10	1800±300	8100±200	390000±20000		
1000GtC	on	off	b 0.0272±0.0002	w_i (%)	9±3	42±5	14±6	11±4	22±5	0.8±0.1	0.999994
			h 0.2319±0.0002	τ_i (yr)	50±10	190±30	500±200	4000±1000	10000±1000	200000±100000	
1000GtC	off	on	b 0.024±0.005	w_i (%)	100±2						0.95
			h 0.168±0.007	τ_i (yr)	1800±300						
1000GtC	off	off	b 0.02922±0.00009	w_i (%)	9±3	44±3	13±5	20±4	13±4		0.999992
			h 0.2298±0.0002	τ_i (yr)	50±10	190±20	600±100	5300±800	13000±2000		
5000GtC	on	on	b 0.048±0.005	w_i (%)	40±2	60±2					0.999
			h 0.723±0.005	τ_i (yr)	900±100	15000±1000					
5000GtC	on	off	b 0.120±0.002	w_i (%)	39.8±0.7	60.2±0.6					0.9999
			h 0.6539±0.001	τ_i (yr)	740±30	14200±400					
5000GtC	off	on	b -0.012±0.009	w_i (%)	33.1±0.5	53.3±0.5	13.7±0.9				0.99992
			h 0.786±0.001	τ_i (yr)	730±30	11700±300	480000±90000				
5000GtC	off	off	b 0.123±0.002	w_i (%)	40.3±0.8	59.7±0.6					0.9999
			h 0.650±0.003	τ_i (yr)	750±40	15500±500					

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	E_a (kJ/mol)		acidification (pH)	i	1	2	3	4	R^2
1000GtC	45	b	0.013±0.004	w_i (%)	100±3				0.95
		h	0.173±0.004	τ_i (yr)	2000±300				
1000GtC	63	b	0.010±0.004	w_i (%)	100±3				0.95
		h	0.175±0.004	τ_i (yr)	2000±300				
1000GtC	74	b	0.009±0.004	w_i (%)	100±3				0.95
		h	0.176±0.003	τ_i (yr)	2000±300				
1000GtC	103	b	0.008±0.003	w_i (%)	100±3				0.95
		h	0.178±0.004	τ_i (yr)	2000±300				
5000GtC	45	b	-0.009±0.003	w_i (%)	3.4±0.5	31.2±0.4	52.2±0.3	13.2±0.3	0.99998
		h	0.794±0.001	τ_i (yr)	60±20	810±20	9600±100	470000±30000	
5000GtC	63	b	-0.008±0.002	w_i (%)	32.7±0.5	54.9±0.3	12.4±0.3		0.99995
		h	0.779±0.003	τ_i (yr)	720±20	8600±200	320000±20000		
5000GtC	74	b	0.039±0.008	w_i (%)	100±1				0.99
		h	0.658±0.009	τ_i (yr)	5400±400				
5000GtC	103	b	-0.0074±0.0007	w_i (%)	3.5±0.3	32.1±0.3	54.2±0.3	10.2±0.1	0.99999
		h	0.7922±0.0008	τ_i (yr)	70±10	820±20	7480±80	212000±7000	

variables				fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$								
emis.	R_Ca	R_Si	R_explicit		acidification (pH)	i	1	2	3	4	5	6	R^2
1000GtC	on	on	on	b	0.006±0.006	w_i (%)	15±2	42±2	9.1±0.7	25±1	9±2		0.999991
				h	0.253±0.006	τ_i (yr)	70±6	250±10	2000±300	8900±300	1400000±500000		
1000GtC	on	on	off	b	0.003±0.003	w_i (%)	15±2	41±2	9.0±0.8	25.1±1	10±1		0.999991
				h	0.256±0.002	τ_i (yr)	70±7	250±10	2000±300	8700±300	1000000±200000		
1000GtC	on	off	on	b	0.024±0.005	w_i (%)	17±6	40±10	10±3	27±9	2±1		0.999991
				h	0.23±0.08	τ_i (yr)	71±6	250±10	2000±300	9100±300	1000000±2000000		
1000GtC	on	off	off	b	0.0272±0.0002	w_i (%)	9±3	42±5	15±6	11±4	22±5	0.8±0.1	0.999994
				h	0.2319±0.0006	τ_i (yr)	50±10	190±30	500±200	4000±1000	10000±1000	200000±100000	
1000GtC	off	on	on	b	0.034±0.004	w_i (%)	100±3						0.96
				h	0.163±0.004	τ_i (yr)	1500±200						
1000GtC	off	on	off	b	-0.002±0.003	w_i (%)	8±2	38±3	13±4	13±3	17±4	12±1	0.999995
				h	0.261±0.001	τ_i (yr)	49±9	190±20	500±100	4300±900	11000±1000	1100000±200000	
1000GtC	off	off	on	b	0.02922±0.00009	w_i (%)	9±3	44±3	13±4	20±4	13±4		0.999992
				h	0.2298±0.0002	τ_i (yr)	50±10	190±20	600±100	5300±800	13000±2000		
1000GtC	off	off	off	b	0.02922±0.00009	w_i (%)	9±3	44±3	13±4	20±4	13±4		0.999992
				h	0.2298±0.0002	τ_i (yr)	50±10	190±20	600±100	5300±800	13000±2000		
5000GtC	on	on	on	b	0.12±0.01	w_i (%)	100±2						0.99
				h	0.566±0.006	τ_i (yr)	6600±700						
5000GtC	on	on	off	b	0.088±0.003	w_i (%)	4±3	38±2	59±1				0.9994
				h	0.697±0.004	τ_i (yr)	100±100	900±100	15800±900				
5000GtC	on	off	on	b	0.14±0.01	w_i (%)	100±1						0.990
				h	0.55±0.01	τ_i (yr)	6200±700						
5000GtC	on	off	off	b	0.119±0.002	w_i (%)	39.9±0.8	60.1±0.6					0.9999
				h	0.655±0.002	τ_i (yr)	740±30	14600±400					
5000GtC	off	on	on	b	0.12±0.01	w_i (%)	100±1						0.99
				h	0.56±0.01	τ_i (yr)	6900±800						
5000GtC	off	on	off	b	0.11±0.01	w_i (%)	100±2						0.99
				h	0.574±0.008	τ_i (yr)	7100±800						
5000GtC	off	off	on	b	0.123±0.002	w_i (%)	40.3±0.8	59.7±0.6					0.9999
				h	0.650±0.003	τ_i (yr)	750±40	15500±500					
5000GtC	off	off	off	b	0.123±0.002	w_i (%)	40.3±0.8	59.7±0.6					0.9999
				h	0.650±0.003	τ_i (yr)	750±40	15500±500					

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	beta		acidification (pH)	i	1	2	3	4	R^2
1000GtC	0.48	b	0.022±0.003	w_i (%)	100±2				0.96
		h	0.168±0.006	τ_i (yr)	1700±200				
1000GtC	0.65	b	0.021±0.003	w_i (%)	100±1				0.96
		h	0.168±0.006	τ_i (yr)	1800±200				
1000GtC	0.8	b	0.020±0.003	w_i (%)	100±3				0.96
		h	0.169±0.003	τ_i (yr)	1800±200				
1000GtC	1.12	b	0.018±0.003	w_i (%)	100±2				0.95
		h	0.170±0.005	τ_i (yr)	1900±200				
5000GtC	0.48	b	0.110±0.008	w_i (%)	100±2				0.990
		h	0.585±0.005	τ_i (yr)	5700±500				
5000GtC	0.65	b	0.114±0.009	w_i (%)	100±2				0.991
		h	0.583±0.006	τ_i (yr)	5500±500				
5000GtC	0.8	b	0.110±0.009	w_i (%)	100±2				0.991
		h	0.586±0.007	τ_i (yr)	5500±500				
5000GtC	1.12	b	-0.03±0.03	w_i (%)	3.3±0.5	30.5±0.5	48.7±0.5	18±3	0.99997
		h	0.819±0.007	τ_i (yr)	60±20	820±30	11100±200	1500000±400000	

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	k_run		acidification (pH)	i	1	2	3	4	R^2
1000GtC	0.012	b	0.023±0.003	w_i (%)	100±3				0.96
		h	0.167±0.003	τ_i (yr)	1700±200				
1000GtC	0.024	b	0.020±0.003	w_i (%)	100±2				0.96
		h	0.169±0.006	τ_i (yr)	1800±200				
1000GtC	0.028	b	0.020±0.003	w_i (%)	100±3				0.96
		h	0.169±0.003	τ_i (yr)	1800±200				
1000GtC	0.045	b	0.017±0.003	w_i (%)	100±5				0.95
		h	0.1705±0.0008	τ_i (yr)	1900±300				
5000GtC	0.012	b	0.115±0.008	w_i (%)	100±2				0.990
		h	0.579±0.005	τ_i (yr)	5700±500				
5000GtC	0.024	b	-0.1±0.2	w_i (%)	29±3	45±5	30±20		0.99993
		h	0.88±0.09	τ_i (yr)	740±20	11300±200	3000000±4000000		
5000GtC	0.028	b	-0.1±0.1	w_i (%)	3.1±0.6	28±2	45±3	20±10	0.99997
		h	0.88±0.06	τ_i (yr)	60±20	820±30	11200±200	3000000±2000000	
5000GtC	0.045	b	-0.03±0.02	w_i (%)	3.3±0.5	30.6±0.4	49.6±0.3	17±2	0.99997
		h	0.814±0.002	τ_i (yr)	60±20	810±30	10600±200	1100000±200000	

variables			fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$							
emis.	P_Ca	P_Si	acidification (pH)	i	1	2	3	4	5	R^2
1000GtC	on	on	b -0.002±0.002	w_i (%)	15±2	41±2	8.7±0.8	25±1	10.9±0.6	0.999990
			h 0.2610±0.0002	τ_i (yr)	70±7	250±10	2000±300	8600±300	680000±70000	
1000GtC	on	off	b 0.02787±0.0001	w_i (%)	9±3	44±3	13±4	23±4	10±4	0.999990
			h 0.2311±0.0002	τ_i (yr)	50±10	190±20	600±200	5700±700	15000±3000	
1000GtC	off	on	b -0.001±0.001	w_i (%)	15±2	41±2	8.7±0.7	25.0±0.9	10.9±0.5	0.999990
			h 0.2598±0.0005	τ_i (yr)	70±7	250±10	1900±300	8700±300	640000±60000	
1000GtC	off	off	b 0.02921±0.00009	w_i (%)	9±3	44±3	13±5	20±4	13±4	0.999992
			h 0.2298±0.0002	τ_i (yr)	50±10	190±20	600±100	5300±800	13000±2000	
5000GtC	on	on	b 0.071±0.004	w_i (%)	39±2	61±2				0.999
			h 0.701±0.003	τ_i (yr)	810±100	17000±1000				
5000GtC	on	off	b 0.119±0.002	w_i (%)	39.8±0.8	60.2±0.6				0.9999
			h 0.655±0.002	τ_i (yr)	740±30	14400±400				
5000GtC	off	on	b 0.09±0.01	w_i (%)	100±2					0.99
			h 0.587±0.007	τ_i (yr)	7400±800					
5000GtC	off	off	b 0.123±0.002	w_i (%)	40.3±0.8	59.7±0.6				0.9999
			h 0.650±0.003	τ_i (yr)	750±40	15500±500				

variables			fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$								
emis.	f_Ca	f_Si	acidification (pH)	i	1	2	3	4	5	6	R^2
1000GtC	on	on	b -0.0005±0.0002	w_i (%)	8±2	38±4	13±5	17±6	16±7	7.8±0.1	0.999995
			h 0.2594±0.0003	τ_i (yr)	50±9	190±20	500±100	4400±900	10000±2000	240000±10000	
1000GtC	on	off	b 0.02621±0.0001	w_i (%)	9±3	44±3	13±4	25±3	9±4		0.999990
			h 0.2328±0.0003	τ_i (yr)	50±10	190±20	600±200	5800±700	15000±3000		
1000GtC	off	on	b -0.0006±0.0002	w_i (%)	8±2	38±4	13±5	16±5	16±6	8.6±0.1	0.999995
			h 0.2594±0.0004	τ_i (yr)	50±9	190±20	500±100	4300±900	10000±1000	228000±9000	
1000GtC	off	off	b 0.02921±0.00009	w_i (%)	9±3	44±3	13±5	20±4	13±4		0.999992
			h 0.2298±0.0002	τ_i (yr)	50±10	190±20	600±100	5300±800	13000±2000		
5000GtC	on	on	b 0.05±0.01	w_i (%)	100.0±0.8						0.99
			h 0.65±0.01	τ_i (yr)	5200±400						
5000GtC	on	off	b 0.113±0.002	w_i (%)	39.0±0.8	61.0±0.6					0.99990
			h 0.661±0.001	τ_i (yr)	730±30	12400±300					
5000GtC	off	on	b -0.007±0.003	w_i (%)	33.1±0.6	55.6±0.5	11.3±0.4				0.99994
			h 0.780±0.001	τ_i (yr)	720±20	9700±200	260000±30000				
5000GtC	off	off	b 0.123±0.002	w_i (%)	40.3±0.8	59.7±0.6					0.9999
			h 0.650±0.003	τ_i (yr)	750±40	15500±500					

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$						
emis.	Scheme		acidification (pH)	i	1	2	3	4	R^2
1000GtC	Globavg	b	0.006±0.003	w_i (%)	100.0±0.3				0.95
		h	0.181±0.008	τ_i (yr)	1900±200				
1000GtC	GKWM	b	0.004±0.003	w_i (%)	100±1				0.95
		h	0.180±0.006	τ_i (yr)	1700±200				
1000GtC	GEM-CO2	b	0.007±0.004	w_i (%)	100±3				0.95
		h	0.179±0.003	τ_i (yr)	1500±200				
5000GtC	Globavg	b	-0.0071±0.0009	w_i (%)	33.1±0.6	58.1±0.4	8.8±0.3		0.99996
		h	0.779±0.002	τ_i (yr)	710±20	6400±100	150000±10000		
5000GtC	GKWM	b	-0.0070±0.0003	w_i (%)	4.7±0.2	35.5±0.4	52.1±0.4	7.67±0.08	0.999997
		h	0.7873±0.0006	τ_i (yr)	91±7	930±20	5080±50	109000±3000	
5000GtC	GEM-CO2	b	-0.0067±0.0002	w_i (%)	5.0±0.2	37.9±0.4	50.0±0.3	7.09±0.08	0.999997
		h	0.785±0.002	τ_i (yr)	95±7	960±20	4840±50	102000±2000	

variables				fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$							
emis.	f_Ca	f_Si	Scheme		acidification (pH)	i	1	2	3	4	5	R^2
1000GtC	on	on	Globavg	b	0.007±0.003	w_i (%)	100±4					0.95
				h	0.1796±0.0006	τ_i (yr)	1900±200					
1000GtC	on	on	GKWM	b	0.004±0.003	w_i (%)	100±3					0.95
				h	0.180±0.003	τ_i (yr)	1700±200					
1000GtC	on	off	Globavg	b	0.023±0.003	w_i (%)	100±3					0.96
				h	0.169±0.003	τ_i (yr)	1600±200					
1000GtC	on	off	GKWM	b	0.020±0.003	w_i (%)	100±3					0.96
				h	0.170±0.003	τ_i (yr)	1800±200					
1000GtC	off	on	Globavg	b	0.007±0.003	w_i (%)	100±3					0.95
				h	0.178±0.004	τ_i (yr)	2000±300					
1000GtC	off	on	GKWM	b	0.007±0.004	w_i (%)	100±3					0.95
				h	0.179±0.004	τ_i (yr)	1600±200					
1000GtC	off	off	Globavg	b	0.026±0.003	w_i (%)	100±4					0.96
				h	0.166±0.002	τ_i (yr)	1600±200					
1000GtC	off	off	GKWM	b	0.026±0.003	w_i (%)	100±1					0.96
				h	0.166±0.006	τ_i (yr)	1700±200					
5000GtC	on	on	Globavg	b	-0.007±0.001	w_i (%)	33.0±0.7	57.6±0.4	9.4±0.2			0.99996
				h	0.779±0.003	τ_i (yr)	710±20	6600±100	190000±10000			
5000GtC	on	on	GKWM	b	-0.0073±0.0003	w_i (%)	4.5±0.2	33.9±0.5	50±3	4±4	7.3±0.3	0.999998
				h	0.788±0.009	τ_i (yr)	87±7	890±20	4700±300	11000±6000	116000±4000	
5000GtC	on	off	Globavg	b	0.117±0.006	w_i (%)	100.0±0.9					0.993
				h	0.586±0.008	τ_i (yr)	4800±300					
5000GtC	on	off	GKWM	b	0.101±0.008	w_i (%)	100±2					0.990
				h	0.590±0.006	τ_i (yr)	6200±500					
5000GtC	off	on	Globavg	b	-0.0074±0.0006	w_i (%)	3.4±0.3	31.9±0.3	54.6±0.3	10.0±0.1		0.99999
				h	0.7922±0.0008	τ_i (yr)	70±10	810±20	7500±80	181000±6000		
5000GtC	off	on	GKWM	b	-0.0069±0.0003	w_i (%)	4.5±0.2	34.2±0.4	53.1±0.2	8.26±0.1		0.999997
				h	0.788±0.002	τ_i (yr)	87±8	900±20	5240±50	100000±3000		
5000GtC	off	off	Globavg	b	0.133±0.007	w_i (%)	100±1					0.992
				h	0.564±0.006	τ_i (yr)	5400±400					
5000GtC	off	off	GKWM	b	0.118±0.004	w_i (%)	39.5±0.8	60.5±0.6				0.9998
				h	0.657±0.003	τ_i (yr)	720±40	18000±700				

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$							
emis.	routing	acidification (pH)	i	1	2	3	4	5	R^2
1000GtC	1	b 0.02903±0.0001	w_i (%)	9±3	44±3	13±4	23±4	10±4	0.999990
		h 0.2301±0.0002	τ_i (yr)	50±10	190±20	600±200	5800±800	15000±3000	
1000GtC	2	b 0.02922±0.00009	w_i (%)	9±3	44±3	13±5	20±4	13±4	0.999992
		h 0.2298±0.0002	τ_i (yr)	50±10	190±20	600±100	5300±800	13000±2000	
1000GtC	3	b 0.075±0.004	w_i (%)	100±5					0.99
		h 0.159±0.003	τ_i (yr)	450±70					
5000GtC	1	b 0.125±0.002	w_i (%)	40.2±0.8	59.8±0.6				0.9999
		h 0.649±0.001	τ_i (yr)	740±30	15500±400				
5000GtC	2	b 0.123±0.002	w_i (%)	40.3±0.8	59.7±0.6				0.9999
		h 0.650±0.003	τ_i (yr)	750±40	15500±500				
5000GtC	3	b 0.129±0.007	w_i (%)	41.5±0.7	58.5±0.7				0.9999
		h 0.644±0.003	τ_i (yr)	760±40	22000±1000				

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$								
emis.	lith.	acidification (pH)	i	1	2	3	4	5	6	R^2
1000GtC	GKWM	b 0.007±0.004	w_i (%)	100±2						0.95
		h 0.179±0.005	τ_i (yr)	1600±200						
1000GtC	GEM-CO2	b -0.0035±0.0001	w_i (%)	10±2	45±1	9.7±0.6	31.1±0.8	4.5±0.1		0.999993
		h 0.2550±0.0001	τ_i (yr)	53±6	197±8	1200±200	5400±100	103000±6000		
1000GtC	GKWM av.	b 0.004±0.003	w_i (%)	100±2						0.95
		h 0.181±0.005	τ_i (yr)	1800±200						
1000GtC	GEM-CO2 av.	b 0.006±0.004	w_i (%)	100±2						0.95
		h 0.180±0.006	τ_i (yr)	2100±300						
1000GtC	mono acid	b -0.0032±0.0001	w_i (%)	8±2	42±2	10±2	24±8	12±9	4.2±0.2	0.999996
		h 0.2587±0.0004	τ_i (yr)	49±7	180±10	600±100	4200±800	9000±3000	105000±9000	
1000GtC	mono basalt	b 0.007±0.004	w_i (%)	100±2						0.96
		h 0.181±0.006	τ_i (yr)	1300±200						
1000GtC	mono carb	b 0.005±0.003	w_i (%)	100±4						0.94
		h 0.162±0.002	τ_i (yr)	1700±200						
1000GtC	mono granite	b -0.0032±0.0002	w_i (%)	8±2	42±2	10±2	24±8	12±9	4.2±0.2	0.999996
		h 0.2588±0.0004	τ_i (yr)	49±7	180±10	600±100	4200±800	9000±3000	106000±9000	
1000GtC	mono sand	b 0.013±0.004	w_i (%)	100±2						0.94
		h 0.171±0.006	τ_i (yr)	3100±500						
1000GtC	mono shale	b 0.002±0.003	w_i (%)	100±1						0.94
		h 0.174±0.006	τ_i (yr)	1300±200						
1000GtC	mono shield	b -0.0030±0.0001	w_i (%)	10±2	44±1	10.2±0.6	31.7±0.7	4.6±0.1		0.999993
		h 0.2585±0.0001	τ_i (yr)	55±7	202±9	1100±100	5800±100	91000±6000		

variables		fit to $pH(t) = b + h \sum_i w_i e^{-(t-t_0)/\tau_i}$								
emis.	lith.		acidification (pH)	i	1	2	3	4	5	6	R^2
5000GtC	GKWM	b	-0.007±0.001	w_i (%)	34±1	57.5±1	8.3±0.4				0.99994
		h	0.773±0.002	τ_i (yr)	720±30	4700±100	100000±10000				
5000GtC	GEM-CO2	b	-0.0071±0.0003	w_i (%)	4.7±0.2	35.3±0.4	52.3±0.3	7.76±0.09			0.999997
		h	0.787±0.002	τ_i (yr)	91±7	920±20	5050±50	106000±3000			
5000GtC	GKWM av.	b	-0.0080±0.0003	w_i (%)	4.1±0.2	33.0±0.4	54.8±0.2	8.12±0.1			0.999995
		h	0.791±0.002	τ_i (yr)	77±9	870±20	5740±50	129000±3000			
5000GtC	GEM-CO2 av.	b	-0.008±0.001	w_i (%)	32.7±0.6	58.2±0.3	9.2±0.3				0.99995
		h	0.782±0.003	τ_i (yr)	700±20	7900±200	180000±10000				
5000GtC	mono acid	b	-0.0076±0.0009	w_i (%)	33.6±0.8	58.9±0.5	7.6±0.4				0.99995
		h	0.779±0.003	τ_i (yr)	700±20	5800±100	105000±10000				
5000GtC	mono basalt	b	-0.0069±0.0003	w_i (%)	4.6±0.2	39.9±0.5	50.1±0.4	5.4±0.1			0.999997
		h	0.786±0.002	τ_i (yr)	88±7	930±10	4470±50	71000±3000			
5000GtC	mono carb	b	-0.008±0.002	w_i (%)	43±1	50±1	7.0±0.3				0.9999
		h	0.7577±0.0009	τ_i (yr)	720±30	5200±200	230000±30000				
5000GtC	mono granite	b	0.014±0.007	w_i (%)	100.0±0.9						0.992
		h	0.696±0.008	τ_i (yr)	3800±200						
5000GtC	mono sand	b	-0.03±0.02	w_i (%)	29.7±0.7	59.4±0.4	11±2				0.9998
		h	0.81±0.01	τ_i (yr)	600±30	21000±700	700000±400000				
5000GtC	mono shale	b	-0.0077±0.0002	w_i (%)	3.6±0.2	48.2±0.4	46.1±0.4	2.1±0.1			0.999994
		h	0.775±0.001	τ_i (yr)	62±7	760±10	4250±50	72000±7000			
5000GtC	mono shield	b	0.014±0.007	w_i (%)	100±1						0.992
		h	0.696±0.006	τ_i (yr)	3800±200						

variables		fit to $pH(t) = b + h\sum_i w_i e^{-(t-t_0)/\tau_i}$								
emis.	clim. sens.		acidification (pH)	i	1	2	3	4	5	6	R^2
1000GtC	1.5	b	0.022±0.005	w_i (%)	100±3						0.96
		h	0.170±0.004	τ_i (yr)	1800±300						
1000GtC	2.64	b	-0.0005±0.0002	w_i (%)	8±2	38±5	13±6	14±7	19±7	8.0±0.1	0.999995
		h	0.2594±0.0002	τ_i (yr)	49±10	180±30	500±100	4000±1000	9000±1000	229000±9000	
1000GtC	3	b	-0.0003±0.0002	w_i (%)	8±2	40±3	12±3	22±8	11±8	7.7±0.1	0.999995
		h	0.2595±0.0006	τ_i (yr)	48±8	190±20	600±100	5100±900	11000±3000	225000±10000	
1000GtC	4.5	b	-0.0004±0.0002	w_i (%)	8±2	40±3	12±4	32.9±0.3	7.46±0.1		0.999993
		h	0.2609±0.0003	τ_i (yr)	48±8	200±20	600±100	6800±90	163000±6000		
1000GtC	6.	b	0.013±0.005	w_i (%)	100±2						0.95
		h	0.182±0.007	τ_i (yr)	2100±300						
5000GtC	1.5	b	-0.012±0.008	w_i (%)	2.4±0.9	31.5±0.7	52.8±0.4	13.3±0.9			0.99995
		h	0.796±0.002	τ_i (yr)	60±40	650±30	11200±200	530000±80000			
5000GtC	2.64	b	-0.006±0.003	w_i (%)	2.8±0.6	31.5±0.6	55.3±0.4	10.3±0.3			0.99997
		h	0.792±0.001	τ_i (yr)	60±30	770±30	8800±200	280000±30000			
5000GtC	3	b	0.046±0.01	w_i (%)	100.0±0.8						0.990
		h	0.66±0.01	τ_i (yr)	5100±400						
5000GtC	4.5	b	-0.003±0.002	w_i (%)	32.2±0.9	57.0±0.8	10.8±0.5				0.99993
		h	0.776±0.002	τ_i (yr)	840±40	7400±200	150000±20000				
5000GtC	6.	b	0.020±0.004	w_i (%)	50±3	50±3					0.999
		h	0.749±0.003	τ_i (yr)	1300±100	13000±1000					

B.4 Percentages of key variables remaining

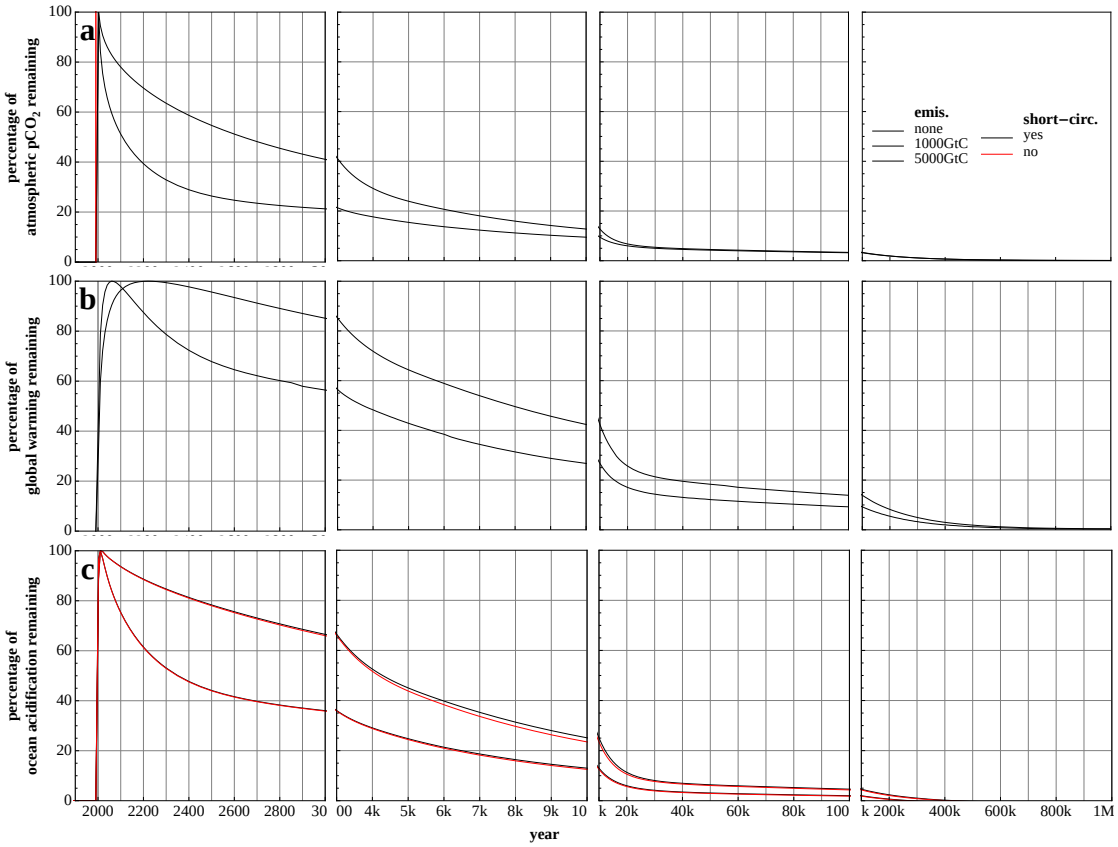

Figure 36: Percentages of key variables remaining for short-circuit test ensemble

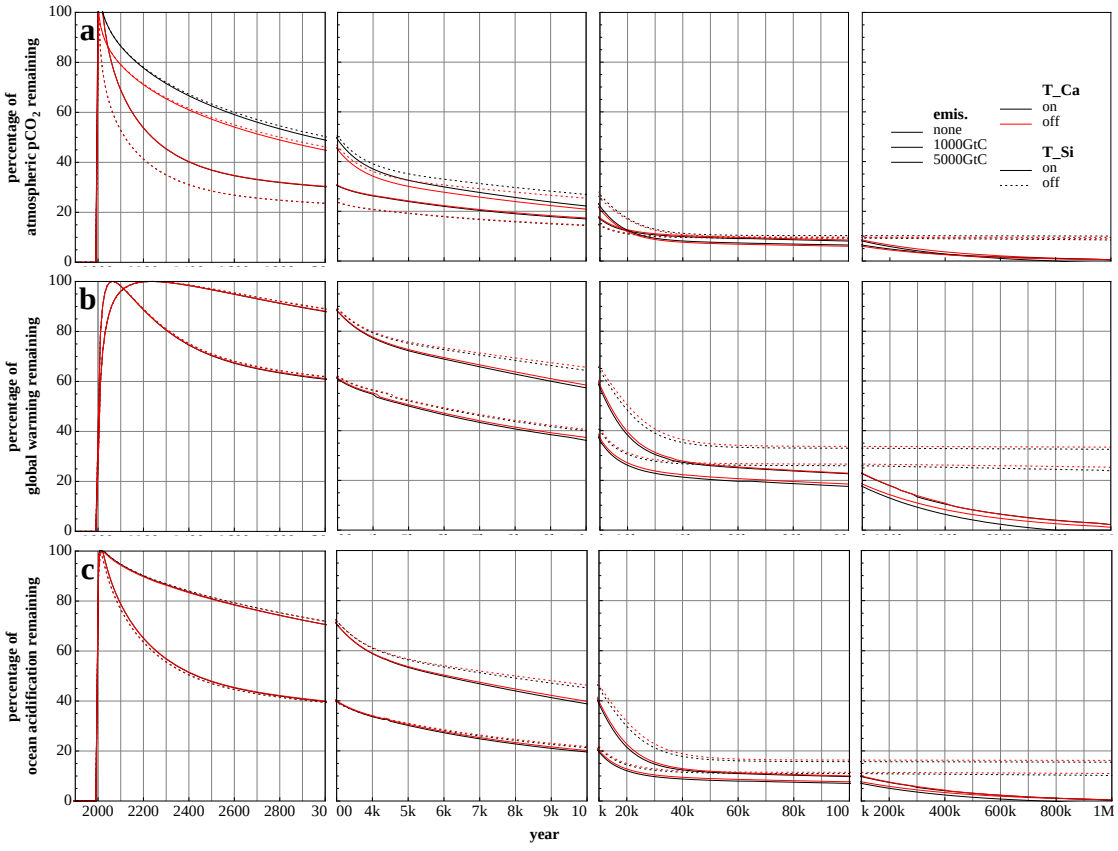

Figure 37: Percentages of key variables remaining for weathering-temperature feedbacks ensemble

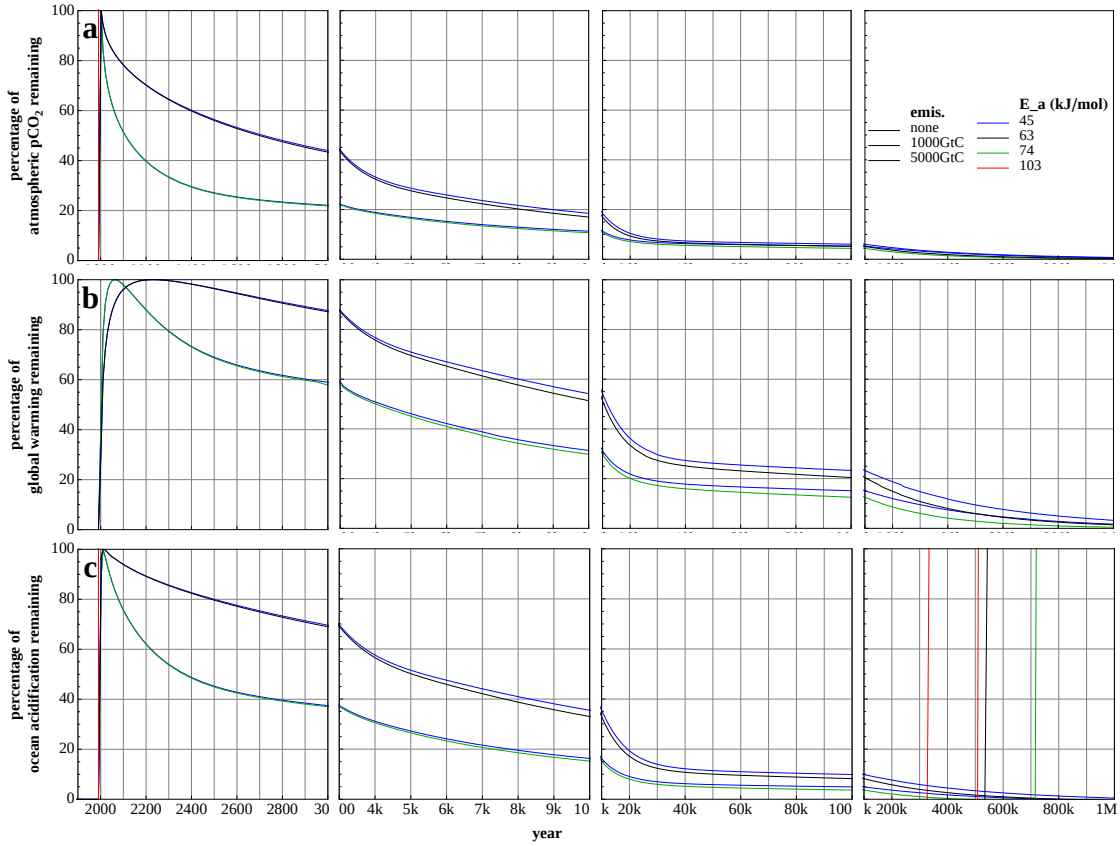

Figure 38: Percentages of key variables remaining for weathering activation energy ensemble

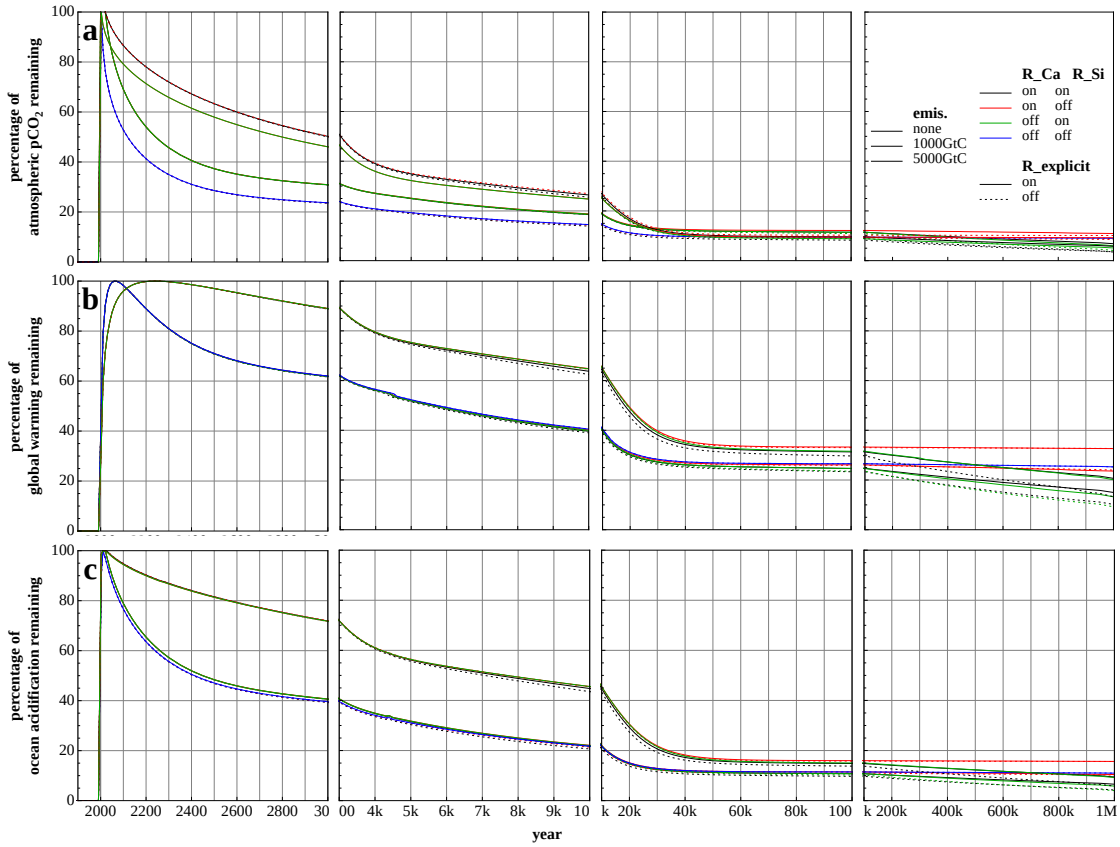

Figure 39: Percentages of key variables remaining for weathering-runoff feedbacks ensemble

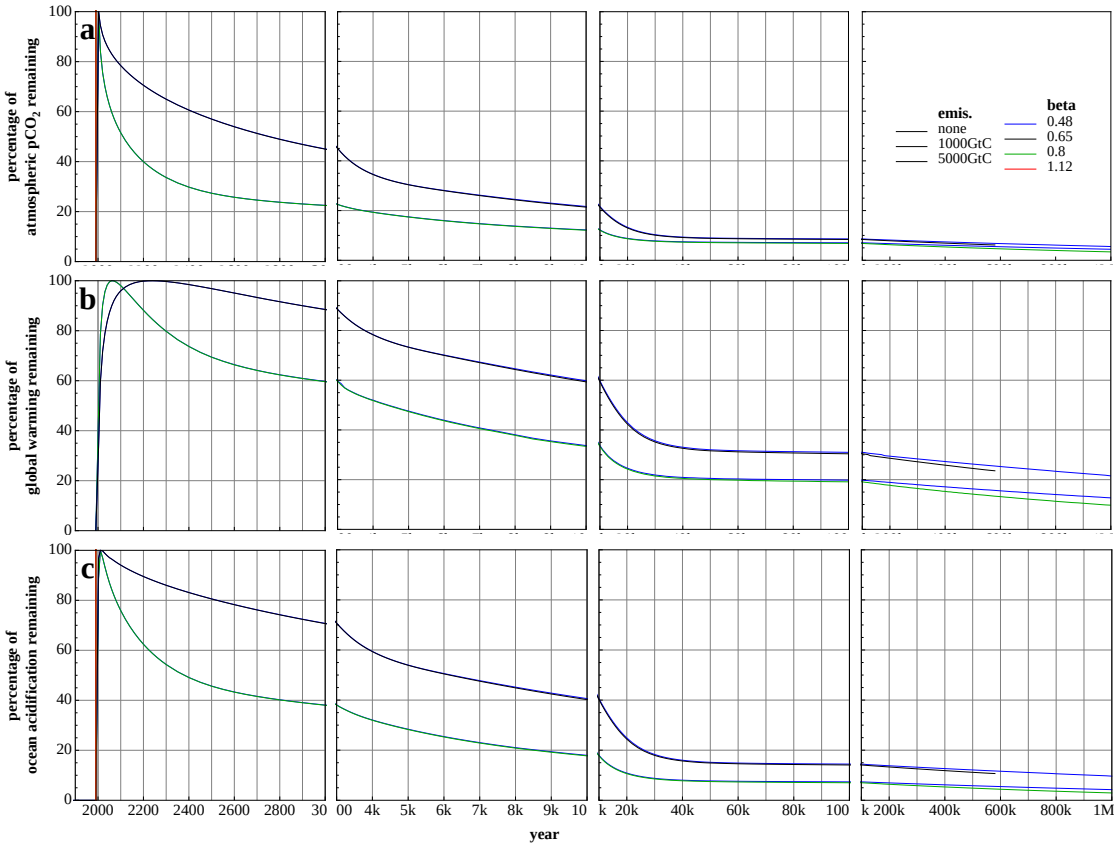

Figure 40: Percentages of key variables remaining for fractional power of explicit weathering-runoff dependence ensemble

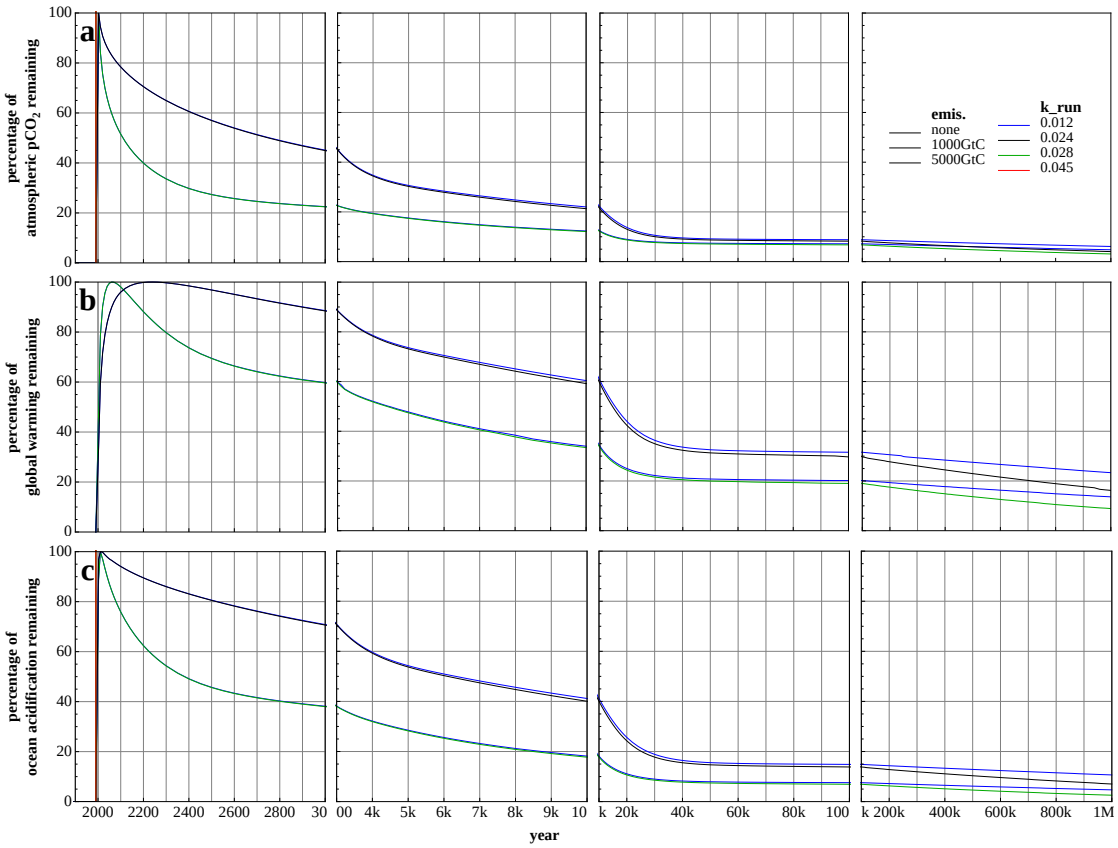

Figure 41: Percentages of key variables remaining for runoff-temperature correlation constant ensemble

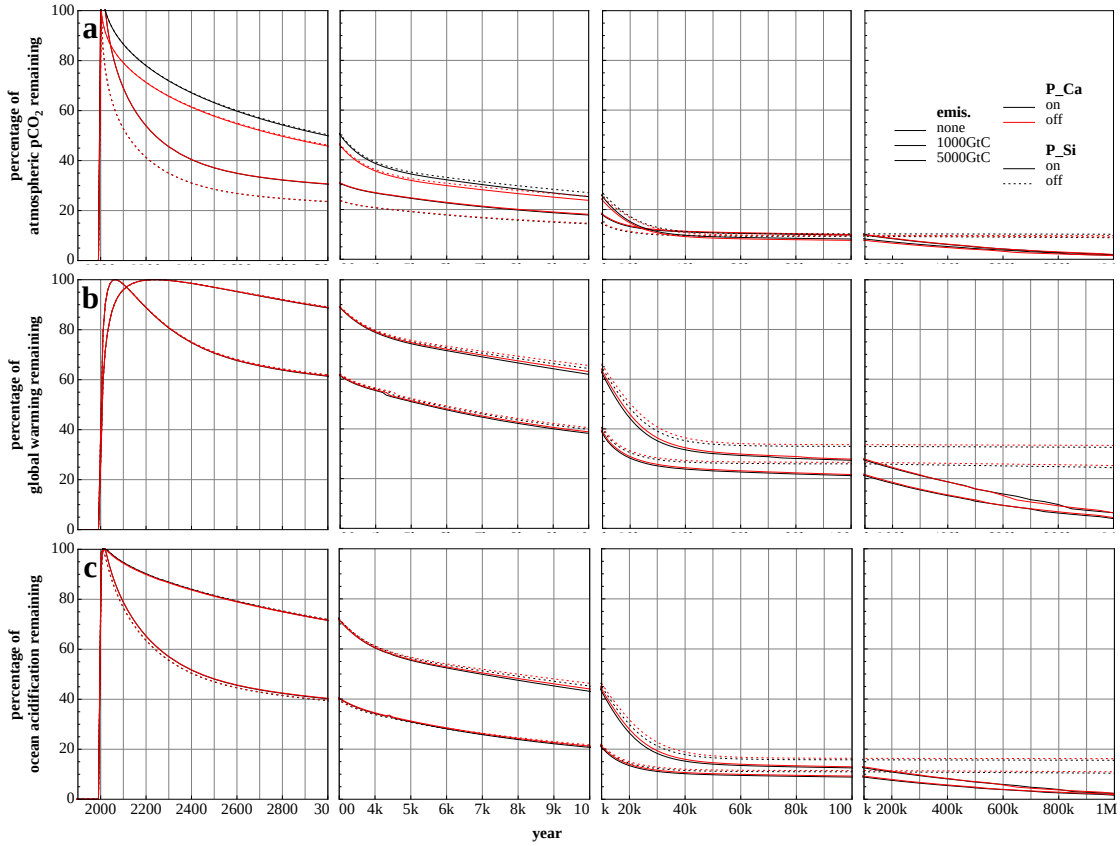

Figure 42: Percentages of key variables remaining for weathering-productivity feedbacks ensemble

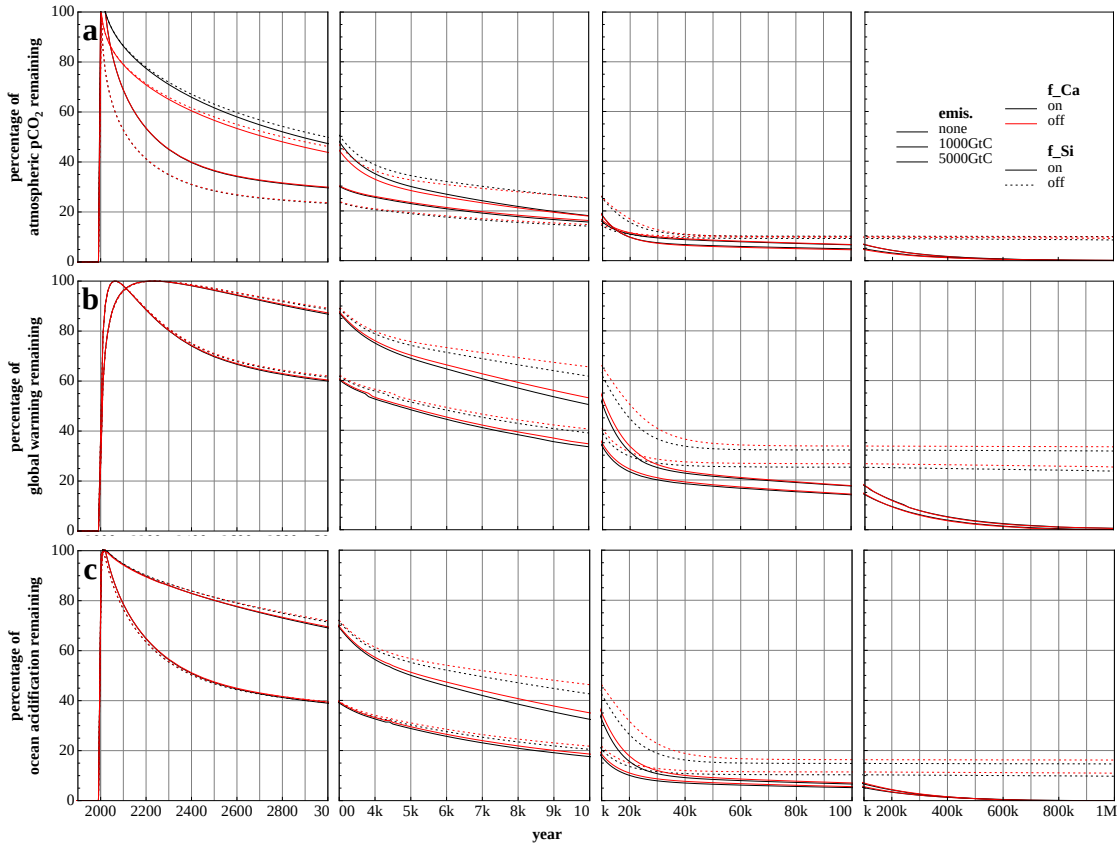

Figure 43: Percentages of key variables remaining for calcite and silicate weathering feedbacks ensemble

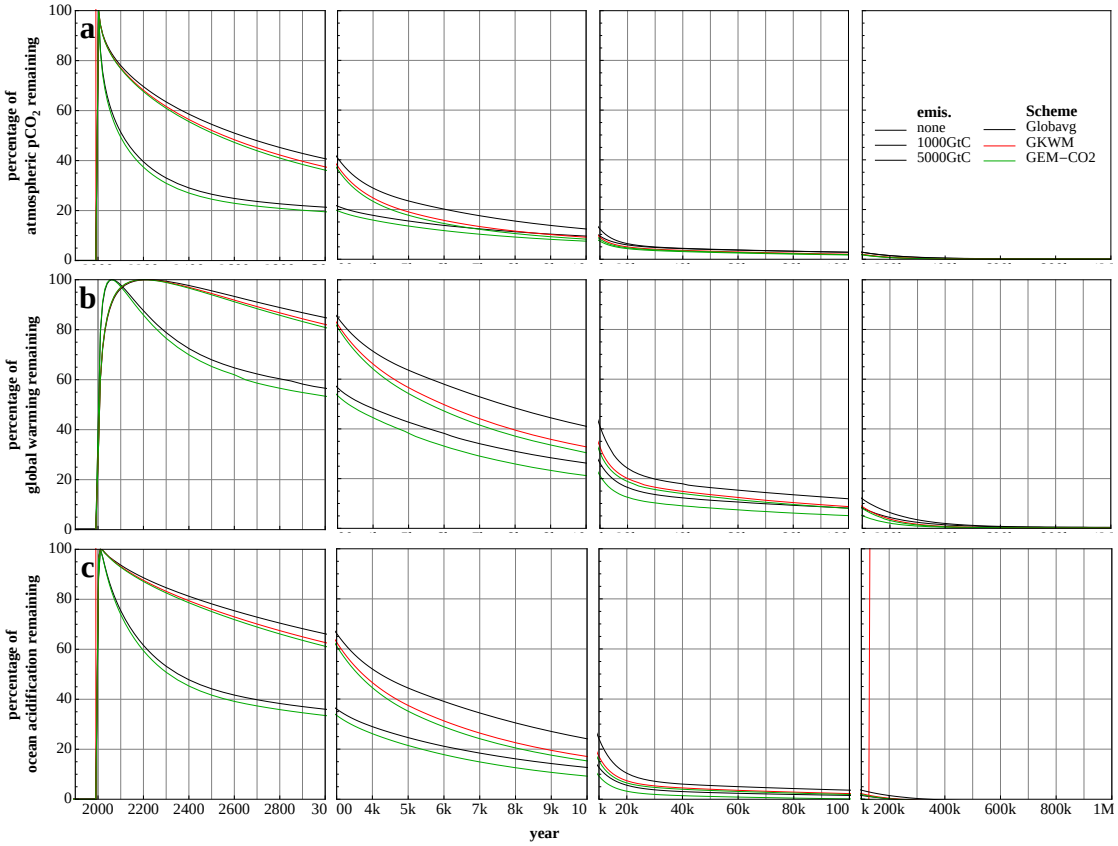

Figure 44: Percentages of key variables remaining for weathering schemes ensemble

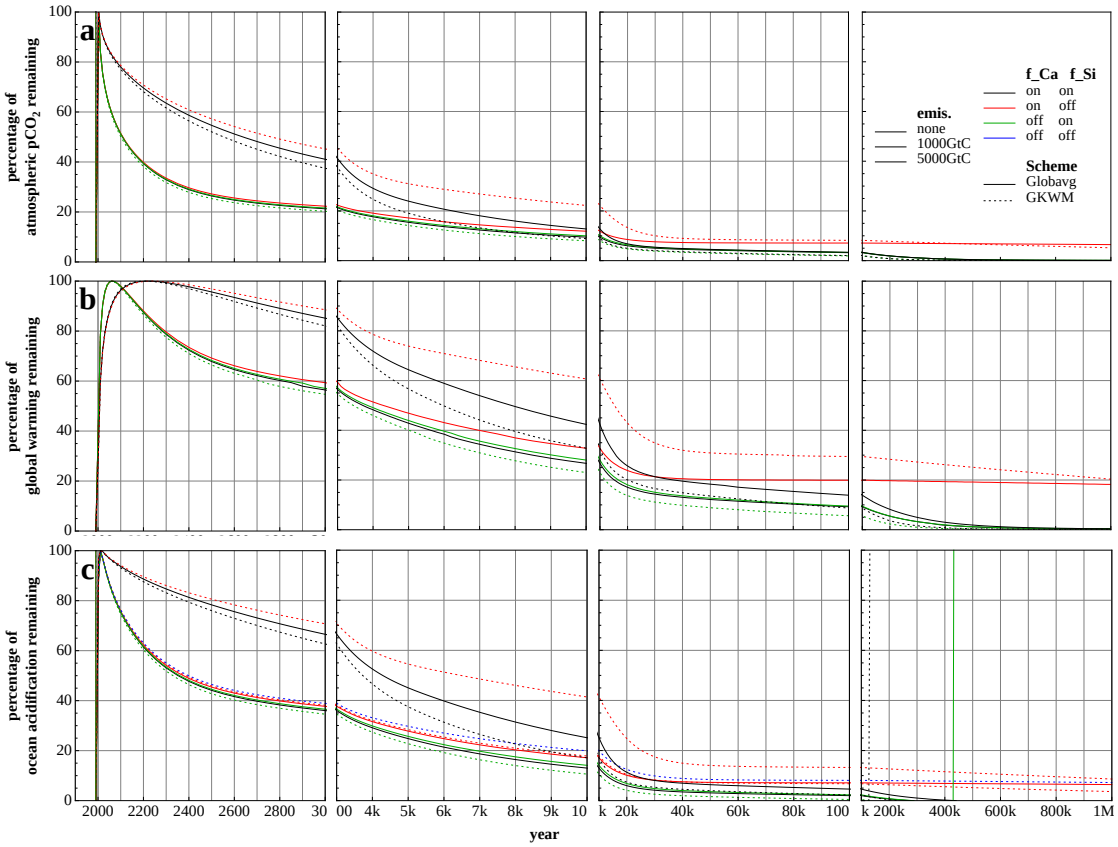

Figure 45: Percentages of key variables remaining for weathering schemes with f_Ca and f_Si on/off ensemble

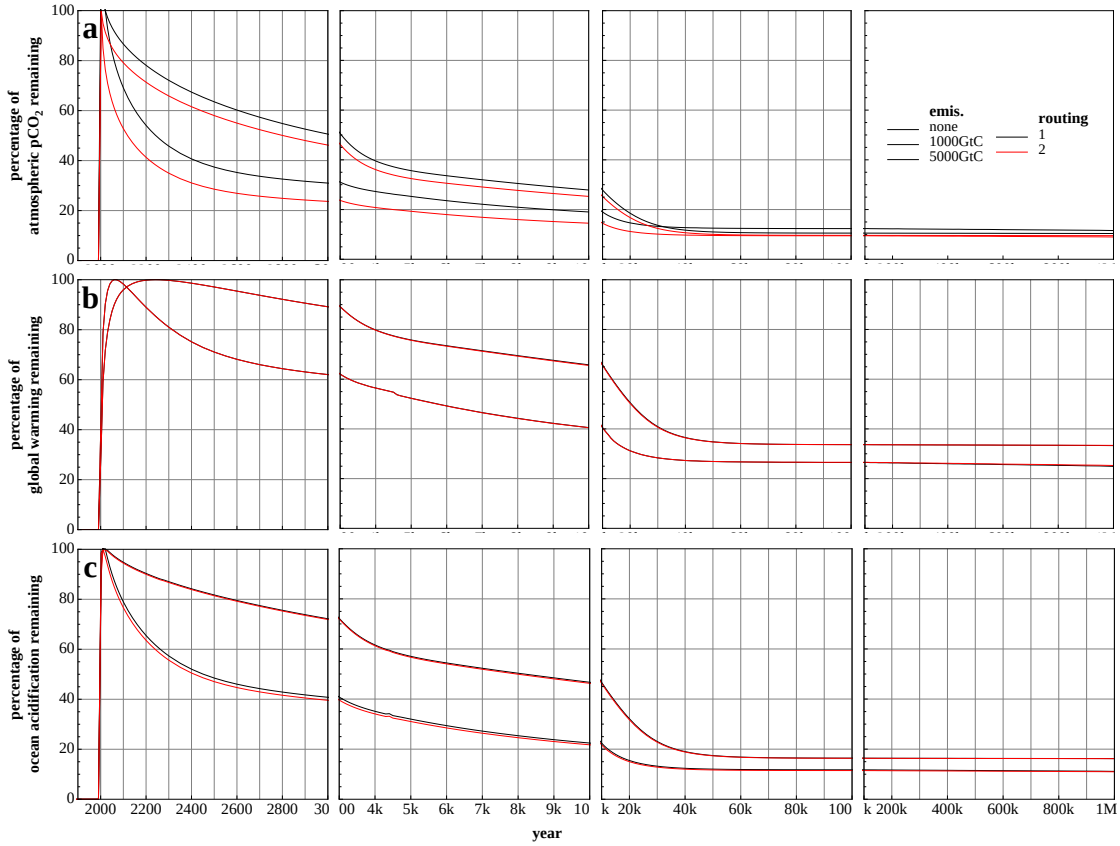

Figure 46: Percentages of key variables remaining for river routing schemes ensemble

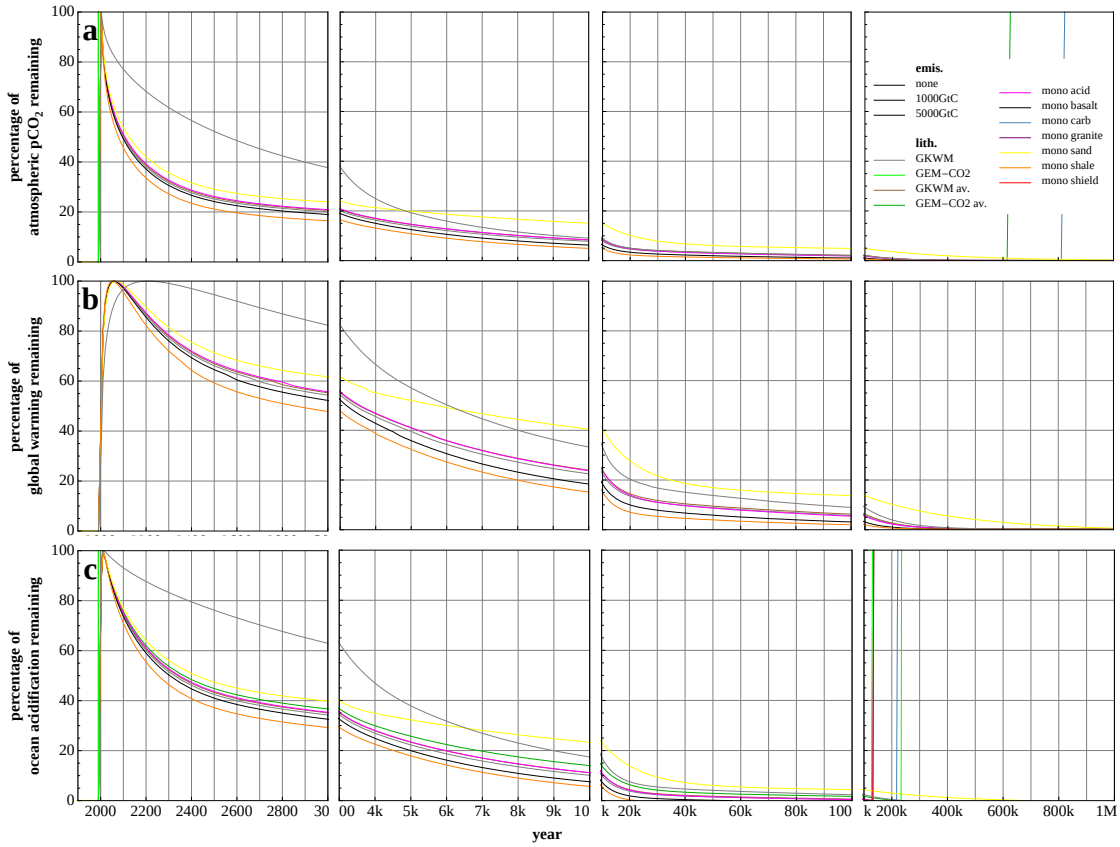

Figure 47: Percentages of key variables remaining for lithologies ensemble

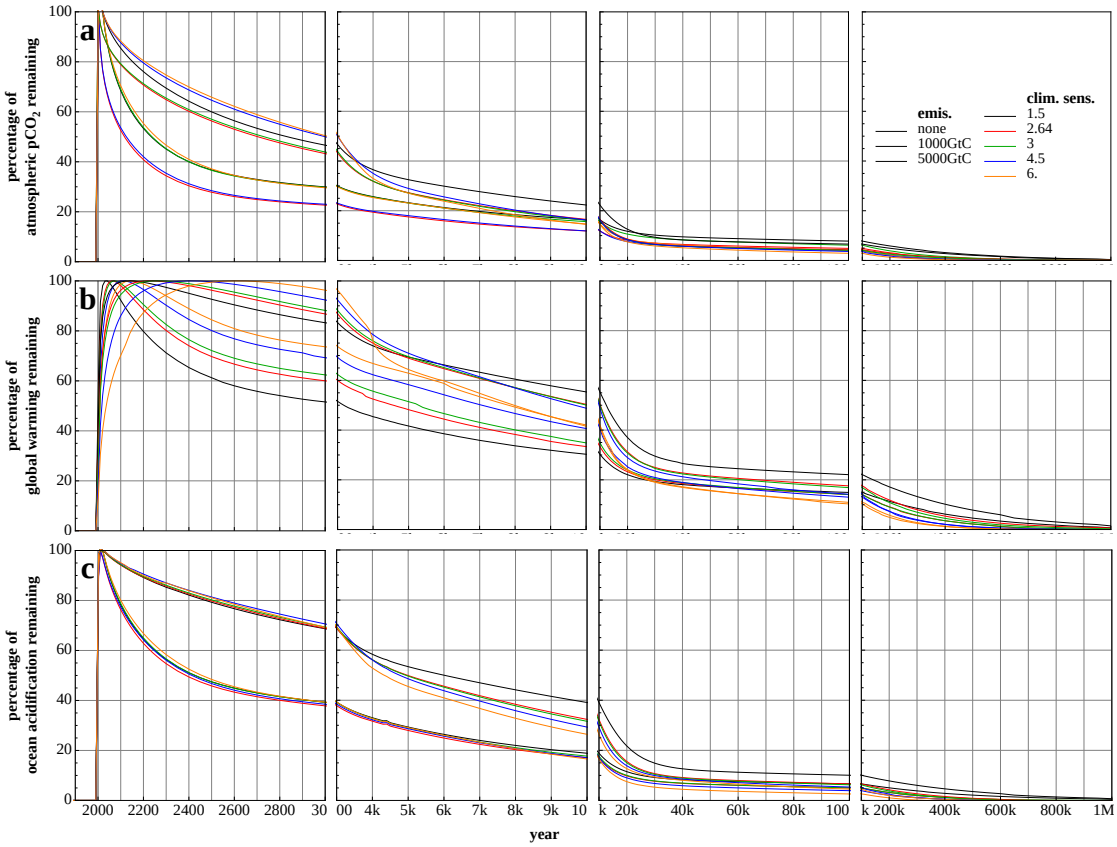

Figure 48: Percentages of key variables remaining for climate sensitivity ensemble

B.5 *e*-folding timescales of key variables remaining

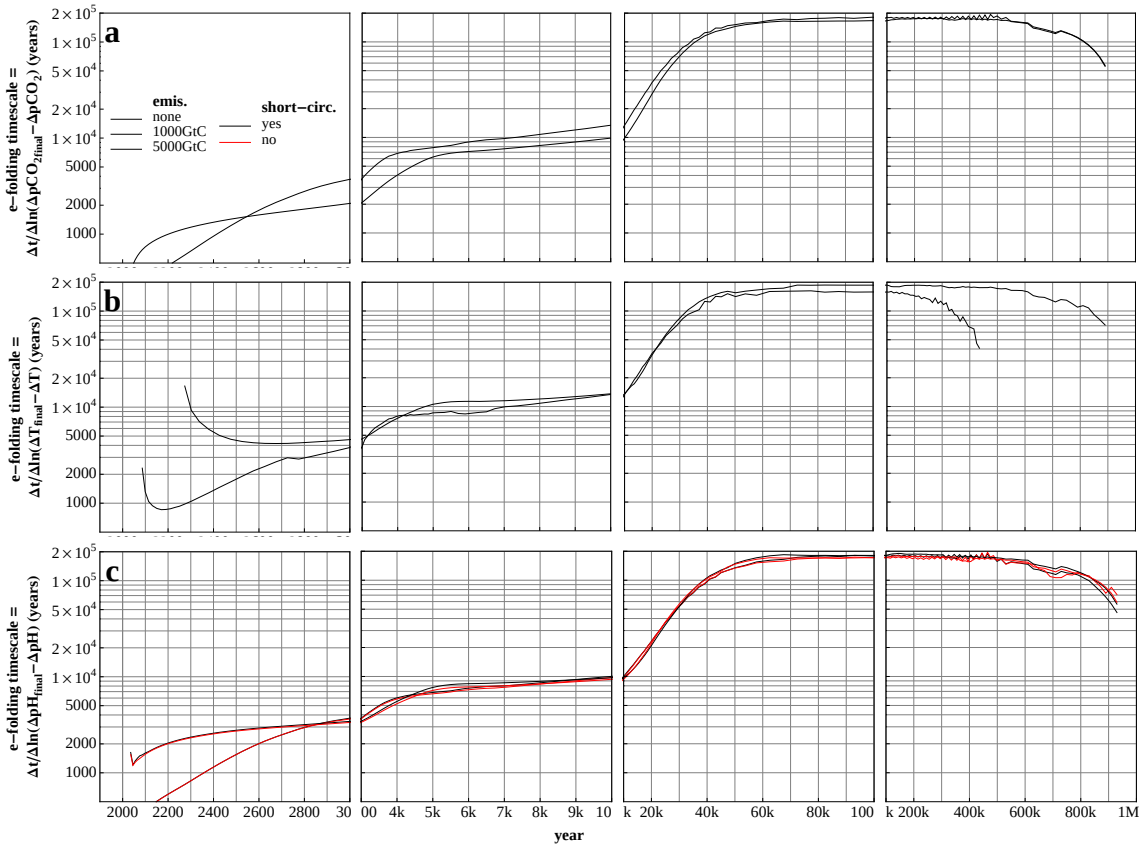

Figure 49: *e*-folding timescales of key variables for short-circuit test ensemble

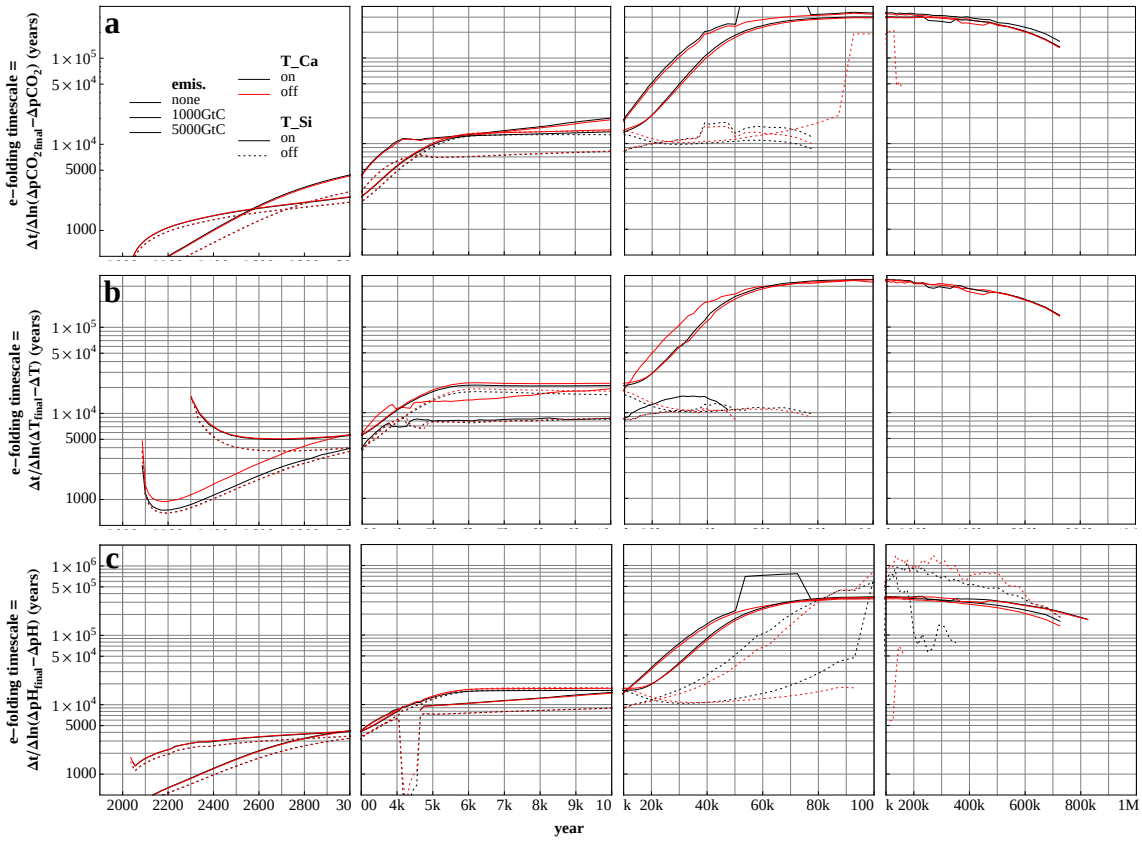

Figure 50: *e*-folding timescales of key variables for weathering-temperature feedbacks ensemble

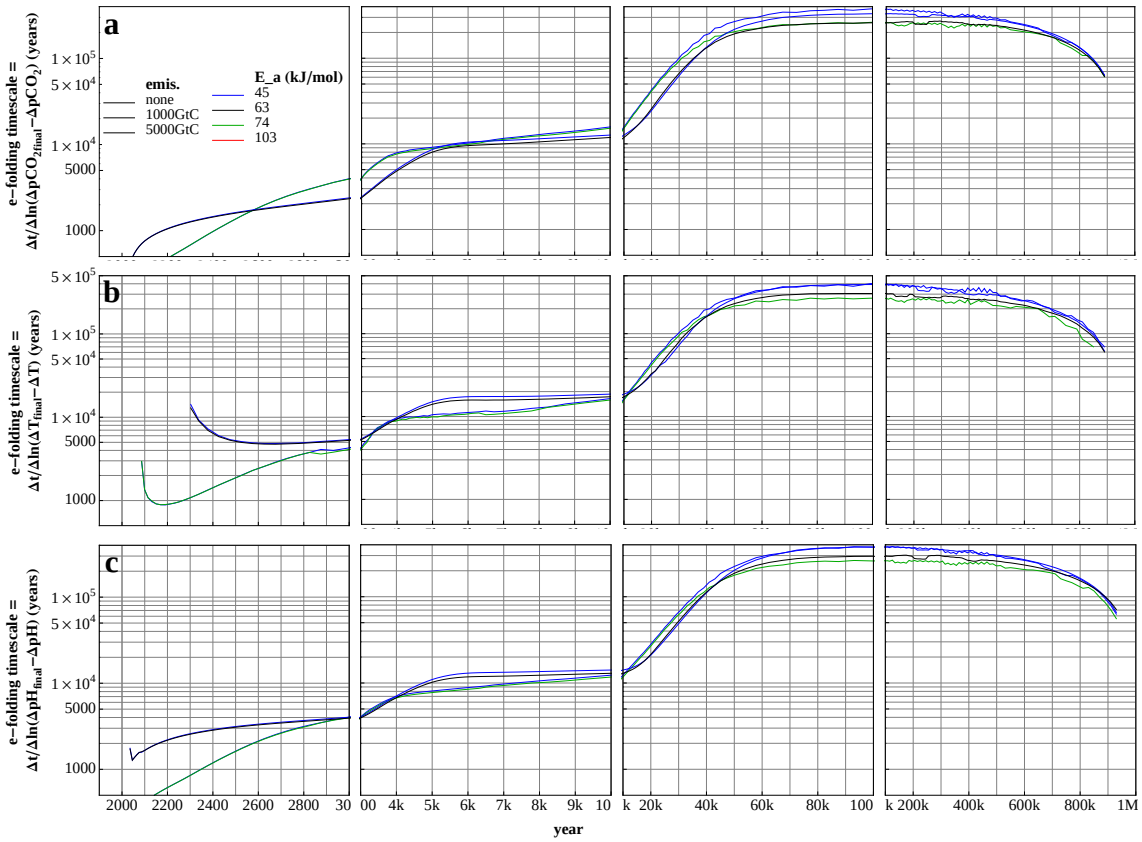

Figure 51: *e*-folding timescales of key variables for weathering activation energy ensemble

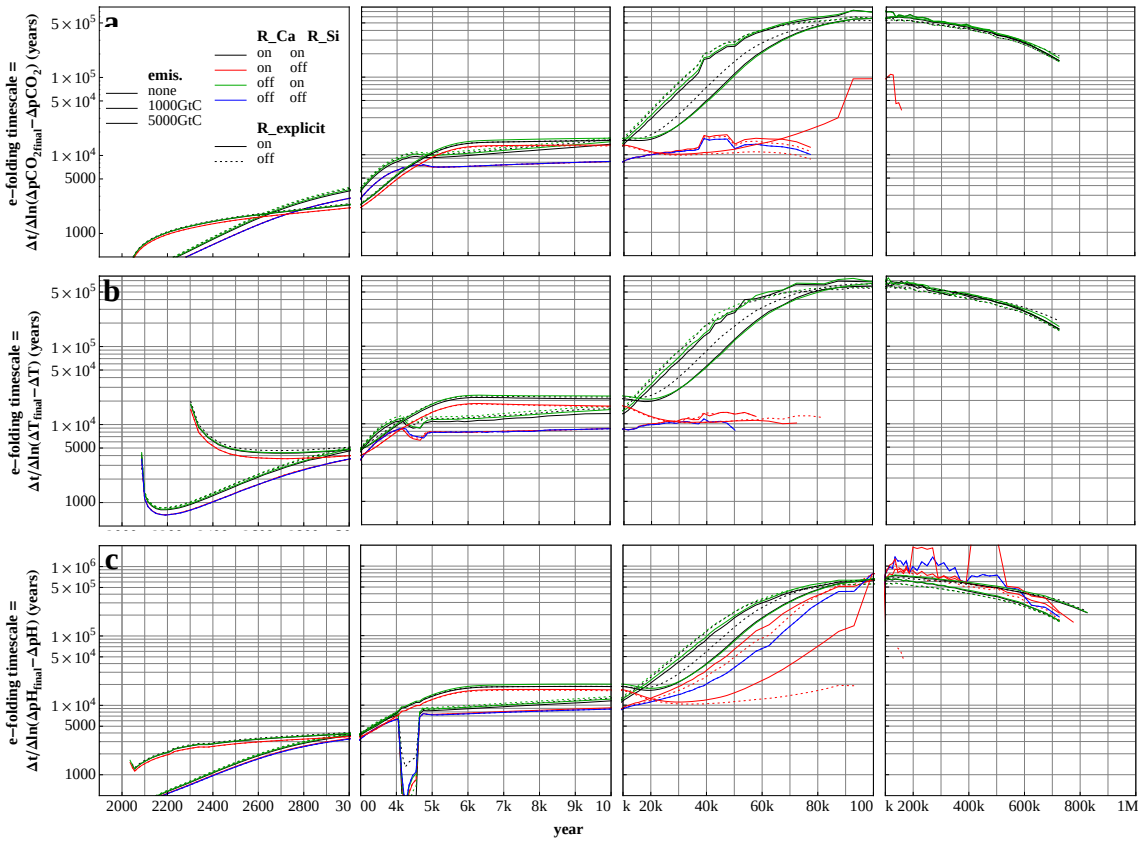

Figure 52: *e*-folding timescales of key variables for weathering-runoff feedbacks ensemble

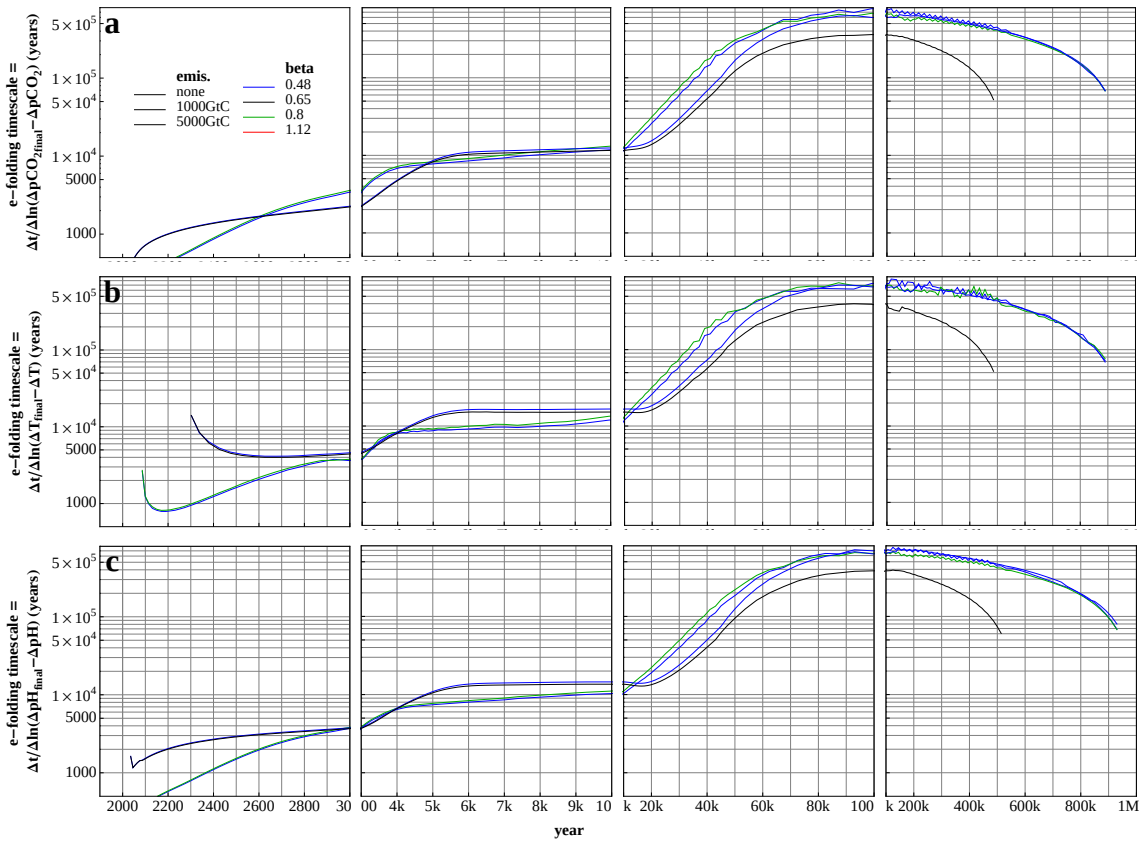

Figure 53: *e*-folding timescales of key variables for fractional power of explicit weathering-runoff dependence ensemble

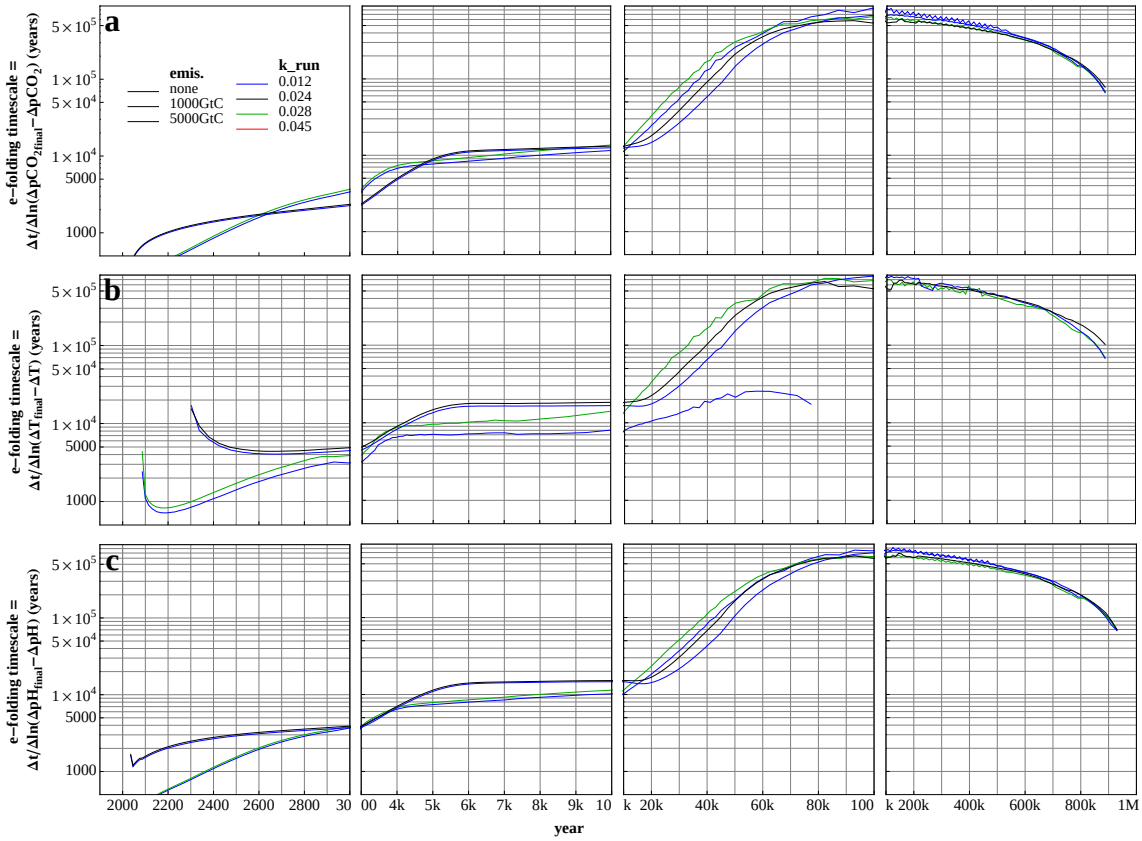

Figure 54: *e*-folding timescales of key variables for runoff-temperature correlation constant ensemble

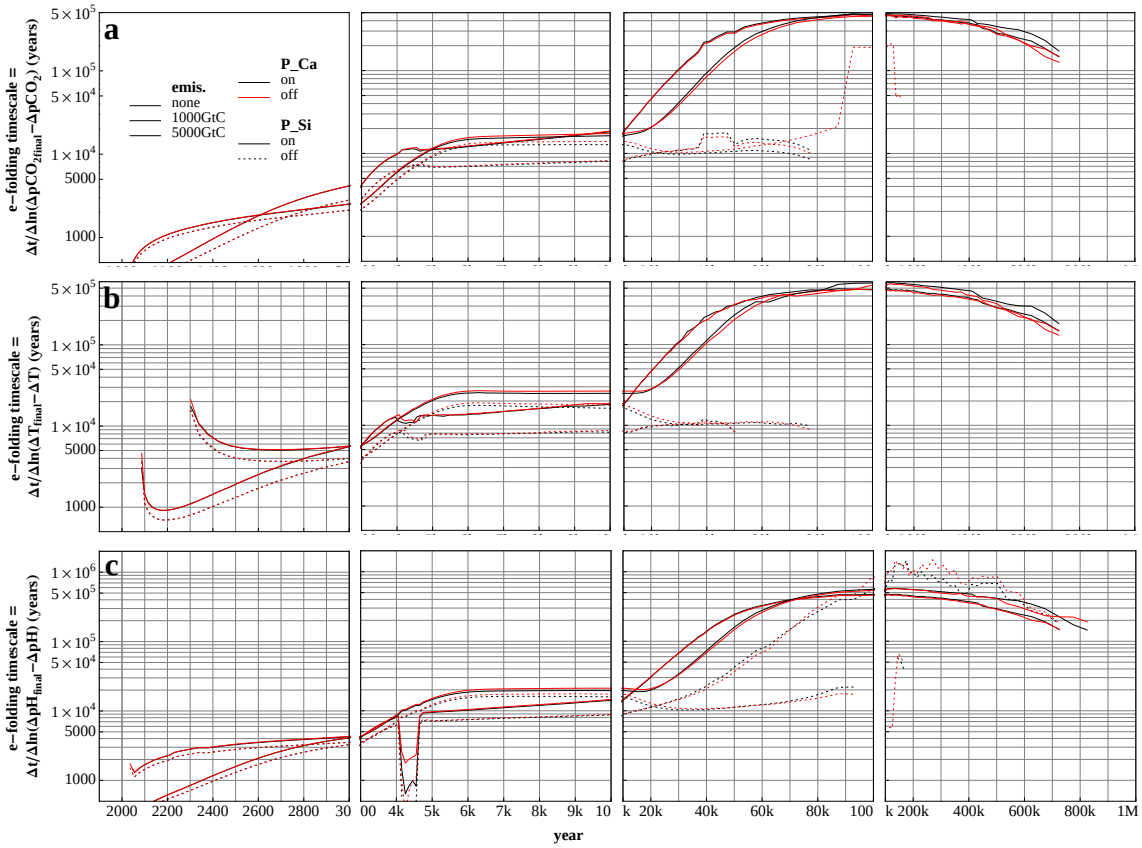

Figure 55: *e*-folding timescales of key variables for weathering-productivity feedbacks ensemble

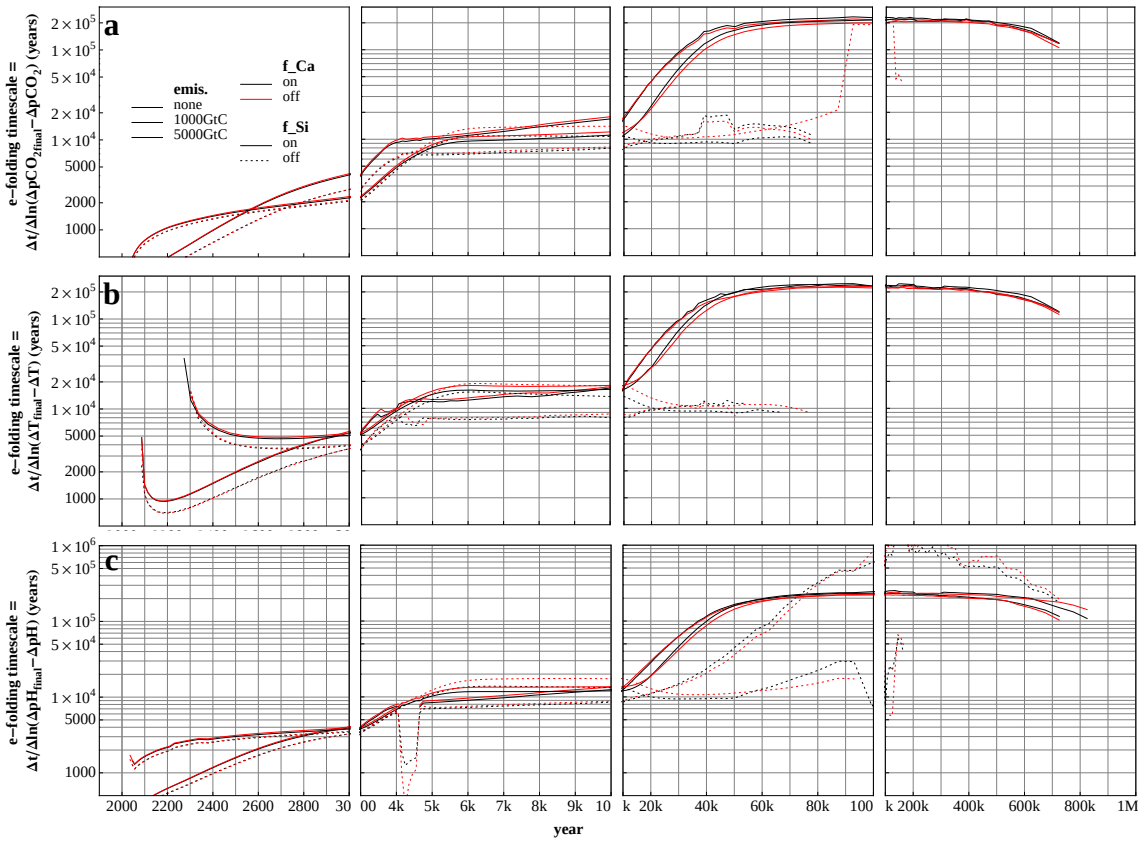

Figure 56: *e*-folding timescales of key variables for calcite and silicate weathering feedbacks ensemble

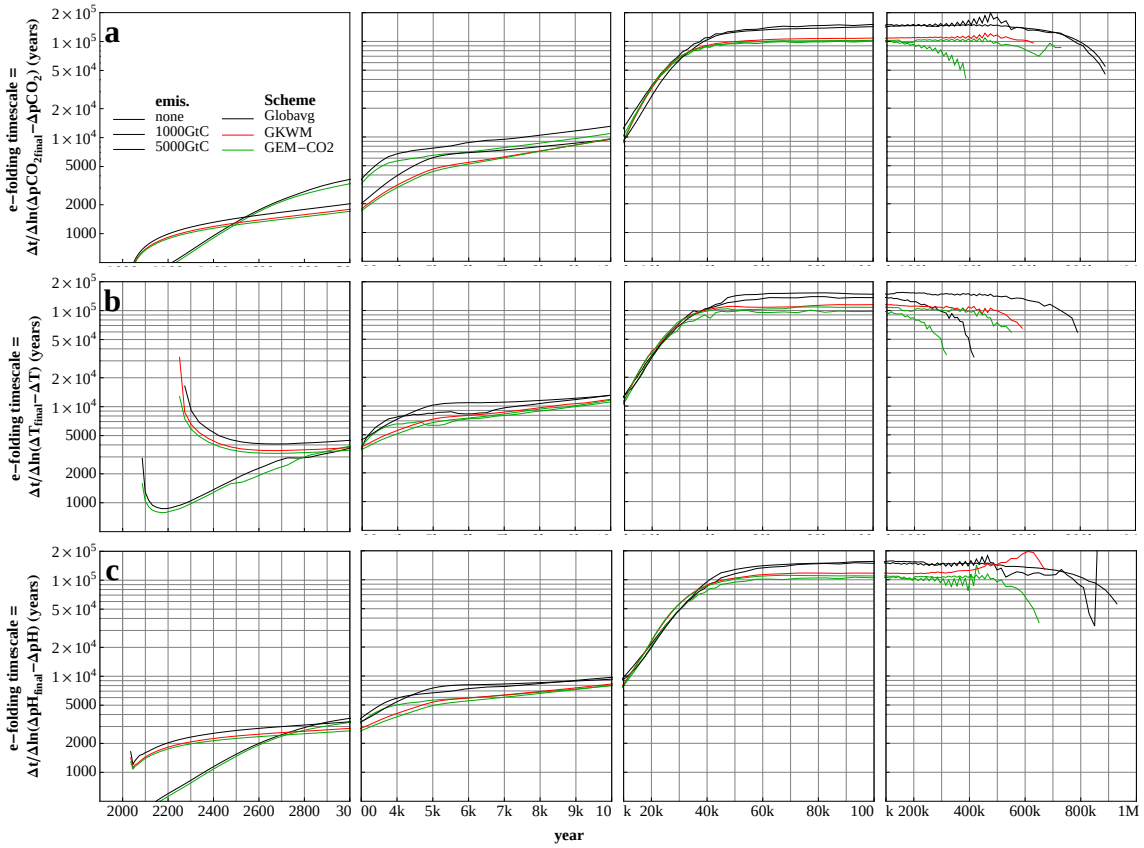

Figure 57: *e*-folding timescales of key variables for weathering schemes ensemble

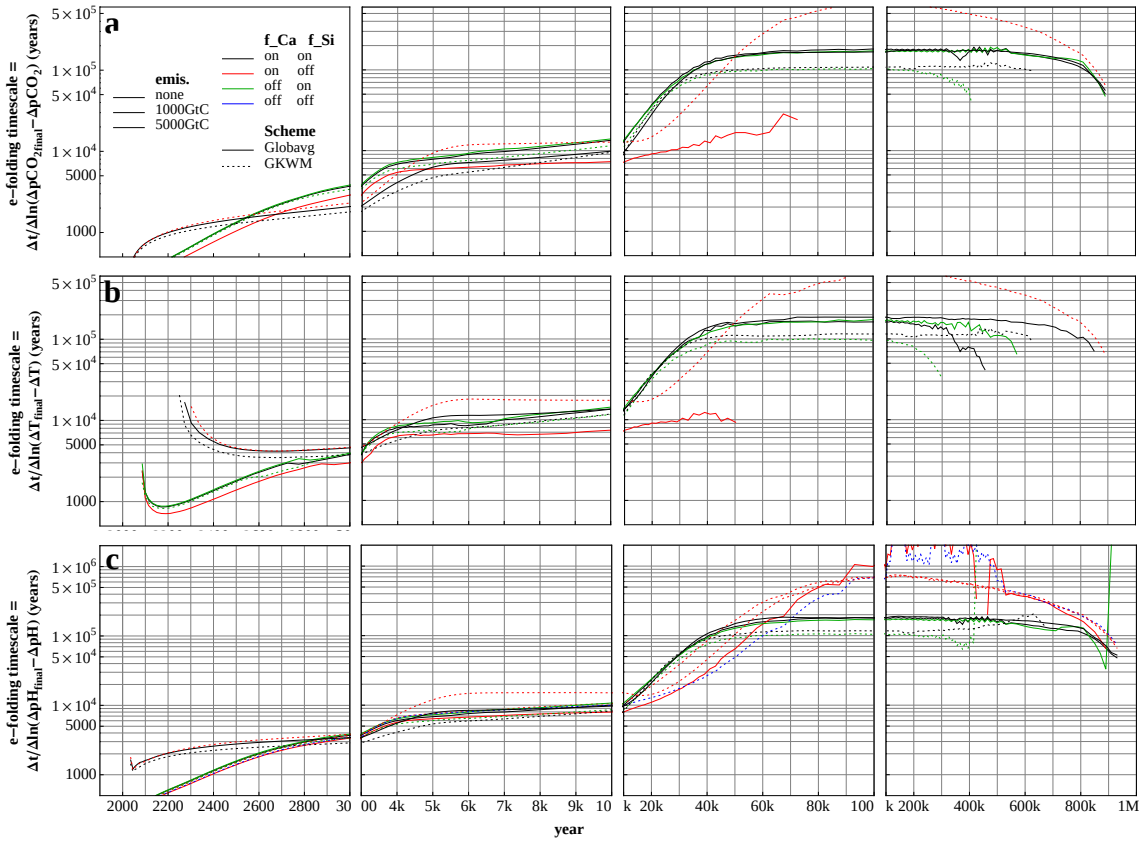

Figure 58: *e*-folding timescales of key variables for weathering schemes with f_Ca and f_Si on/off ensemble

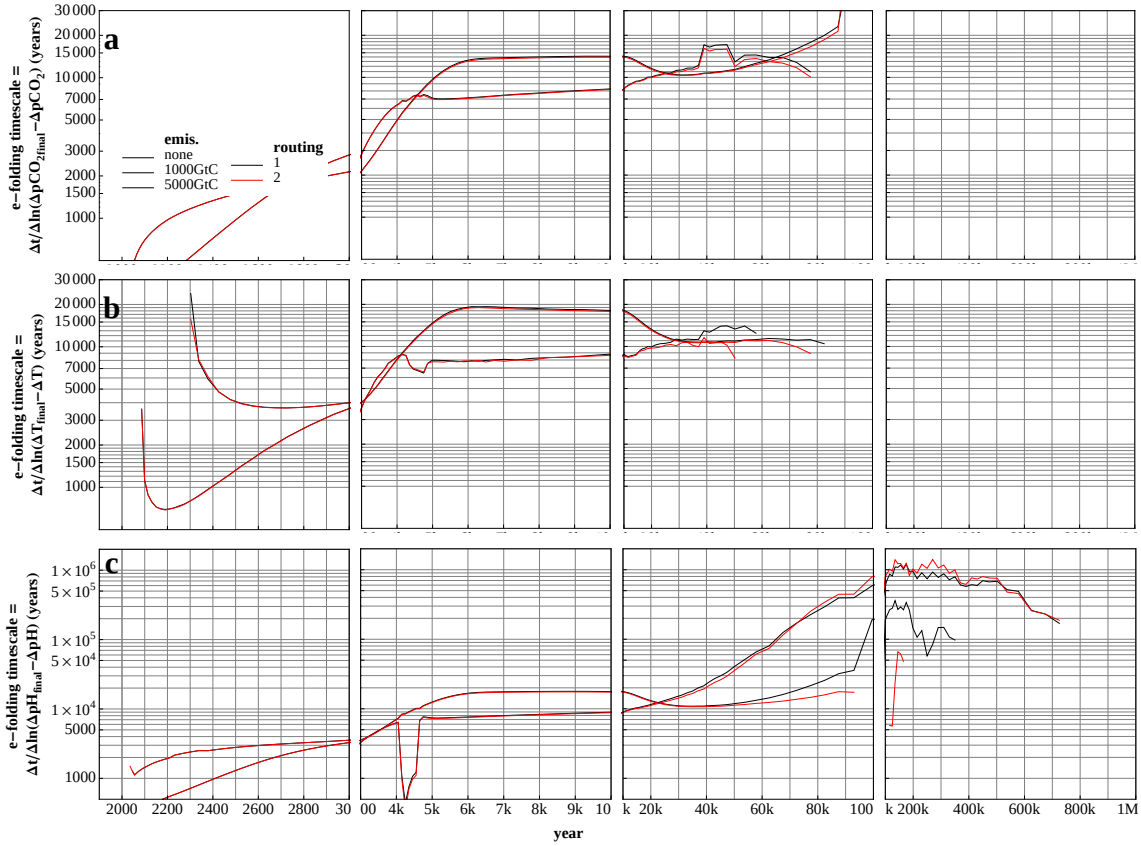

Figure 59: *e*-folding timescales of key variables for river routing schemes ensemble

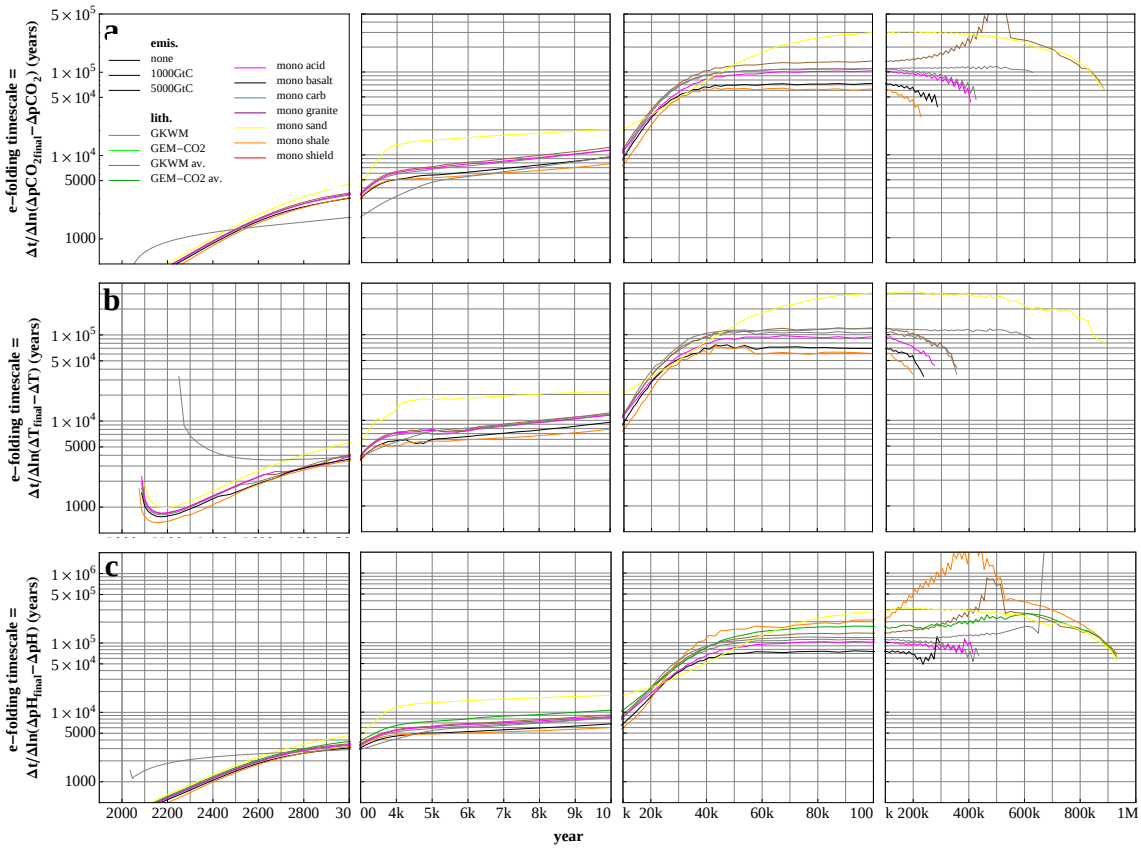

Figure 60: *e*-folding timescales of key variables for lithologies ensemble

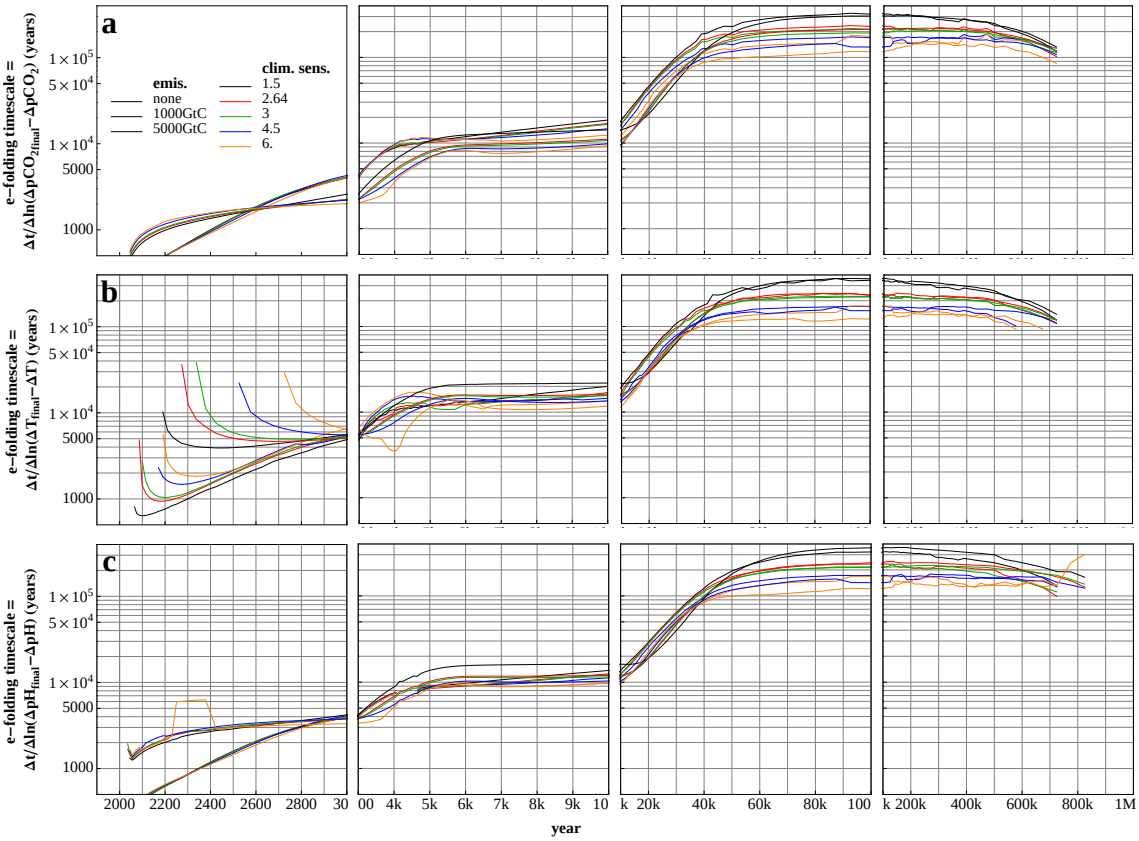

Figure 61: *e*-folding timescales of key variables for climate sensitivity ensemble