Supporting Information for

Exploring Diverse Modeling Schemes for Runoff Prediction: An Application to 544 Basins in China

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Table S1 Basin distribution information of China's nine river systems.

River system_id	River system name	Basins number
1	Southeast Basin	18
2	Haihe River Basin	16
3	Huaihe River Basin	30
4	Yellow River Basin	72
5	Continental Basin	52
6	Songhua and Liaohe River Basin	90
7	Southwest Basin	61
8	Yangtze River Basin	146
9	Pearl River Basin	59

Table S2 Basin distribution information of China's seven climate regions.

Region_id	Region name	Basins number
1	Mid-temperate arid regions	21
2	Temperate semi-arid regions	30
3	Mid-temperate semi-humid regions	75
4	Warm temperate semi-humid regions	75
5	Northern subtropical humid regions	190
6	Plateau temperate semi-arid regions	112
7	Marginal humid tropical regions	41

Table S3 EXP-HYDRO model hydrological parameters meaning and value range table.

Parameters	Description	Units	Lowe limit	Upper limit
f	the rate of decline in runoff from catchmentbucket	mm^{-1}	0.0	0.1
S_{max}	Maximum storage of the catchment bucket	mm	100.0	1500.0
Q_{max}	Maximum subsurface runoff at full bucket	mm/day	10.0	50.0
D_f	Thermal degree-day factor	mm/day/℃	0.0	5.0
T_{max}	Temperature above which snow starts melting	℃	0.0	3.0
T_{min}	Temperature below which precipitation is snow	℃	-3.0	0.0

Table S4 Xin'anjiang model model hydrological parameters meaning and value range table.

Parameters	Description	Units	Lowe limit	Upper limit
UM	areal mean tension water storage in the upper layer	mm	0.1	20
LM	areal mean tension water storage in the lower layer	mm	60	90
DM	areal mean tension water storage in the deep layer	mm	60	120
C	conversion coefficient of deep evapotranspiration		0.01	0.2
B	exponent of the tension water capacity curve		0.1	0.4
K1	outflow coefficients of the free water storage to interflow	-	0.01	0.7
K2	outflow coefficients of the free water storage to groundwater	-	0.01	0.7
K3	recession constant of the lower interflow storage	-	0.01	0.9

Table S5 The details for all the hybrid models.

Models	**Model inputs**	**Training set**	**Testing set**
EXP-IN-LSTM	EXP-HYDRO predicted runoff, 5 meteorological forcings, 15 static basin attribute	October 1, 1975, to September 30, 19955	October 1, 1995, to September 30, 2015
XAJ-IN-LSTM	Xin'anjiang predicted runoff, 5 meteorological forcings, 15 static basin attribute		
EXP-dPL	5 meteorological forcings, 15 static basin attribute		
XAJ-dPL	5 meteorological forcings, 15 static basin attribute		

Table S6 The data sources of indexs in Figure 13.

Index	Precipitation	Runoff	Evapotranspiration
Observation	ERA5 /CN05.1	VIC-CN05.1	ERA5
LSTM	ERA5 /CN05.1	predicted by LSTM	
EXP-IN-LSTM	ERA5 /CN05.1	predicted by EXP-IN-LSTM	
XAJ-IN-LSTM	ERA5 /CN05.1	predicted by XAJ-IN-LSTM	
EXP-dPL	ERA5 /CN05.1	predicted by EXP-dPL	
XAJ-dPL	ERA5 /CN05.1	predicted by XAJ-dPL	
EXP-dPL-ET	ERA5 /CN05.1	predicted by EXP-dPL	output by EXP-dPL
XAJ-dPL-ET	ERA5 /CN05.1	predicted by XAJ-dPL	output by XAJ-dPL

Figure. S1. Spatial distribution of outlets in 544 basins

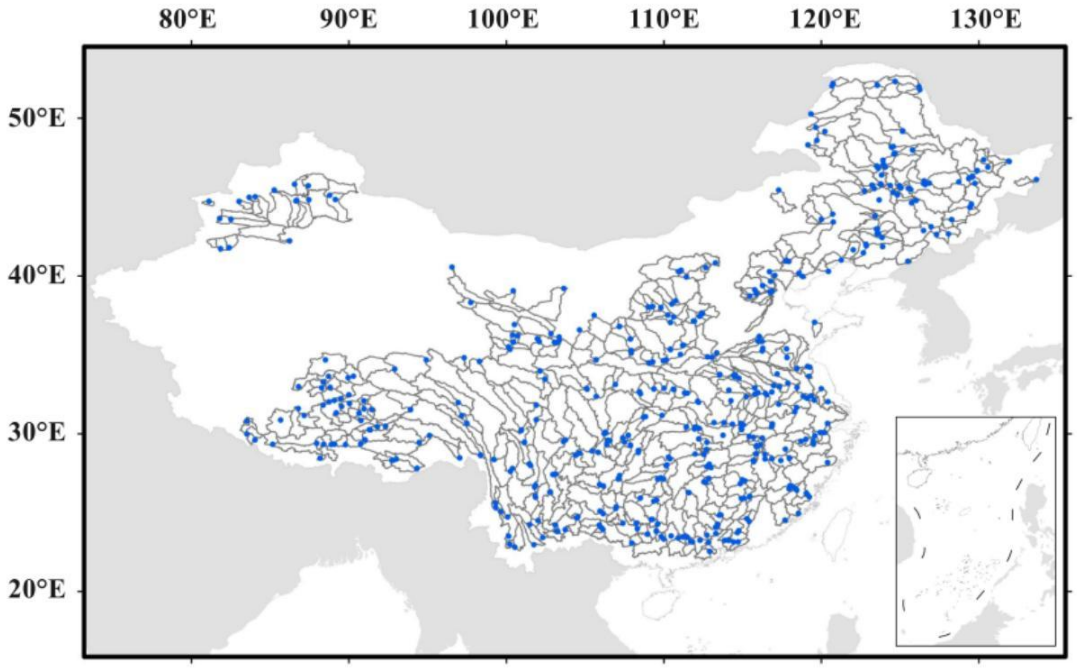

Figure. S2 The time series of runoff over 15 gauged basins