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Construction and application of a pollen emissions model based on phenology and random forests

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Supplementary Figures:

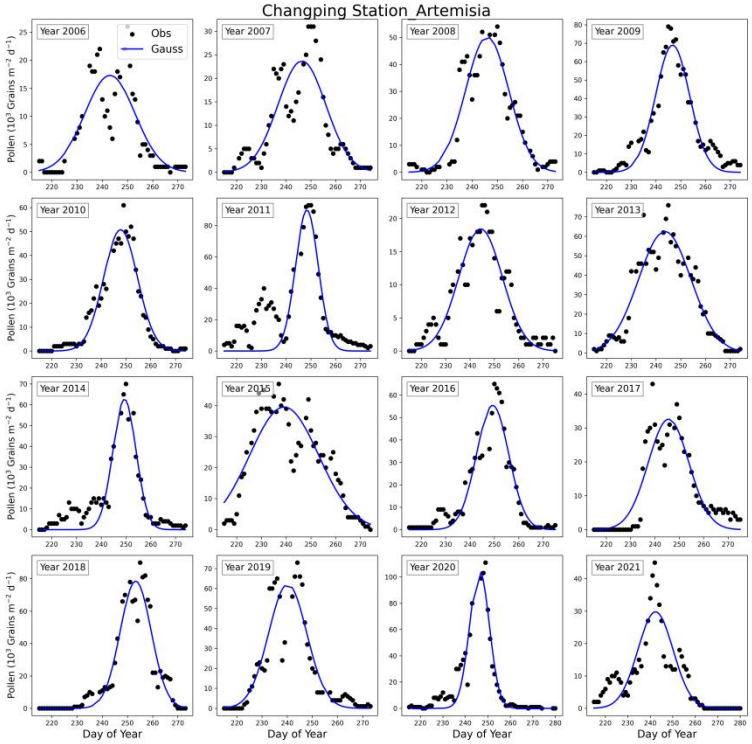

Figure. S1. Artemisia and its Gaussian fitting distribution at the CP station from 2006 to 2021.

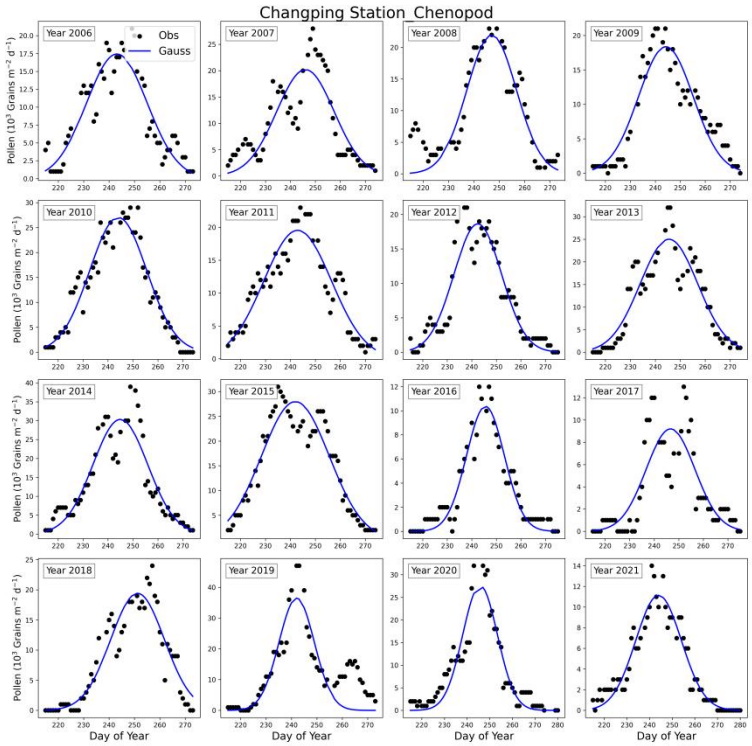

Figure. S2. Chenopod and its Gaussian fitting distribution at the CP station from 2006 to 2021.

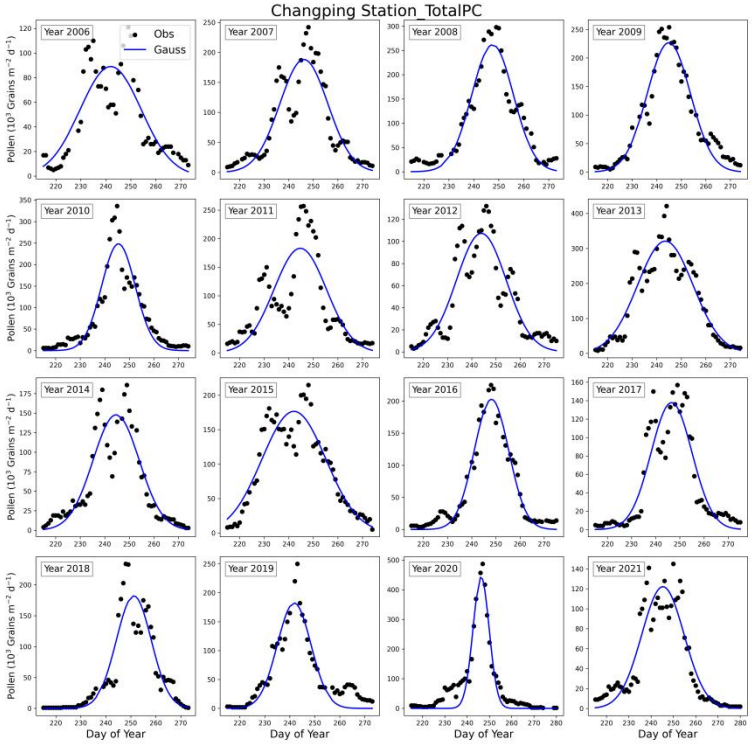

Figure. S3. TotalPC and its Gaussian fitting distribution at the CP station from 2006 to 2021.

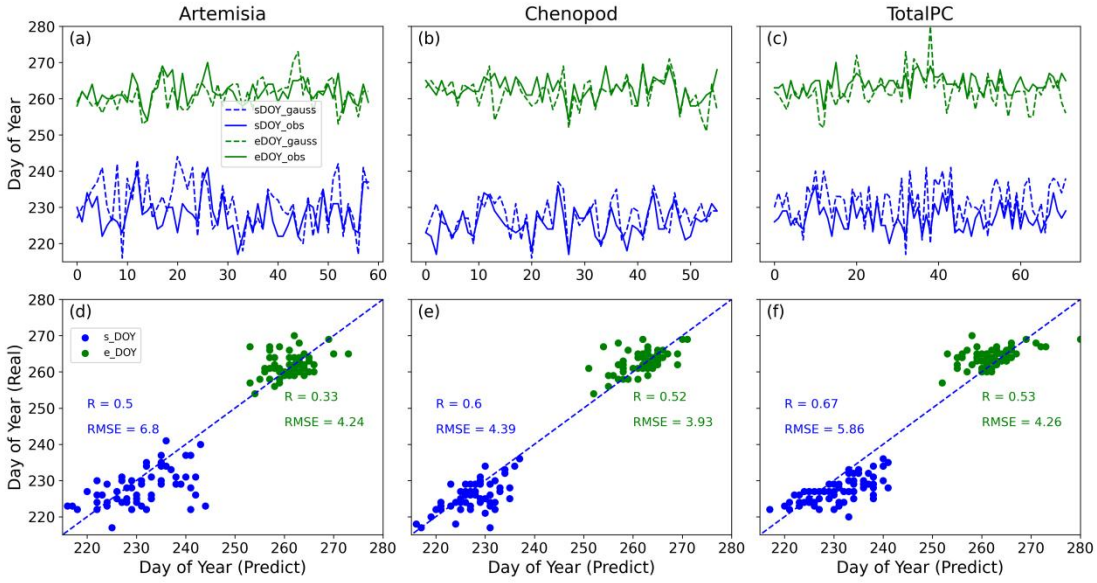

Figure. S4. Comparison of pollen sDOY and eDOY in Gauss fitting: simulation vs. observation. Line plots of three different pollen sDOY and eDOY (a-c) and scatter plot comparison of the same (d-f). Specific comparisons for Artemisia (a, d), Chenopod (b, e), and TotalPC (c, f). The horizontal axis of (a-c) represents the sequential distribution of effective sample counts for the three types of pollen.

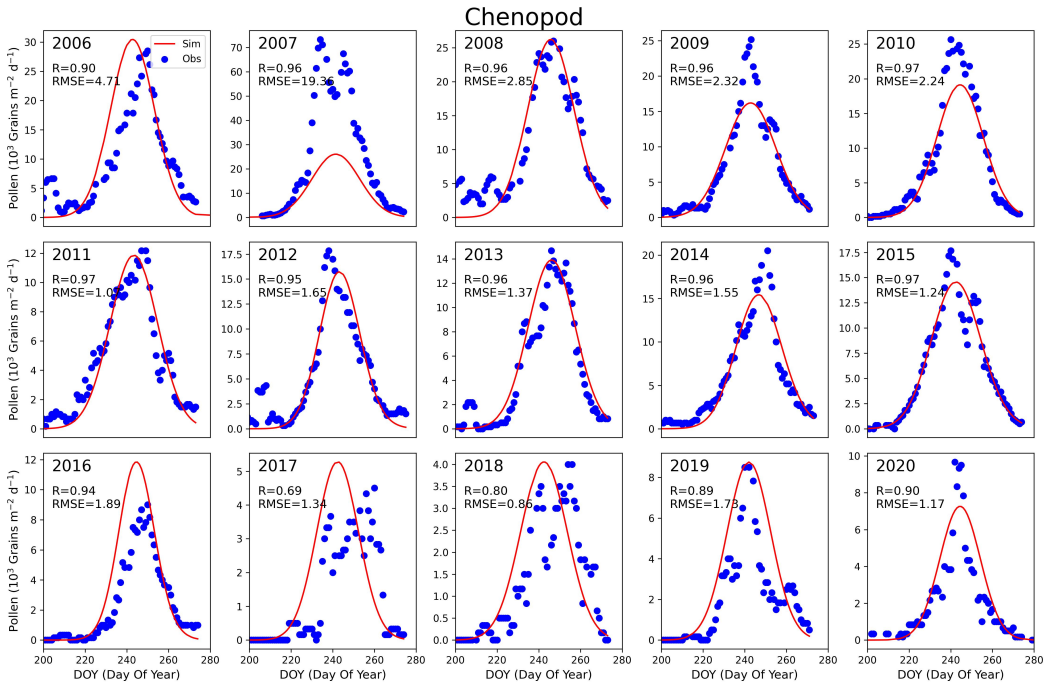

Fig. S5. Time series of observation and simulation of average Chenopod emissions at stations in Beijing from 2006 to 2020. The red solid line represents the simulation of pollen emissions model, while blue dots depict observations

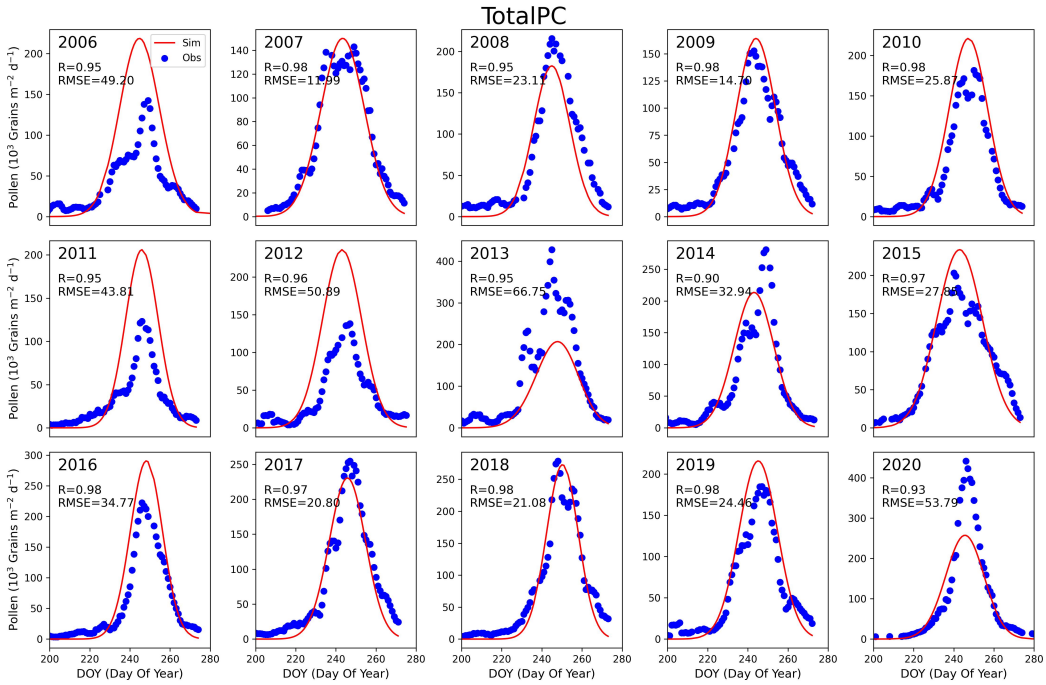

Fig. S6. Time series of observation and simulation of average TotalPC emissions at stations in Beijing from 2006 to 2020. The red solid line represents the simulation of pollen emissions model, while blue dots depict observations

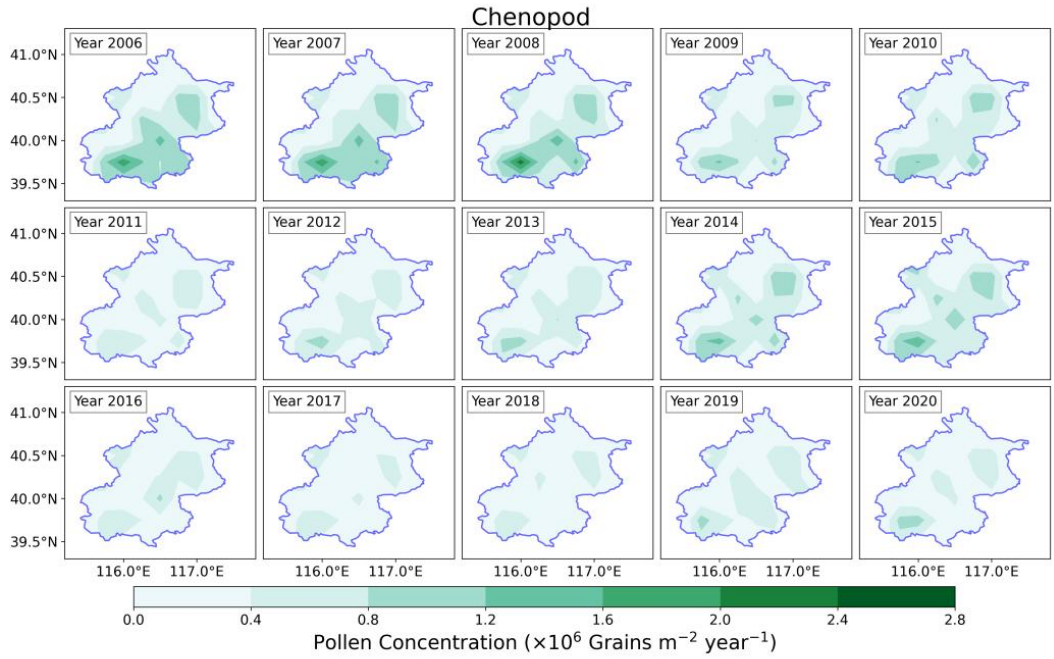

Fig. S7. Distribution of Chenopod in Beijing from 2006 to 2020 based on pollen emissions model

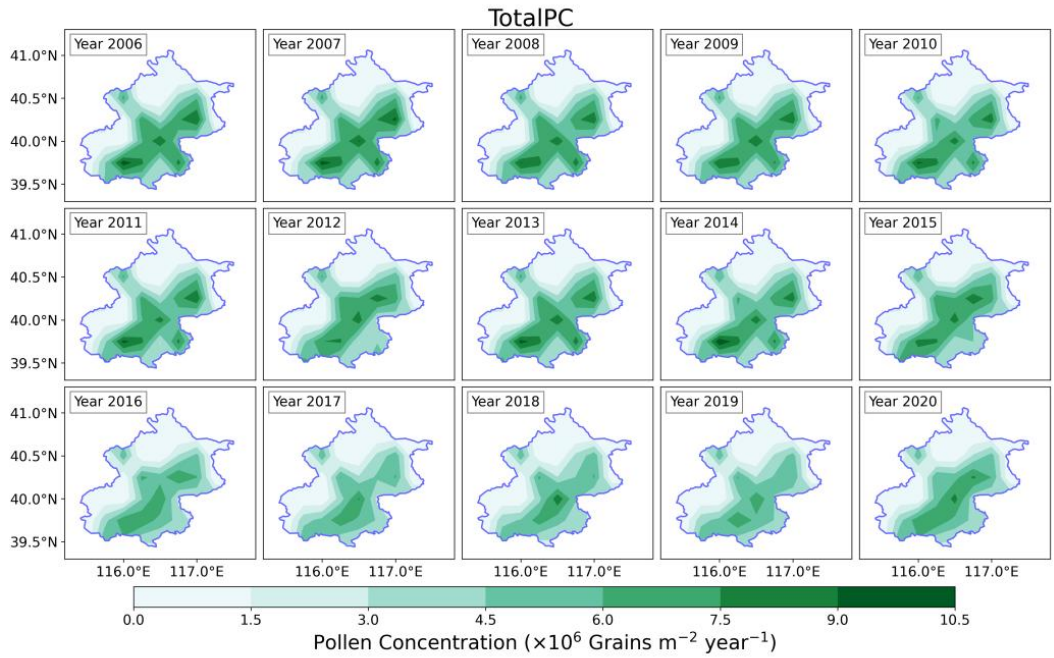

Fig. S8. Distribution of TotalPC in Beijing from 2006 to 2020 based on pollen emissions model

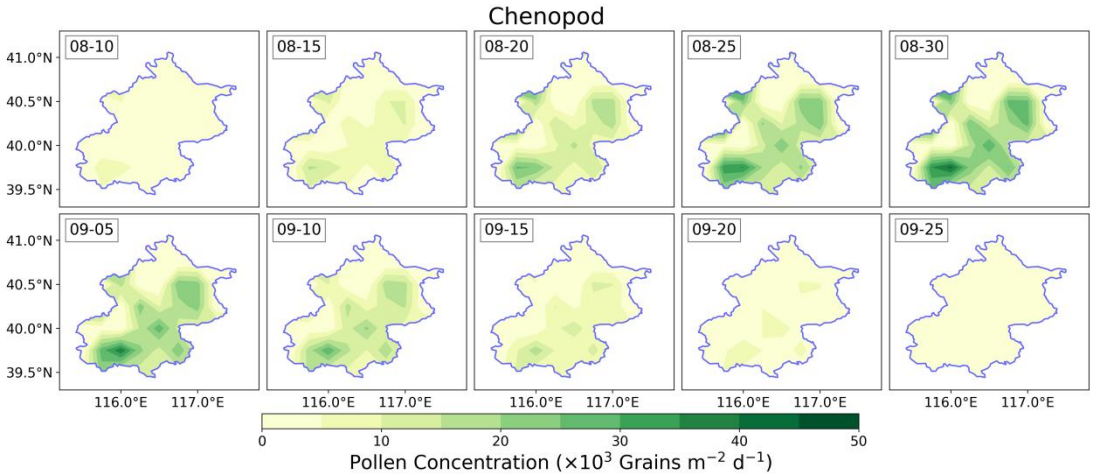

Fig. S9. Temporal and spatial distribution of Chenopod in Beijing (average from 2006 to 2020)

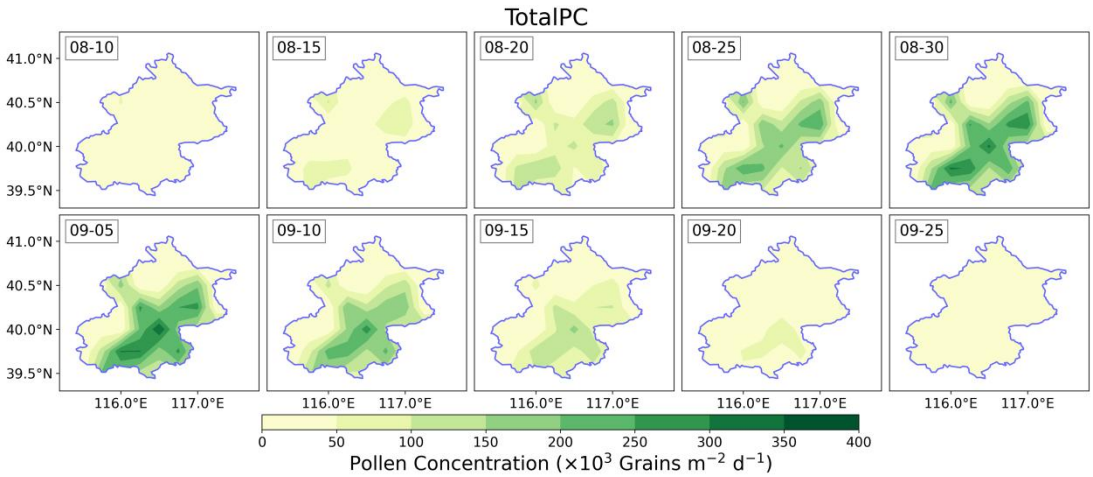

Fig. S10. Temporal and spatial distribution of TotalPC in Beijing (average from 2006 to 2020)

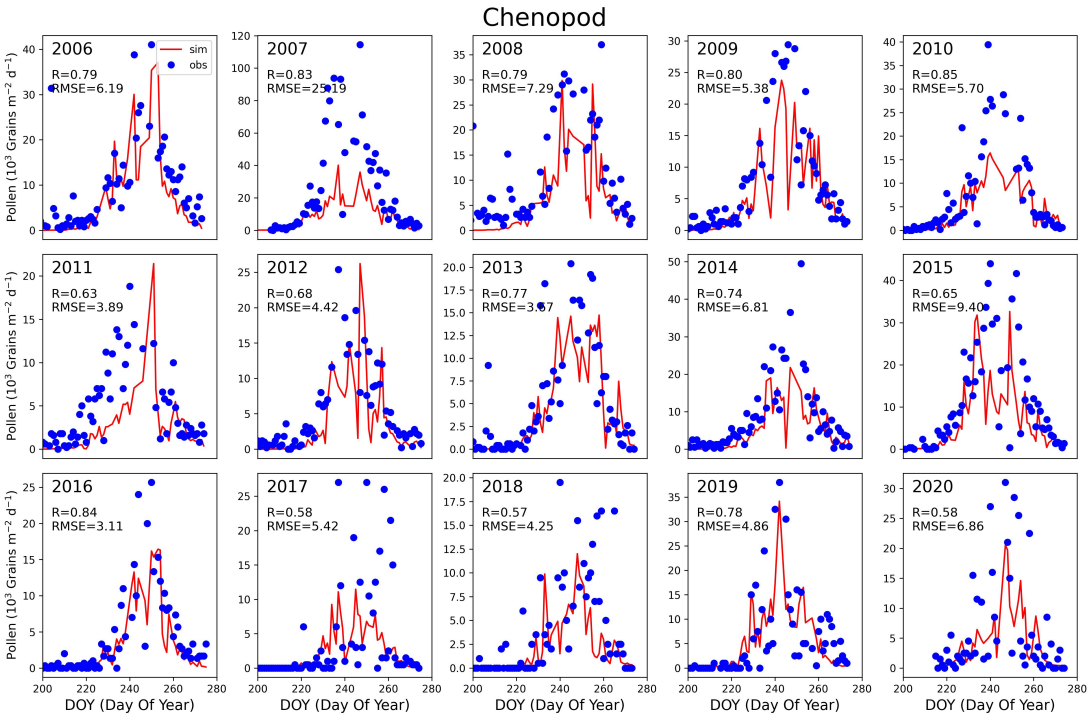

Fig. S11. Time-series distribution of Chenopod under RegCM simulation compared to observations (averaged across effective pollen monitoring sites). The red solid line represents model simulations, while blue dots depict observations

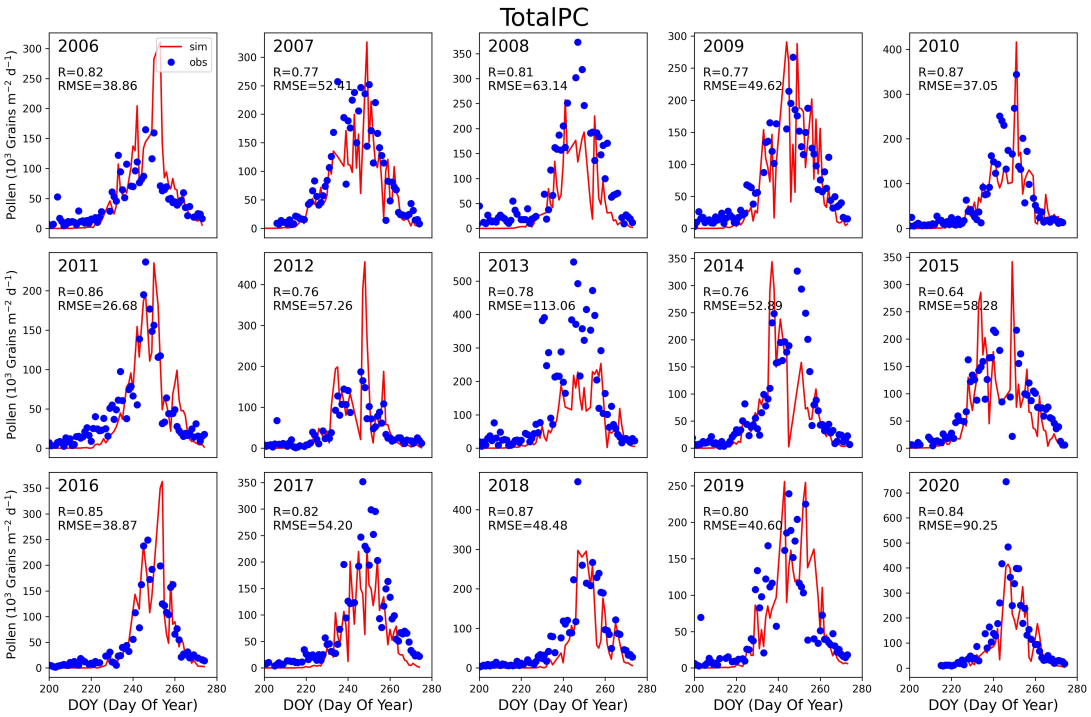

Fig. S12. Time-series distribution of TotalPC under RegCM simulation compared to observations (averaged across effective pollen monitoring sites). The red solid line represents model simulations, while blue dots depict observations

TableS1 Statistical indicators of Chenopod phenology under different phenological methods and temperature conditions. (Unit of RMSE: day)

	Chenopod	Rs_1(R)		Rs_2(R)		Rs_{sig}(R)		Rs_1(RMSE)		Rs_2(RMSE)		Rs_{sig}(RMSE)	
		Train	Test	Train	Test	Train	Test	Train	Test	Train	Test	Train	Test
sDOY	TEM_Min	0.42	0.44	0.59#	0.36	0.47	0.36	4.68	5.09	4.12	5.28	4.38	5.25
	TEM_Avg	0.55*	0.47	**0.63#**	**0.33**	0.51	0.28	4.13	5.37	4.49	5.42	4.12	5.32
	TEM_Max	0.31	-0.1	0.43	0.28	0.42	0.18	7.84	9.13	5.66	5.9	5.55	6.06
eDOY	TEM_Min	**0.42**	**0.25**	0.17	0.2	0.26	0.11	4.23	4.94	4.31	4.71	4.15	4.75
	TEM_Avg	0.37	0.1	0.39	0.23	0.34	0.33	3.98	5.29	4.09	4.84	4.16	4.65
	TEM_Max	0.23	-0.0	0.27	-0.1	0.13	0.11	5.57	6.87	5.53	7.09	6.31	7.14

TableS2 Statistical indicators of TotalPC phenology under different phenological methods and temperature conditions. (Unit of RMSE: day)

	TotalPC	Rs_1(R)		Rs_2(R)		Rs_{sig}(R)		Rs_1(RMSE)		Rs_2(RMSE)		Rs_{sig}(RMSE)	
		Train	Test	Train	Test	Train	Test	Train	Test	Train	Test	Train	Test
sDOY	TEM_Min	0.52*	0.53#	**0.59#**	**0.56#**	0.58#	0.55#	5.84	5.32	5.51	5.32	5.61	5.6
	TEM_Avg	0.54#	0.54#	0.08	nan	0.59#	0.45	5.89	5.21	6.75	6.27	5.71	5.62
	TEM_Max	-0.21	-0.19	0.51*	0.48*	0.52*	0.4	9.04	9.2	7.66	6.45	5.83	6.1
eDOY	TEM_Min	0.41	0.21	0.35	0.24	0.5*	0.36	4.76	4.47	4.9	4	4.75	3.41
	TEM_Avg	0.51*	0.18	0.63#	0.32	**0.5***	**0.49***	4.47	4.83	4.4	3.95	4.63	3.11
	TEM_Max	0.44	0.4	0.18	0.2	0.39	0.29	6.41	6.47	7.7	6.56	4.78	3.72

Note: Bold represents the best model performance, # Indicates significance levels at $P < 0.001$, * Indicates significance levels at $P < 0.005$