

Supplementary Materials:

Table S1. Selected Variables for the Data-driven Machine Learning Modelling

Name	Units	Description	Source
ET	mm	Total evapotranspiration	MODIS
SSM	mm	Surface soil moisture	USDA
GLDAS soil moisture	mm	Soil moisture in 0 - 10 cm underground	GLDAS
FLDAS soil moisture	mm	Soil moisture in 0 - 10 cm underground	FLDAS
GLDAS Evap_tavg	mm	Evapotranspiration	GLDAS
FLDAS Evap_tavg	mm	Evapotranspiration	FLDAS
LWdown_f_tavg	W m-2	Downward longwave radiation flux	FLDAS
Lwnet_tavg	W m-2	Net longwave radiation flux	FLDAS
Psurf_f_tavg	Pa	Surface pressure	FLDAS
Qair_f_tavg	kg kg-1	Specific humidity	FLDAS
Qg_tavg	W m-2	Soil heat flux	FLDAS
Qh_tavg	W m-2	Sensible heat net flux	FLDAS
Qle_tavg	W m-2	Latent heat net flux	FLDAS
Qs_tavg	kg m-2 s-1	Storm surface runoff	FLDAS
Qsb_tavg	kg m-2 s-1	Baseflow-groundwater runoff	FLDAS
RadT_tavg	K	Surface radiative temperature	FLDAS
Rainf_f_tavg	kg m-2 s-1	Total precipitation rate	FLDAS
SoilMoi00_10cm_tavg	m ³ m-3	Soil moisture (0 - 10 cm underground)	FLDAS
SoilMoi100_200cm_tavg	m ³ m-3	Soil moisture (100 - 200 cm underground)	FLDAS
SoilMoi40_100cm_tavg	m ³ m-3	Soil moisture (40 - 100 cm underground)	FLDAS
SoilTemp00_10cm_tavg	K	Soil temperature (0 - 10 cm underground)	FLDAS
SoilTemp10_40cm_tavg	K	Soil temperature (10 - 40 cm underground)	FLDAS
SoilTemp100_200cm_tavg	K	Soil temperature (100 - 200 cm underground)	FLDAS
SoilTemp40_100cm_tavg	K	Soil temperature (40 - 100 cm underground)	FLDAS
SWdown_f_tavg	W m-2	Surface downward shortwave radiation	FLDAS
SWE_inst	kg m-2	Snow water equivalent	FLDAS
Swnet_tavg	W m-2	Net shortwave radiation flux	FLDAS
Tair_f_tavg	K	Near surface air temperature	FLDAS
Wind_f_tavg	m s-1	Near surface wind speed	FLDAS

Table S2. The metrics of selected models for SSM and ET

SSM Model	R ²	Mean Absolute Error
Deep Neural Network	0.87269	0.17419
Ensemble Model	0.79932	0.27305
Decision Tree	0.72214	0.25911
Linear regression	0.31218	0.75683
ET Model	R ²	Mean Absolute Error
Deep Neural Network	0.81962	54.30276
Ensemble Model	0.7637	62.26475

Decision Tree	0.53614	73.41365
Linear regression	0.28588	97.87938