Supplementary materials for

Simulating heat and CO_2 fluxes in Beijing using SUEWS V2020b: Sensitivity to vegetation phenology and maximum conductance

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Table S1. Notation used in Table S2 and Table S3.

Parameter	Description
α_i	Effective surface albedo (–)
ϵ_i	Effective surface emissivity (–)
$a_{0,wd,we}$	Parameter defining the base Q_F per capita (W m^{-2} (capita^{-1} ha^{-1})$^{-1}$)
$a_{1,wd,we}$	Parameter defining the base CDD per capita (W m^{-2} (capita^{-1} ha^{-1})$^{-1}$)
$a_{2,wd,we}$	Parameter defining the base HDD per capita (W m^{-2} K^{-1} (capita^{-1} ha^{-1}) $^{-1}$
b	Empirical coefficient in the calculation of drainage (–)
$IrrFr_i$	Fraction of irrigated surface i (–)
$b_{0a,1a,2a}$	Parameters for automatic irrigation (mm, mm K^{-1}, mm d^{-1})
$b_{0m,1m,2m}$	Parameters for manual irrigation (mm, mm K^{-1}, mm d^{-1})
C_i	Interception state of ith surface (mm)
$C_{soil,i}$	Soil water storage (mm)
C^R_{min}	Minimum retention capacity (mm)
C^R_{max}	Maximum retention capacity (mm)
$D_{0,i}$	Drainage rate (mm)
$DaysSinceRain$	Days since rain before the simulation period (–)
I_w	Additional water to water surface type (mm)
res_{cap}	Surface water capacity in LUMPS (mm)
res_{drain}	Drainage rate of water bucket in LUMPS (mm h^{-1})
R_C	Limit when surface is totally covered with water in LUMPS (mm)
S_{pipe}	Maximum depth capacity of pipes (mm)
T_{step}	Time step for water balance calculation (s)

Table S2. Overall model parameter values used in model runs in Beijing (Kokkonen et al. 2019). See Table S1 for parameter description.

Parameter	Value	Parameter	Value
$a_{0,wd,we}$	0.308 (W m^{-2} (capita^{-1} ha^{-1})$^{-1}$)	C^R_{min}	0.05 mm
$a_{1,wd,we}$	0.0099 (W m^{-2} (capita^{-1} ha^{-1})$^{-1}$)	C^R_{max}	0.2 mm
$a_{3,wd,we}$	0.0102 (W m^{-2} (capita^{-1} ha^{-1})$^{-1}$)	$DaysSinceRain$	28
$b_{0,a}$	-19.19 mm	I_w	0 mm
$b_{1,a}$	2.22 mm K^{-1}	res_{cap}	10 mm
$b_{2,a}$	0.78 mm d^{-1}	res_{drain}	0.25 mm h^{-1}
$b_{0,m}$	-5.76 mm	R_C	1.0 mm
$b_{1,m}$	0.67 mm K^{-1}	S_{pipe}	100 mm
$b_{2,m}$	0.24 mm d^{-1}	T_{step}	300 s

Table S3. Model parameters used in SUEWS for different surfaces: buildings (Bldgs), paved surface (Paved), evergreen tree/shrub (Everg), deciduous tree/shrub (Dec), grass, and water (Kokkonen et al. 2019). Initial conditions assume there is no snow on the ground. See Table S1 for parameter description.

	Unit	Bldgs	Paved	Everg	Dec	Grass	Water
$D_{0,i}$	mm	10	10	0.013	0.013	10	–
b	–	3	3	1.71	1.71	0.013	–
α_i	–	0.15	0.12	0.1	0.16	0.19	0.1
ϵ_i	–	0.95	0.91	0.98	0.98	0.93	0.95
$IrrFr_i$	–	0	0	0.31	0.31	0.7	–

Reference

Kokkonen, Tom V, Sue Grimmond, Sonja Murto, Huizhi Liu, Anu-Maija Sundström, and Leena Järvi. 2019. 'Simulation of the radiative effect of haze on the urban hydrological cycle using reanalysis data in Beijing', *Atmospheric Chemistry and Physics*, 19: 7001-17.