

Supporting Information for

A methodological framework for improving the performance of data-driven models, a case study for daily runoff prediction in the Maumee domain, U.S.

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Introduction

The supplementary information contains the list of 72 candidate variables from NOAA's NWM (Table S1), among which we selected seven influential variables for the Maumee Domain (Table S2).

Table S1. List of candidate variables from the National Water Model.

No.	Variable Name	Definition	Units
1.	SWFORC	Shortwave radiation forcing	$W m^{-2}$
2.	LWFORC	Longwave radiation forcing	$W m^{-2}$
3.	RAINRATE	Precipitation in model timestep	$mm s^{-1}$
4.	EMISS	Emissivity: grid-average	-
5.	FSA	Total absorbed SW radiation	$W m^{-2}$
6.	FIRA	Total net LW radiation (+ to atmosphere)	$W m^{-2}$
7.	HFX	Sensible heat flux: grid-average (+ to atmosphere)	$W m^{-2}$
8.	LH	Latent heat flux: grid-average (+ to atmosphere)	$W m^{-2}$
9.	EDIR	Direct soil evaporation rate	$kg m^{-2} hr^{-1}$
10.	ETRAN	Transpiration rate	$kg m^{-2} hr^{-1}$
11.	ZWT	Depth to the water table	m
12.	WA	Water in aquifer	$kg m^{-2}$
13.	WT	Water in aquifer and saturated soil	$kg m^{-2}$
14.	TR	Transpiration heat flux	$W m^{-2}$
15.	IRG	Ground net longwave radiation	$W m^{-2}$
16.	SHG	Ground sensible heat	$W m^{-2}$
17.	EVG	Ground evaporation heat	$W m^{-2}$
18.	SAG	Solar radiation absorbed by the ground	$W m^{-2}$
19.	IRB	Net emitted longwave radiation by the bare ground	$W m^{-2}$
20.	SHB	Sensible heat flux by the bare ground to the atmosphere	$W m^{-2}$
21.	EVB	Latent heat flux by the bare ground to the atmosphere	$W m^{-2}$
22.	TRAD	Surface radiative temperature	K
23.	TG	Ground temperature	K
24.	TGV	Ground temperature with vegetated ground	K

25.	TGB	Ground temperature with bare ground	K
26.	T2MV	2m temperature with vegetated ground	K
27.	Q2MV	2m mixing ratio with vegetated ground	kg kg ⁻¹
28.	ZSNSO_SN	Snow layer depths from snow surface	m
29.	SNICE	Snow layer ice	mm
30.	SNLIQ	Snow later liquid water	mm
31.	SOIL_T1	Soil temperature at the top layer	K
32.	SOIL_T2	Soil temperature at layer 2	K
33.	SOIL_T3	Soil temperature at layer 3	K
34.	SOIL_T4	Soil temperature at the bottom layer	K
35.	SOIL_W1	Liquid volumetric soil temperature at the top layer	m ³ m ⁻³
36.	SOIL_W2	Liquid volumetric soil temperature at layer 2	m ³ m ⁻³
37.	SOIL_W3	Liquid volumetric soil temperature at layer 3	m ³ m ⁻³
38.	SOIL_W4	Liquid volumetric soil temperature at the bottom layer	m ³ m ⁻³
39.	SNOW_T	Snow temperature	K
40.	SNOWH	Snow depth	m
41.	SNEQV	Snow water equivalent	kg m ⁻²
42.	QSNOW	Snowfall rate at the surface	mm hr ⁻¹
43.	ISNOW	Number of snow layers	-
44.	FSNO	Fraction of surface covered with snow	fraction
45.	ACSNOW	Accumulated snowfall	mm
46.	ACSNOM	Accumulated melting water out of snow bottom	mm
47.	CM	Momentum drag coefficient	-
48.	CH	Grid average sensible heat exchange coefficient	-
49.	CHV	Exchange coefficient from vegetation to atmosphere	m hr ⁻¹
50.	CHB	Exchange coefficient from the bare ground	m hr ⁻¹
51.	CHLEAF	Exchange coefficient from leaf surface	m hr ⁻¹

52.	CHUC	Exchange coefficient from below the canopy	m hr^{-1}
53.	CHV2	Exchange coefficient from the vegetation to atmosphere at 2m	m hr^{-1}
54.	CHB2	Exchange coefficient from the bare ground at 2m	m hr^{-1}
55.	RTMASS	Root carbon mass	g C m^{-2}
56.	STMASS	Stem carbon mass	g C m^{-2}
57.	WOOD	Wood and woody roots carbon mass	g C m^{-2}
58.	NEE	Net ecosystem exchange	$\text{g m}^{-2} \text{hr}^{-1}$ CO^2
59.	GPP	Net instantaneous carbon assimilation	$\text{g m}^{-2} \text{hr}^{-1} \text{C}$
60.	ACCET	Accumulated total evapotranspiration	mm
61.	SOILICE	Fraction of soil moisture that is ice	fraction
62.	SOILSAT	Fraction of soil saturation, column integrated	fraction
63.	SNOWT_AVG	Average snow temperature (by layer mass)	K
64.	ZWATABLRT	Depth of saturated layers	m
65.	QBDRYRT	Accumulated flow volume routed outside of the domain	mm
66.	SFHEADSUBRT	Depth of ponded water on the surface	mm
67.	QQSFC_ACC	Accumulated depth of surface water leaving a cell	mm
68.	SOIL_M1	Volumetric soil moisture in the top layer	$\text{m}^3 \text{m}^{-3}$
69.	SOIL_M2	Volumetric soil moisture in layer 2	$\text{m}^3 \text{m}^{-3}$
70.	SOIL_M3	Volumetric soil moisture in layer 3	$\text{m}^3 \text{m}^{-3}$
71.	SOIL_M4	Volumetric soil moisture in the bottom layer	$\text{m}^3 \text{m}^{-3}$
72.	ALBEDO	Surface albedo	-

Table S2. Influential variables for the Maumee Domain.

No	Variables	Definition	Units
1	RAINRATE	Daily Precipitation	mm d ⁻¹
2	ACSNOM	Daily accumulated melting water out of snow bottom	mm d ⁻¹
3	SFHEADSUBRT	Daily average depth of ponded water on the surface	mm d ⁻¹
4	FIRA	Total net LW radiation (+ to atmosphere) per day	W m ⁻² d ⁻¹
5	SOIL_T4	Daily average soil temperature at the bottom layer	K d ⁻¹
6	SOIL_M3	Daily average volumetric soil moisture in layer 3	m ³ m ⁻³ d ⁻¹
7	SOILSAT	Fraction of soil saturation, column integrated per day	d ⁻¹