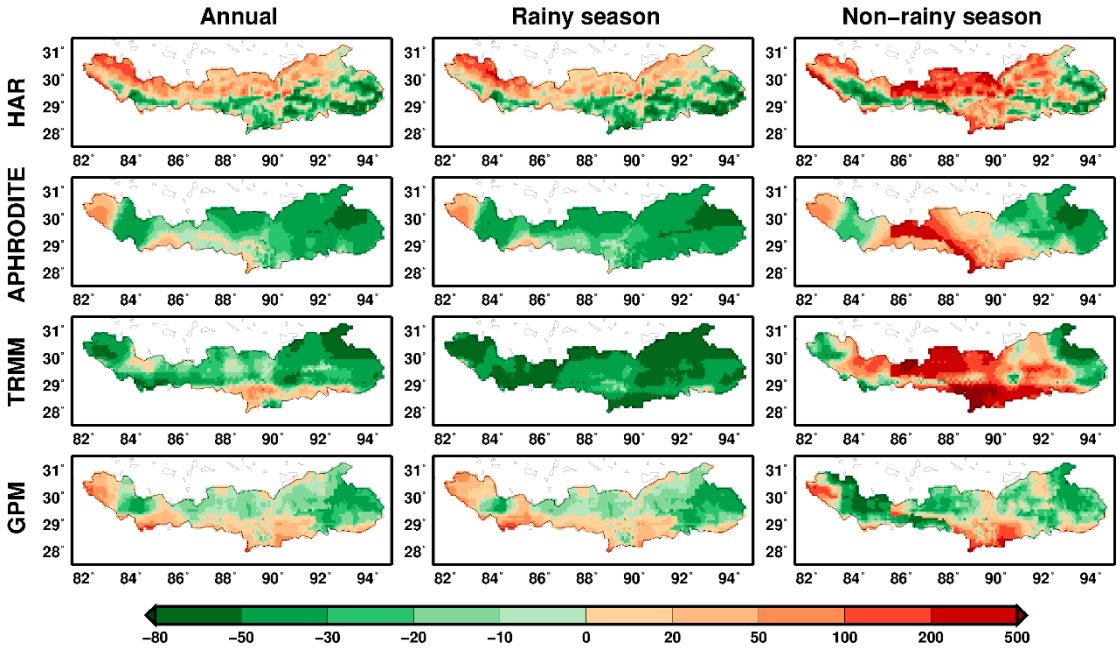

Figure S1. Spatial distributions of relative bias (%) of four precipitation datasets to the PCP_Sun at annual period, rainy season, and non-rainy season.

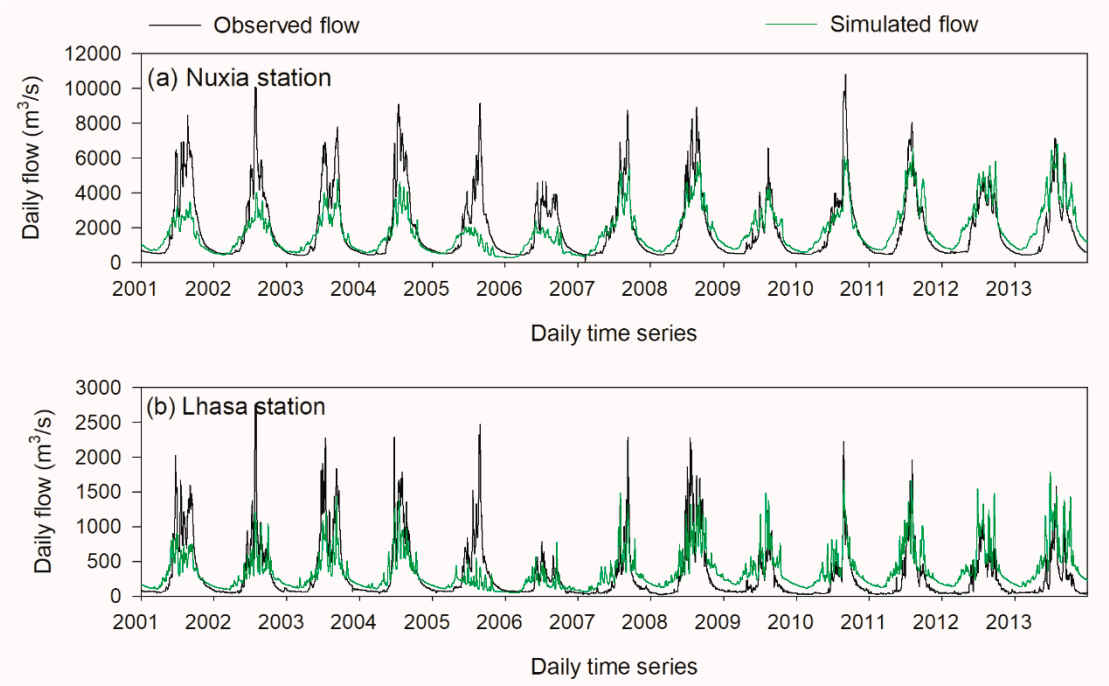

Figure S2. Daily flow simulation at Nuxia (a) and Lhasa hydrological stations (b), with recalibrated parameters using HAR-specific input.

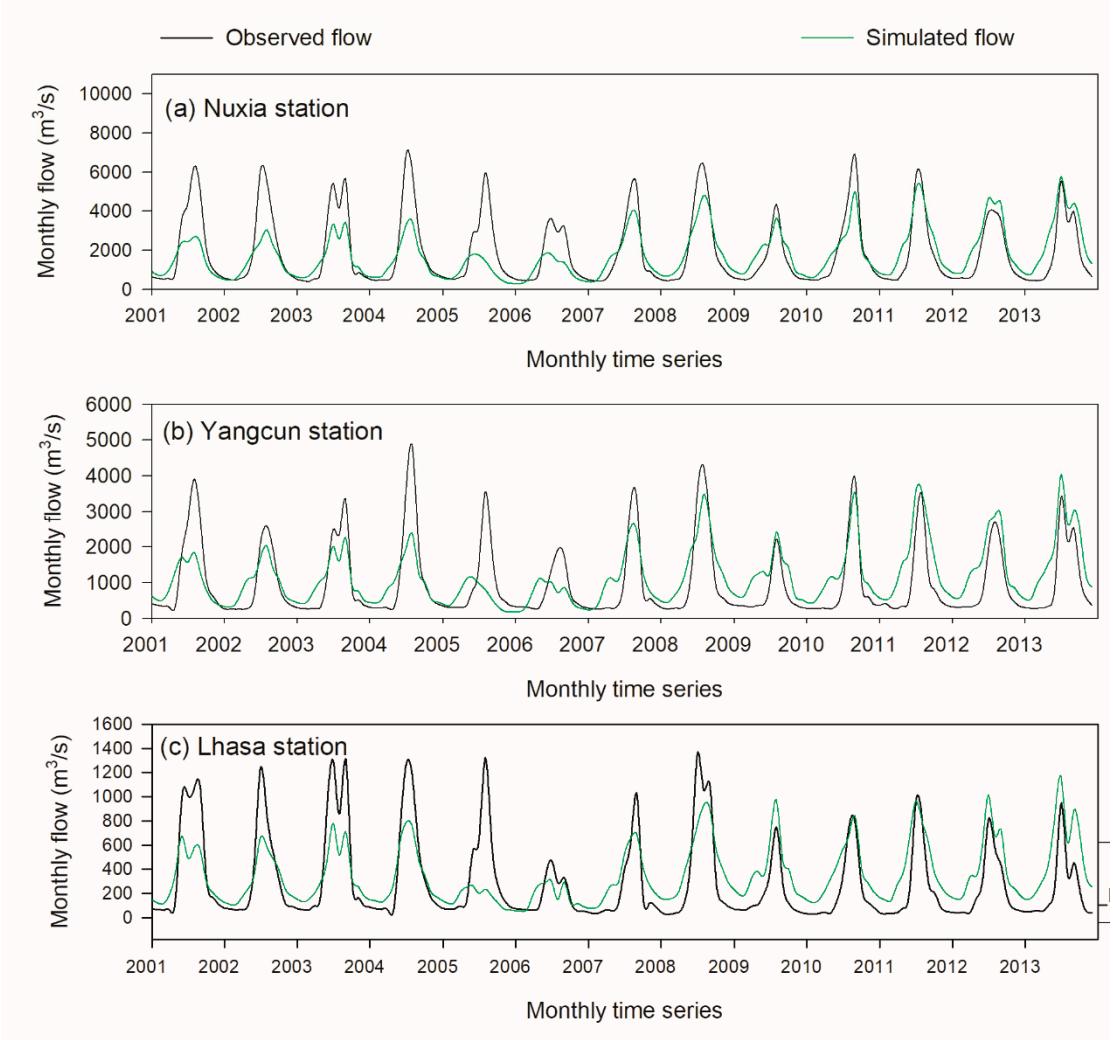

Figure S3. Monthly flow simulation at Nuxia (a), Yangcun (b), and Lhasa hydrological stations (c), with recalibrated parameters using HAR-specific input.

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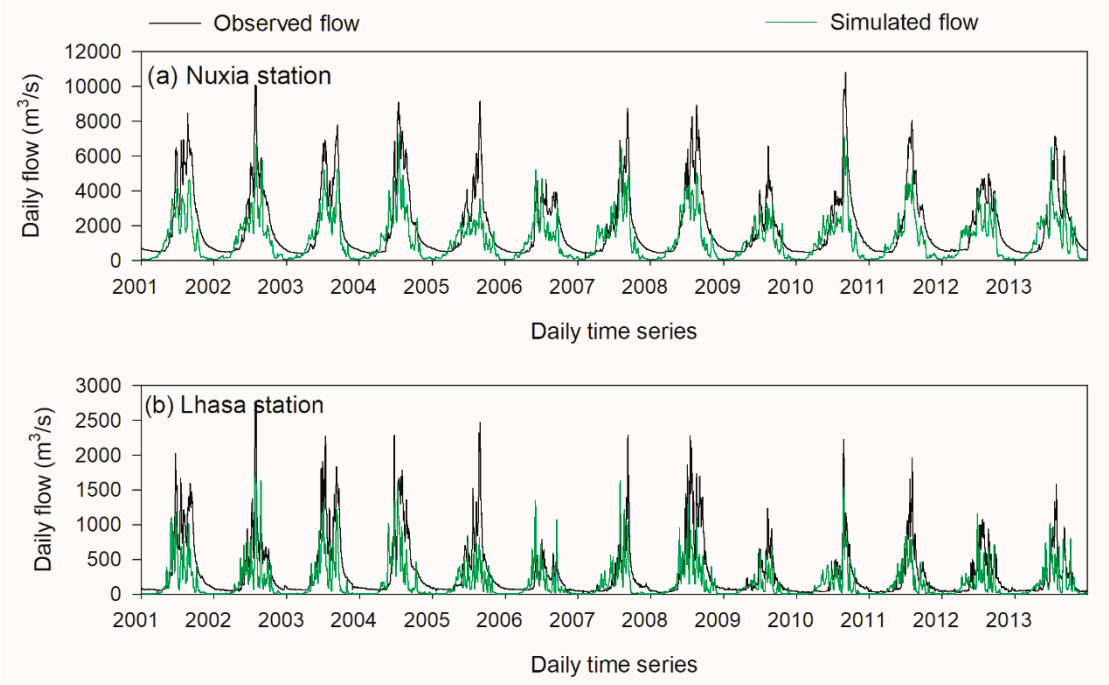

Figure S4. Daily flow simulation at Nuxia (a) and Lhasa hydrological stations (b), with recalibrated parameters using APHRODITE-specific input.

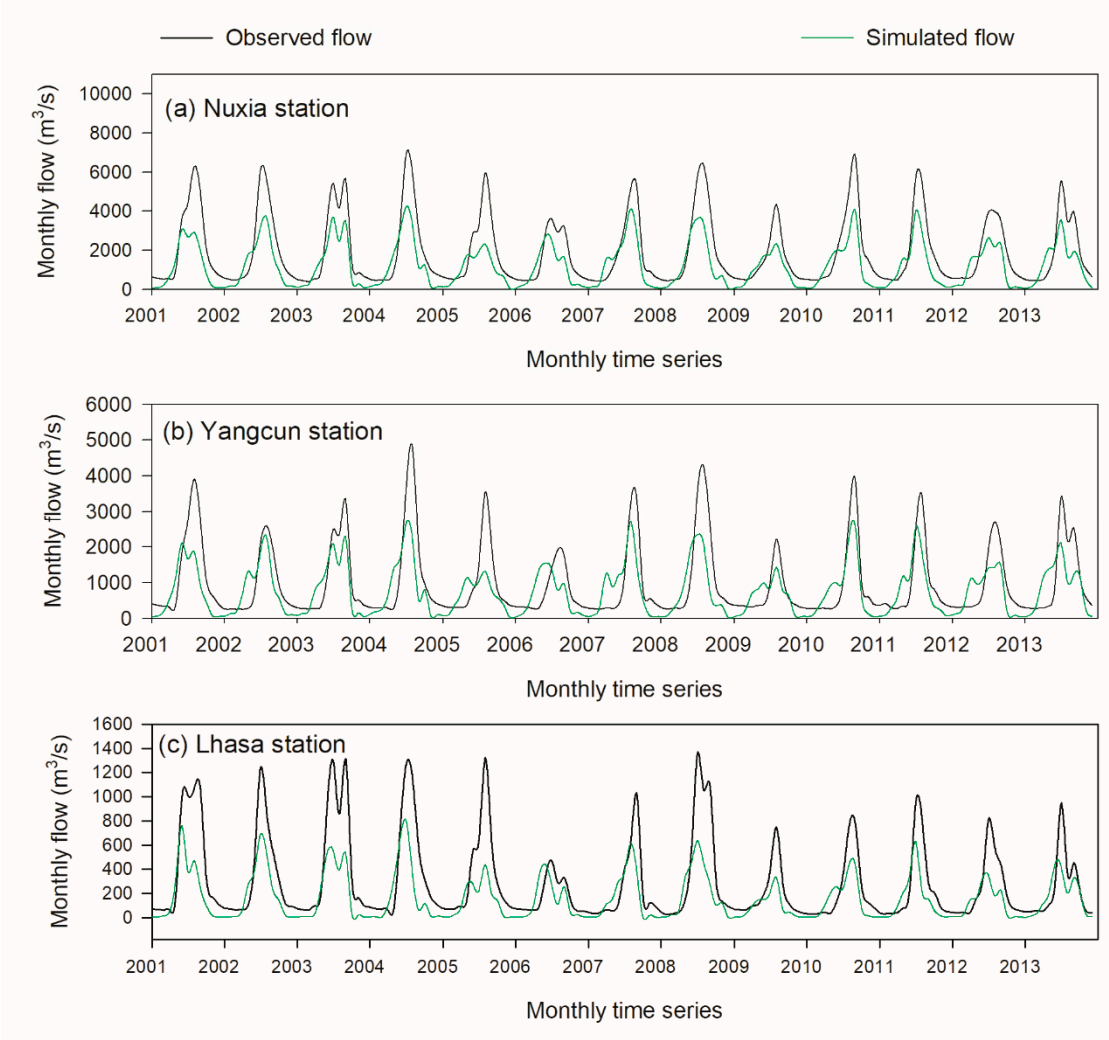

Figure S5. Monthly flow simulation at Nuxia (a), Yangcun (b), and Lhasa hydrological stations (c), with recalibrated parameters using APHRODITE-specific input.

Table S1. List of VIC-glacier model parameters, ranges, and recalibrated values of HAR and APHRODITE.

Model Parameter	Unit	Range	PCP_Sun *	HAR	APHRODITE
Degree-day factor for ice-melt (DDF_{ice})	$mm°C^{-1}day^{-1}$	3.4–11.8	9	9	9
Degree-day factor for snowmelt (DDF_{snow})	$mm°C^{-1}day^{-1}$	3.0–7.9	4.1	4.1	4.1
Fraction of Dsmax where non-linear baseflow begins (Ds)	None	0–1	0.3	0.3	0.3

Maximum velocity of baseflow (D_{smax})	mm/d	0–50	10	10	10
Fraction of maximum soil moisture where non-linear baseflow occurs (W_s)	None	0–1	0.9	0.9	0.9
Variable infiltration curve parameter (b_{infilt})	None	0–0.4	0.2	0.1	0.3
Thickness of the second soil moisture layer (d_2)	m	0–3	1.1	2.9	0.1

* The parameters calibrated by the PCP_Sun were placed here for comparison to those of HAR and APHRODITE by using input-specific calibration method.

Table S2. Statistical indices of the simulated streamflow at the three hydrological stations by using product-specific calibration method for HAR and APHRODITE in the UB.

Hydrological station	Precipitation inputs	Daily simulation period (2001–2013)			Monthly simulation period (2001–2013)		
		PBIAS (%)	NSE	KGE	PBIAS (%)	NSE	KGE
Nuxia	HAR	-7.58(3.23)	0.58(0.60)	0.63(0.78)	-7.52(2.99)	0.63(0.70)	0.67(0.82)
	APHRODITE	-36.64(-54.86)	0.52(0.13)	0.59(0.38)	-37.00(-54.97)	0.56(0.15)	0.61(0.40)
Yangcun	HAR	-	-	-	17.64(42.52)	0.56(0.22)	0.55(0.53)
	APHRODITE	-	-	-	-26.41(-41.75)	0.53(0.25)	0.65(0.42)
Lhasa	HAR	16.33(26.71)	0.48(0.29)	0.48(0.56)	16.40(26.92)	0.54(0.48)	0.49(0.57)
	APHRODITE	-45.15(-60.64)	0.41(0.21)	0.46(0.34)	-45.20(-60.43)	0.45(0.17)	0.52(0.35)

Note: The numbers in the parentheses are the statistical results of the simulation based on calibrated parameters using PCP_Sun.