Supplementary materials

Table 1. Prior and hyperprior distributions for fixed effect, nonlinear and dynamic models.

Model	Parameter	Prior/Hyperior
Fixed effect model	Intercept (β_0)	$Gaussian(0, 10^3)$
	Slop ($\beta_1, \ldots., \beta_K$)	$Gaussian(0, 10^3)$
Nonlinear model	Intercept (α_0)	$Gaussian(0, 10^3)$
	Slop ($\beta_1, \ldots., \beta_K$)	$Gaussian(0, 10^3)$
	$f_j(X_j) = \beta_j$	$RW1: \beta_{j,k} - \beta_{j,k-1} \sim Gaussian(0, \sigma_j^2)$
		$RW2: \beta_{j,k} - 2\beta_{j,k-1} + \beta_{j,k-2} \sim Gaussian(0, \sigma_j^2)$
		$\sigma_j^2 \sim IG(1, 0.0005)$
Dynamic model	Intercept (β_0)	$Gaussian(0, 10^3)$
	Slop β_{kt}	$\beta_{kt} - \beta_{kt-1} \sim Gaussian(0, \sigma_k^2)$
		$\sigma_k^2 \sim IG(1, 0.0005)$

Table 2. Descriptive statistics of climatic variables.

Variable	Mean	Median	SD	Min	Max
Temperature (°C)	24.24	23.90	0.92	22.70	26.86
Humidity (%)	75.51	76.00	5.66	59.69	88.00
Wind Speed (knot)	4.04	4.00	2.27	0.70	11.10
Air Pressure (mb)	923.43	923.37	1.01	921.00	926.40
Precipitation (mm)	193.83	192.70	131.26	0.20	559.60
Number Rainfall (%)	17.63	20.00	8.33	0.46	30.00
Sunshine Duration (%)	58.96	57.00	14.07	33.66	90.00

Table 3. Variable selection in the fixed effect model.

Model	Covariate	WAIC	
		Poisosn	Neg. binom
F-1	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,T_1,RH_1,WS_1,AP_1,RF_1,NR_1, SR_1,T_2,RH_2,WS_2, AP_2,RF_2,NR_2,SR_2,T_3,RH_3,WS_3,AP_3,RF_3,NR_3,SR_3	15208.67	1357.8
F-2	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,T_1,RH_1,WS_1,AP_1,RF_1,NR_1, SR_1,T_2,RH_2,WS_2, AP_2,NR_2,SR_2,T_3,RH_3,WS_3,AP_3,RF_3,NR_3,SR_3	15662.13	1355.2
F-3	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,T_1,RH_1,WS_1,AP_1,RF_1,NR_1,SR_1,T_2,RH_2,WS_2, AP_2,SR_2,T_3,RH_3,WS_3,AP_3,RF_3,NR_3,SR_3	18432.17	1352.8
F-4	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,T_1,RH_1,WS_1,RF_1,NR_1,SR_1, T_2,RH_2,WS_2,AP_2, SR_2,T_3,RH_3,WS_3,AP_3,RF_3,NR_3,SR_3	18559.27	1350.4
F-5	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,RF_1,NR_1,SR_1,T_2, RH_2,WS_2,AP_2,SR_2, T_3,RH_3,WS_3,AP_3,RF_3,NR_3,SR_3	19555.58	1348.1
F-6	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,NR_1,SR_1,T_2,RH_2, WS_2,AP_2,SR_2,T_3, RH_3,WS_3,AP_3,RF_3,NR_3,SR_3	19078.98	1345.9
F-7	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,NR_1,SR_1,T_2,RH_2, WS_2,AP_2,SR_2,T_3, RH_3,WS_3,AP_3,NR_3,SR_3	22216.72	1343.7
F-8	T_0,RH_0,WS_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,NR_1,SR_1,T_2,RH_2, WS_2,AP_2,SR_2,RH_3, WS_3,AP_3,NR_3,SR_3	22209.98	1341.6
F-9	T_0,RH_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,NR_1,SR_1,T_2,RH_2,WS_2, AP_2,SR_2,RH_3,WS_3, AP_3,NR_3,SR_3	23687.79	1339.5
F-10	T_0,RH_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,SR_1,T_2,RH_2,WS_2,AP_2, SR_2,RH_3,WS_3,AP_3, NR_3,SR_3	23343.34	1337.5
F-11	T_0,RH_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,SR_1,T_2,RH_2,WS_2,AP_2, SR_2,RH_3,WS_3,NR_3, SR_3	23838.45	1335.6
F-12	T_0,RH_0,AP_0,RF_0,NR_0,SR_0,RH_1,WS_1,SR_1,T_2,RH_2,WS_2,AP_2, RH_3,WS_3,NR_3,SR_3	24587.70	1333.8
F-13	T_0,RH_0,AP_0,RF_0,SR_0,RH_1,WS_1,SR_1,T_2,RH_2,WS_2,AP_2,RH_3, WS_3,NR_3,SR_3	22606.08	1331.9
F-14	T_0,RH_0,AP_0,SR_0,RH_1,WS_1,SR_1,T_2,RH_2,WS_2,AP_2,RH_3,WS_3, NR_3,SR_3	21191.32	1330.0

Model	Covariate	WAIC	
		Poisosn	Neg. binom
F-15	T_0,RH_0,AP_0,SR_0,RH_1,WS_1,SR_1,T_2,RH_2,WS_2,AP_2,RH_3,WS_3, SR_3	19576.48	1328.1
F-16	T_0,RH_0,SR_0,RH_1,WS_1,SR_1,T_2,RH_2,WS_2,AP_2,RH_3,WS_3,SR_3	32207.34	1326.2
F-17	T_0,RH_0,SR_0,RH_1,SR_1,T_2,RH_2,WS_2,AP_2,RH_3,WS_3,SR_3	45082.13	1324.7

WAIC**,** Watanabe–Akaike Information Criterion; AP, air pressure; RH, relative humidity; SR, sunshine duration; T, temperture; WS, wind speed.

Table 4. Specification for the nonlinear effect model.

Model	Variable		WAIC	
	Nonlinear	Linear	Poisson	Neg. binomial
N-1	RH,T	AP,SR,WS	6951.377	1382.997

WAIC, Watanabe–Akaike Information Criterion; AP, air pressure; SR, sunshine duration; WS, wind speed.

Table 5. Specification for the Dynamic Model.

Model	Covariate	WAIC	
		Poisson	Neg. binomial
D-1	AP,RH,SR,T,WS	945.10	1012.92
D-2	AP,RH,T,WS	944.75	1010.41
D-3	AP,T,WS	944.53	1009.50
D-4	AP,WS	944.48	1007.58
D-5	AP	944.44	1013.72

WAIC**,** Watanabe–Akaike Information Criterion; AP, air pressure; RH, relative humidity; SR, sunshine duration; T, temperture; WS, wind speed.

Table 6. Summary of model selection results.

Model	Distribution	WAIC
Fixed Effect: $\log(\mu_t) = o_t + \beta_0 + \beta_{T,0}\,T_t + \beta_{RH,0}\,RH_t + \beta_{SR,0}\,SR_t + \beta_{RH,1}\,RH_{t-1} + \beta_{SR,1}\,SR_{t-1} + \beta_{T,2}\,T_{t-2} + \beta_{RH,2}\,RH_{t-2} + \beta_{WS,2}\,WS_{t-2} + \beta_{AP,2}\,AP_{t-2} + \beta_{RH,3}\,RH_{t-3} + \beta_{WS,3}\,WS_{t-3} + \beta_{SR,3}\,SR_{t-3}$	Negative Binomial	1324.71
Nonlinear Effect: $\log(\mu_t) = o_t + \beta_0 + f_T(T_t) + f_{RH}(RH_t) + \beta_{AP}\,AP_t + \beta_{SR}\,SR_t + \beta_{WS}\,WS_t.$	Negative Binomial	1382.98
Dynamic Effect: $\log(\mu_t) = o_t + \alpha(t) + \beta_{AP}(t)\,AP_t$	Poisson	944.44

WAIC**,** Watanabe–Akaike Information Criterion; AP, air pressure; RH, relative humidity; SR, sunshine duration; T, temperture; WS, wind speed.

Table 7. Comparison of fixed, nonlinear, and dynamic effect models.

Model	Family	WAIC	DIC	R^2	RMSE	MAE	p-value (PIT)
Dynamic	Poisson	944.441	976.548	1.000	0.574	0.403	0.000
Fixed	Neg. binomial	1326.659	1325.842	0.552	168.753	118.751	0.779
Nonlinear	Neg. binomial	1374.953	1371.790	0.257	216.201	155.859	0.599

WAIC**,** Watanabe–Akaike Information Criterion; DIC, deviance information criterion; RMSE, root mean square error; MAE, mean absolute error; PIT, probability integral transformation.

Table 8. Parameter estimates of the fixed effect model (F-17).

Parameter	Mean	SD	*q*(0.025)	*q*(0.5)	*q*(0.975)
Intercept	-9.127	0.048	-9.221	-9.127	-9.031

T_0	0.324	0.075	0.177	0.324	0.471
RH_0	0.317	0.110	0.101	0.317	0.533
SR_0	0.121	0.090	-0.057	0.121	0.298
RH_1	0.191	0.097	0.001	0.191	0.381
SR_1	0.157	0.096	-0.032	0.157	0.345
T_2	0.165	0.091	-0.013	0.165	0.343
RH_2	0.367	0.091	0.188	0.367	0.545
WS_2	-0.150	0.116	-0.377	-0.150	0.077
AP_2	-0.083	0.063	-0.207	-0.083	0.041
RH_3	0.209	0.084	0.044	0.209	0.373
WS_3	0.134	0.100	-0.063	0.134	0.330
SR_3	0.138	0.090	-0.039	0.138	0.315

T, temperature; RH, relative humidity; SR, sunshine duration; WS, wind speed; AP, air pressure.

Table 9. Model selection with trend and seasonal components.

Model	Trend	Seasonal	WAIC
M-1	TRUE	TRUE	1065
M-2	TRUE	FALSE	1125
M-3	FALSE	TRUE	1352

WAIC**,** Watanabe–Akaike Information Criterion.

Table 10. Parameter Estimates of M-1, M-2, and M-3.

Model	Parameter	Mean	SD	*q*(0.025)	*q*(0.5)	*q*(0.975)
M-1	Intercept	-9.338	0.101	-9.568	-9.334	-9.123
	T_0	-0.003	0.053	-0.107	-0.003	0.101
	RH_2	0.158	0.051	0.059	0.158	0.259
M-2	Intercept	-9.244	0.017	-9.274	-9.246	-9.207
	T_0	0.009	0.053	-0.095	0.009	0.113
	RH_2	0.276	0.050	0.179	0.276	0.376
M-3	Intercept	-9.133	0.087	-9.310	-9.131	-8.971
	T_0	0.196	0.061	0.076	0.196	0.315
	RH_2	0.439	0.075	0.288	0.440	0.584

T, temperature; RH, relative humidity.

Table 11. Interpretation of regression parameters.

Parameter	Standardized coefficient	Sd(X)	Unstandized coefficient	IIRR
Intercept (β_0)	-9.133	1.000	-9.133	0.0001
Temperature at temporal lag 0 ($\beta_{T,2}$)	0.196	0.933	0.347	1.415
Relative humidity at temporal lag 2 ($\beta_{RH,2}$)	0.439	5.541	0.066	1.068

IRR, incidence rate ratio.