Parameter	Description	Unit	Range (theoretical)	Optimized value	± uncertainty (%)	Eq.
Snow						
p_{sf}	scaling factor for snowfall	–	0–3 (∞)	0.67	$\pm 1 \times 10^{-3}$ ($< 1\%$)	(S2)
sn_c	minimum SWE that ensures complete snow cover of the grid	mm	0–500 (∞)	80	± 19 (24%)	(S3)
m_t	snowmelt factor for T	$mm\,K^{-1}\,day^{-1}$	0–10	2.63	± 0.26 (10%)	(S4)
m_r	snowmelt factor for R_n	$mm\,MJ^{-1}\,day^{-1}$	0–3	0.90	± 0.05 (6%)	(S4)
sn_a	sublimation resistance	–	0–3	0.44	± 0.01 (3%)	(S5)
Soil						
s_{exp}	shape parameter of runoff–infiltration curve	–	0.1–5	1.46	± 0.02 (2%)	(S12)
s_{max}	maximum soil water holding capacity	mm	10–1000 (0–∞)	515	± 9 (2%)	(S12)
et_a	alpha coefficient in Priestley–Taylor formula	–	0–3	1.20	± 0.01 (1%)	(S14)
et_{sup}	ET sensitivity and/or SM fraction available for ET	day^{-1}	0–1	0.02	$\pm 6 \times 10^{-5}$ ($< 1\%$)	(S18)
Runoff						
q_t	recession timescale for land runoff	d	0.5 (0)–100	13	± 4 (31%)	(S20)