Supplementary information: Towards the use of dynamic growing seasons in a chemical transport model

A. Sakalli and D. Simpson

1. Site-by-site comparisons of observed and estimated start of growing season (SGS) values. For details of methods, see main text.

Table S1: Comparison of average observed SGS of *B. pubescens* from the PAN database with estimated SGS using T5, LPJ-CRU, TTM and LAT (EMEP standard) methods

Lon. (°E)	Lat. (°N)	Alt. (m asl)	SGS Obs.	LAT	LPJ CRU[a]	TTM	T5
69.05	27.10	156	160	129	141	173	163
68.40	27.38	301	162	129	139	172	160
68.38	23.65	301	163	129	141	175	162
68.02	24.15	276	157	128	141	168	158
67.73	29.60	321	158	128	141	169	158
67.58	24.20	336	152	128	132	165	154
67.35	23.82	161	150	127	132	164	153
67.02	27.25	216	158	126	134	161	150
66.82	28.40	196	143	126	137	162	152
66.35	26.72	154	141	125	128	157	144
66.30	25.00	118	147	125	127	155	143
64.80	26.00	26	140	123	122	148	144
64.52	26.45	116	153	123	122	147	147
64.23	19.77	226	149	122	127	153	147
63.92	23.88	41	141	122	120	142	139
63.55	29.02	143	139	121	122	147	142
63.50	10.87	61	132	121	-	142	133
63.07	29.82	136	138	121	120	147	142
63.07	21.72	6	139	120	120	145	134
63.00	27.72	116	137	121	117	143	141
62.77	30.97	149	138	120	119	147	142
62.73	25.18	161	137	120	117	145	140
62.63	27.05	120	136	120	116	144	141
62.60	29.72	81	137	120	120	148	142
62.07	24.48	136	136	119	114	139	134
62.02	23.03	114	138	119	112	138	133
61.80	29.32	82	135	119	114	146	141
61.38	25.03	121	136	118	113	136	131
61.02	24.45	131	133	118	112	135	131
60.88	14.40	321	142	117	115	138	138

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TableS1–Continued

Lon.	Lat.	Alt.	Obs.	LAT	LPJ	TTM	T5
(°E)	(°N)	(m asl)	Obs.		CRU[(a)]		
60.62	26.17	31	133	117	110	133	131
60.43	22.75	51	136	117	112	135	131
60.38	22.55	11	133	117	112	135	131
60.05	23.03	16	130	116	111	135	130
59.67	10.78	96	129	116	100	126	124
57.23	9.92	21	121	112	108	116	118
57.17	14.78	181	131	112	91	126	129
55.97	13.33	51	122	110	102	120	124
55.87	12.50	41	125	110	93	116	115
55.67	12.30	31	125	109	92	114	115
54.95	-7.72	61	85	109	89	100	109
53.78	21.58	128	118	107	90	115	125
53.73	9.88	14	105	107	91	105	115
53.67	10.27	51	116	107	88	105	115
53.65	10.20	47	112	107	88	105	115
53.33	-6.23	31	100	106	88	100	109
52.85	6.18	1	113	105	-	99	110
52.75	6.90	1	114	105	94	101	113
52.38	-6.93	81	99	105	-	98	109
52.38	4.63	1	111	105	100	94	100
52.27	5.60	1	125	104	92	98	109
52.25	17.10	75	97	105	84	105	117
52.22	4.63	1	102	104	-	96	109
52.20	5.97	1	109	104	92	98	109
52.20	13.20	43	103	104	82	101	113
52.10	5.12	1	102	104	91	96	109
52.00	5.97	1	93	104	92	97	103
51.98	5.67	26	108	104	90	97	103
51.97	7.63	61	106	104	93	100	114
51.97	6.22	1	109	104	96	98	109
51.95	6.47	1	110	104	96	98	109
51.80	5.40	1	97	104	89	97	103
51.73	5.13	1	115	103	89	96	103
51.57	5.07	1	86	103	92	96	103
51.48	3.95	1	111	103	91	94	101
51.32	3.62	1	105	103	91	92	103
51.28	3.43	1	117	103	93	91	78
51.08	-0.88	85	107	103	95	95	101
50.98	3.80	16	104	103	92	92	103
50.98	13.53	361	117	103	86	106	118
50.00	5.73	501	113	101	90	109	112
49.77	7.05	481	109	100	85	107	112
49.75	6.67	266	103	101	86	104	110
49.02	-0.03	71	123	100	95	88	100
48.82	9.12	331	105	99	79	100	110

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TableS1–Continued

Lon. (°E)	Lat. (°N)	Alt. (m asl)	Obs. Obs.	LAT	LPJ CRU[a]	TTM	T5
48.72	9.22	381	108	99	79	100	110
48.45	18.93	541	113	99	-	108	112
48.40	11.73	461	114	99	85	104	116
48.33	18.37	181	114	98	80	97	107
48.25	16.72	151	101	98	81	95	108
48.25	16.37	203	100	98	80	95	108
48.18	11.17	541	119	98	82	107	116
48.07	7.68	266	106	98	79	91	108
47.95	8.52	681	118	98	-	110	118
47.60	19.35	221	106	97	79	94	103
47.33	21.13	91	100	97	75	91	101
46.03	16.57	147	105	95	75	89	104
45.78	19.12	91	98	95	75	85	99
44.37	20.95	122	101	93	-	84	103
43.75	18.02	1001	125	92	92	113	120

Notes: (a) '-' indicates no values, due to complications with land/sea overlap and/or topography

2. Experiments with fixed day-requirements

In the final version of the 'T5' equation, a variable number of days, $D_{u,,i}$, is needed with more than 5°C before SGS is attained. As seen in Fig. 2 of the main text, $D_{u,,i}$ can vary between zero to almost 40 days (applicable in warmer climates).

This variable $D_{u,,i}$ formulation made possible a very good fit to the observed SGS, in terms of regression statistics and index of agreement. We illustrate here the results of earlier experiments, in which different fixed values, $D_{u,,fix}$, were used to define the number of days >5 °C. Figure S1 shows that most fixed-value formulations have great problems in reproducing the observed SGS values. The most succesful version is that with a 15-day requirement, and here the results are rather good, indeed much better than the standard EMEP 'LAT' method. However, we found that the 2-parameter T5 method provided even better results.
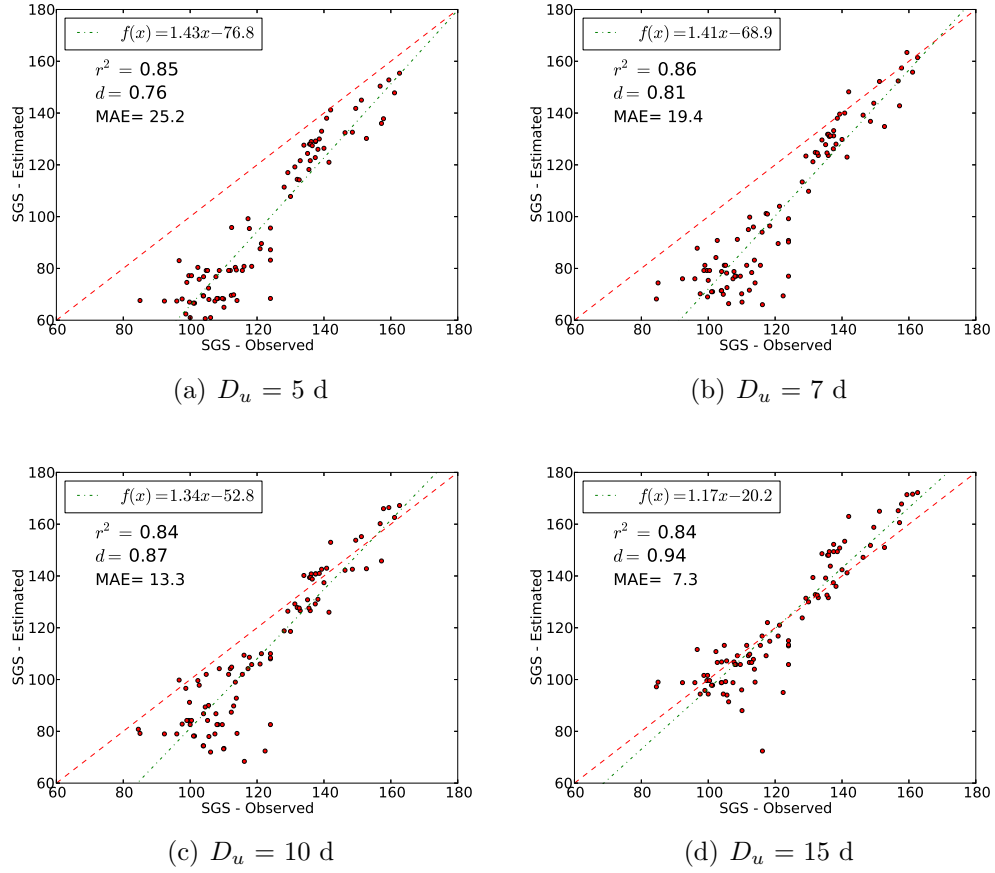
Figure S1: Evaluation of preliminary versions of the 'T5' equation, in which fixed $D_{u,,\text{fix}}$ values of 5, 7, 10 and 15 days were tested. Notation as in main text, Fig. 4.