

Attached file 1

we add the words in the end of P5493:

“Nonparametric Pettitt test is used in this study for detecting a change point in the data series. The test is a kind of distribution-free method, and allows minimum assumptions to be made about the data. Therefore it is particularly suited to hydrological series. The test is robust, simple and relatively powerful (Kundzewicz and Robson, 2004). Pettitt test uses a version of the Mann-Whitney statistic, $U_{t,N}$, that verifies if two samples of x_1, \dots, x_t and x_{t+1}, \dots, x_N are from the same population. The test statistic, $U_{t,N}$, is given by

$$U_{t,N} = U_{t-1,N} + \sum_{j=1}^N \text{sgn}(x_t - x_j) \quad \text{for } t = 2, \dots, N \quad (6)$$

where $\text{sgn}(\theta) = 1$ if $\theta > 0$; $\text{sgn}(\theta) = 0$ if $\theta = 0$; $\text{sgn}(\theta) = -1$ if $\theta < 0$.

The test statistic counts the number of times a member of the first sample exceeds a member of the second sample. Its statistic $k(t)$ and the associated probabilities used in the significance testing are:

$$k(t) = \max_{1 \leq t \leq N} |U_{t,N}| \quad (7)$$

$$\text{and } P \cong 2 \exp \left\{ -6(k_N)^2 / (N^3 + N^2) \right\} \quad (8)$$

Additionally, sequential Mann-Kendall test is also used to validate the result of change point detected with Pettitt test in streamflow and sediment load. It is also helpful to compare the results of change point tested by the non-parametric methods with the original data series to determine the change point used in this study.”

Attached file 2

For answering the specific comment 3.

Table 1 The change point of standardized streamflow in the study area

Catchments	pettitt		MK	
	1st		1st	
Kuyehe River	1981		1992	
Tuweihe River	1983		1984	
Jialuhe River	1982		1984	
Qingjianhe River	-		-	
Yanhe River	-		-	
Yunyanhe River	1995		1998	
Shiwangchuan River	1988		1989	

Table 2 The change point of standardized sediment load in the study area

Catchments	pettitt		MK	
	1st	2nd	1st	2nd
Kuyehe River	1979	1996	Null	1997
Tuweihe River	1978	1997	1982	1998
Jialuhe River	1977		1977	
Qingjianhe River	-		-	
Yanhe River	-		-	
Yunyanhe River	1982	1995	1982	1996
Shiwangchuan River	1982	-	1981	-

Attached file 3.

For explain the revision in P5506 of the manuscript.

For table 2, the values for Tuwei catchment were changed as following:

Catchment	Year	Terrace (km ²)	Afforestation (km ²)	Pasture (km ²)	Sediment trapping dam ^b (km ²)	Area affected (%)
Tuwei	1959	1.0	25.4	1.4	0.2	0.9
	1969	10.8	77.7	6.1	1.7	2.9
	1979	31.3	174.7	16.1	7.1	7.0
	1989	45.5	754.5	28.8	11.1	25.8
	1996	66.5	1021.6	37.4	15.5	35.1

Attached file 4.

For explain the revision in P5507 of the manuscript.

For table 3, the title was changed to “Trends of the annual streamflow and change points by Mann-Kendall and Pettitt test”. And note “b” was added to the column “Slope(θ)” to explain the unit of “Slope(θ)” is essentially dimensionless and the value in the column means the change rate of the runoff coefficient in catchment like following:

Table 3. Trends of the annual streamflow **and change points** by Mann-Kendall and Pettitt test

Catchment ^a	Annual streamflow		Slope (θ) ^b (m ³ .km ⁻² .mm ⁻¹ .a ⁻¹)	Change point	
	Test Z	Significance		Year	Significance
Kuye ^T	-5.59	***	-3.671	1981	***
Tuwei ^T	-4.73	***	-2.871	1983	***
Jialu ^T	-7.24	***	-3.613	1982	***
Qingjian ^L	0.13	<i>ns</i>	0.054	—	—
Yanhe ^L	-0.47	<i>ns</i>	-0.071	—	—
Yunyan ^R	-2.53	*	-0.346	1995	***
Shiwang ^R	-4.13	***	-0.994	1988	***

^a The superscripts in this column mean the locations of the study catchments. T means the transition zone from the sandy area to the loess hilly-gully area; L, the loess hilly-gully area; and R, the rocky mountain area. Some of following tables have the same marks.

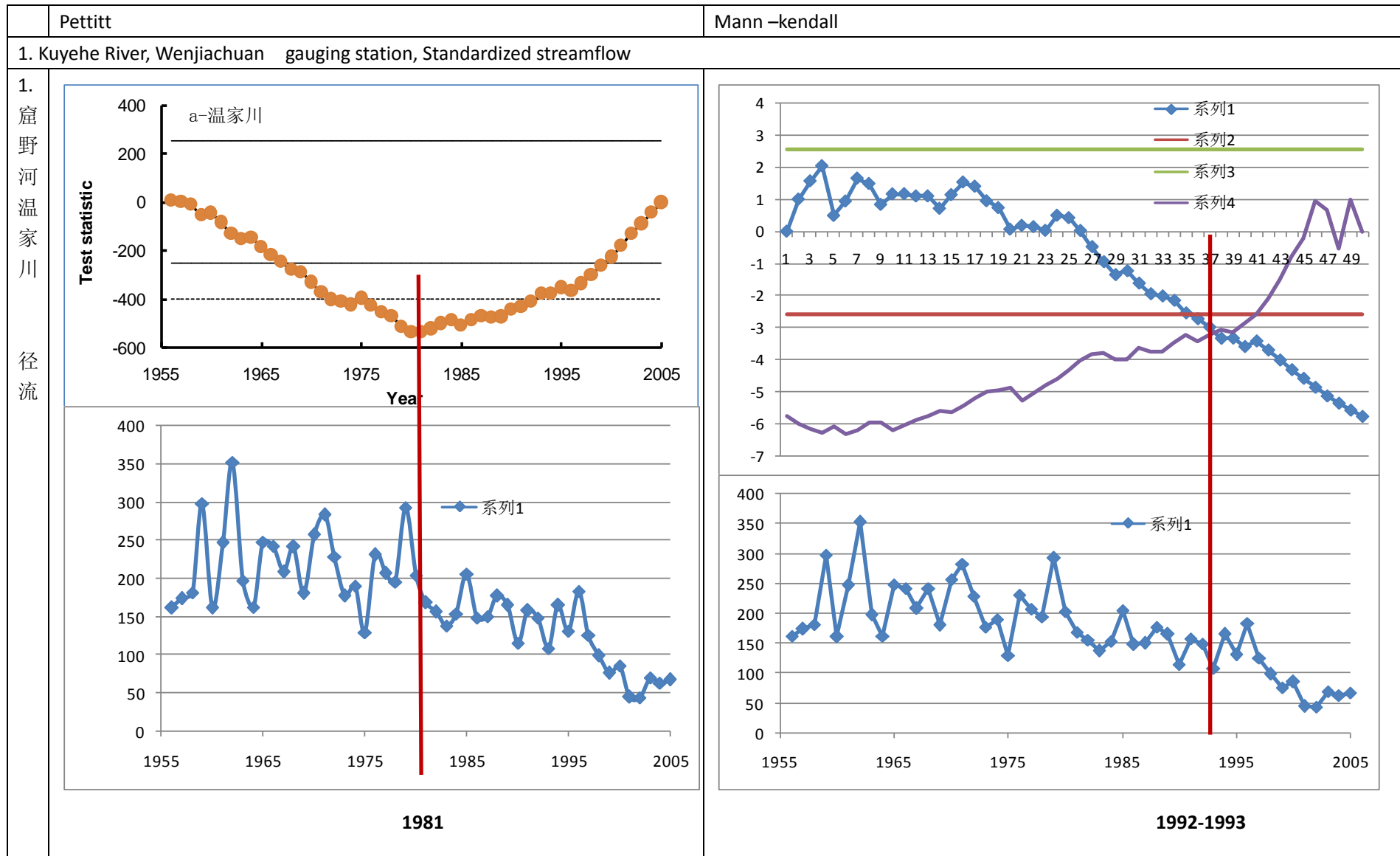
^b **The unit is essentially dimensionless and the value in the column means the change rate of the runoff coefficient in catchment.**

Symbols “*”, “***” and “****” indicate significance levels of 0.05, 0.01, and 0.001, respectively.

ns indicates that significance level exceeds 0.05.

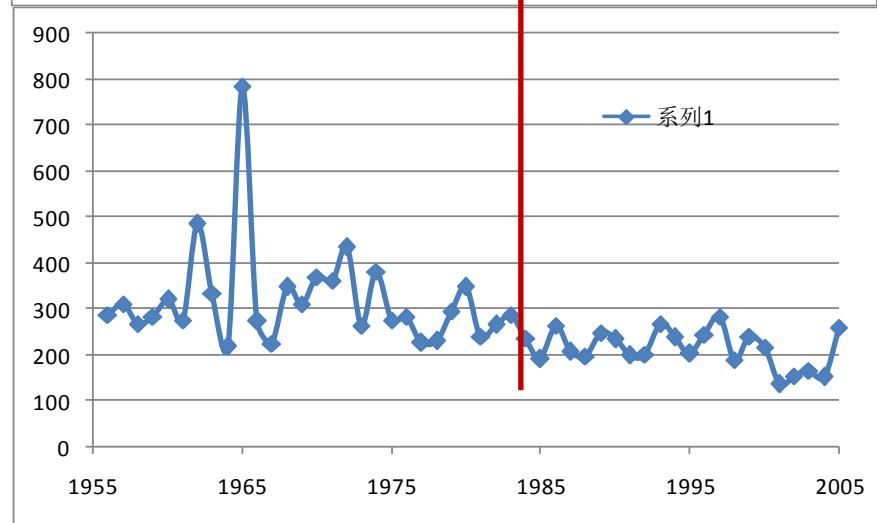
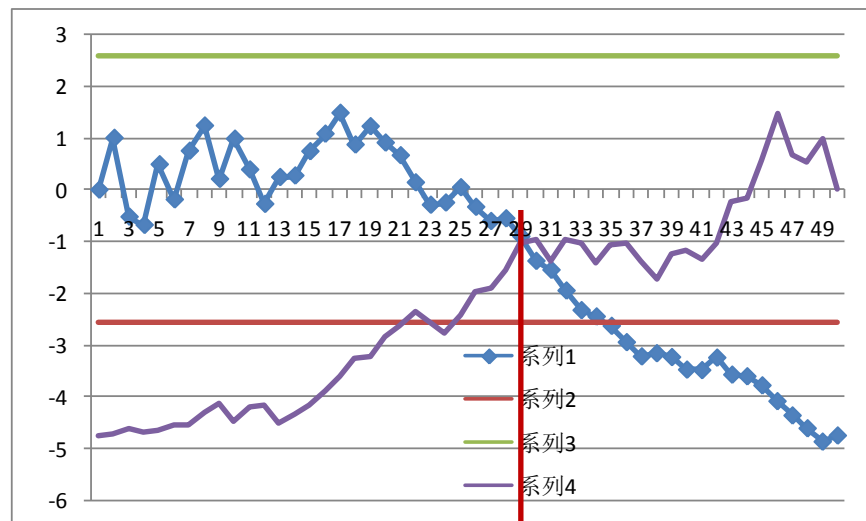
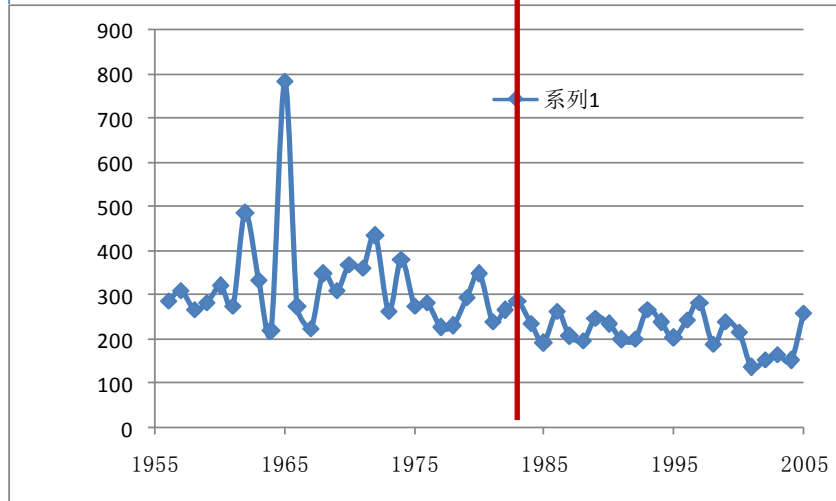
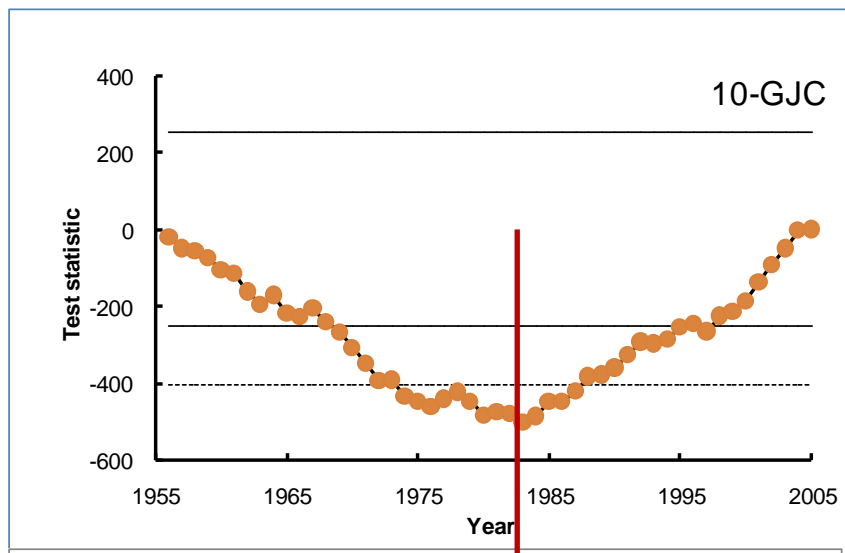
Attached file 5 "Comparison of change points detected using Pettitt test and sequential Mann-Kendall test":

Standardized streamflow



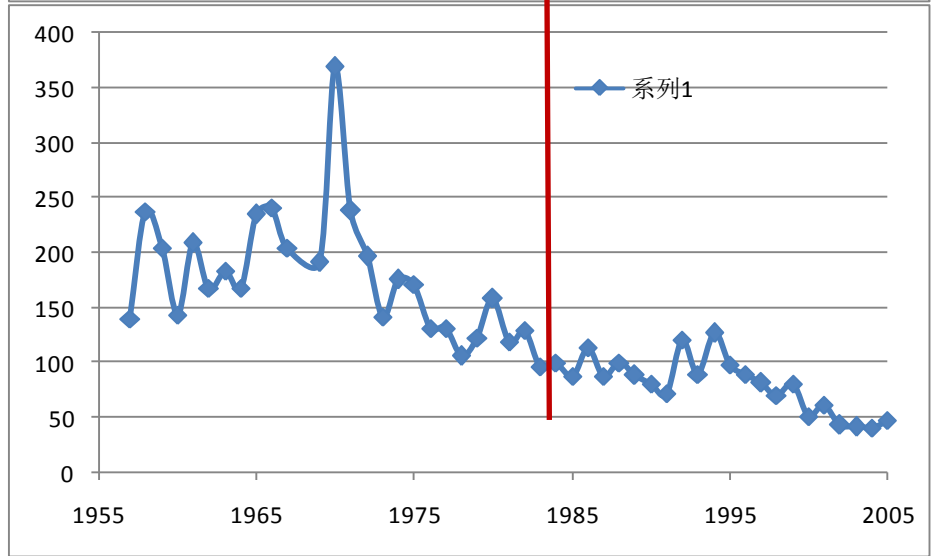
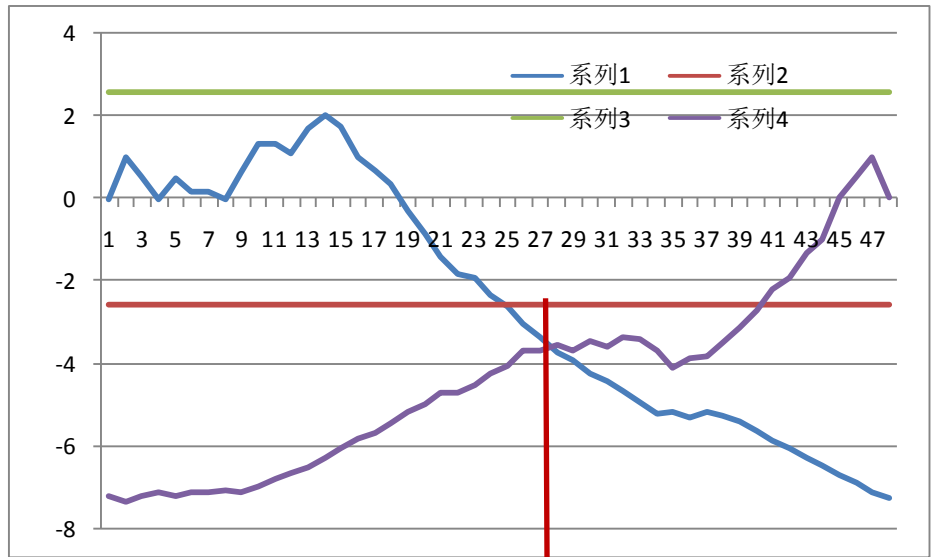
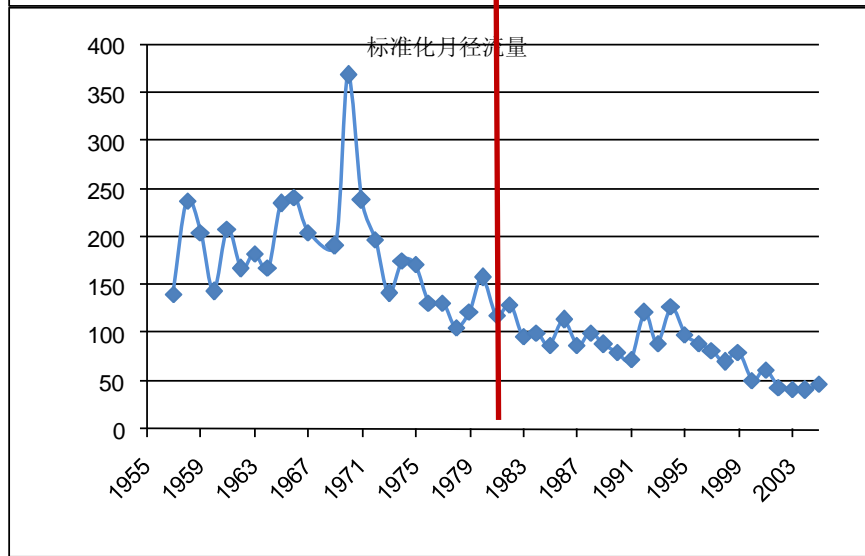
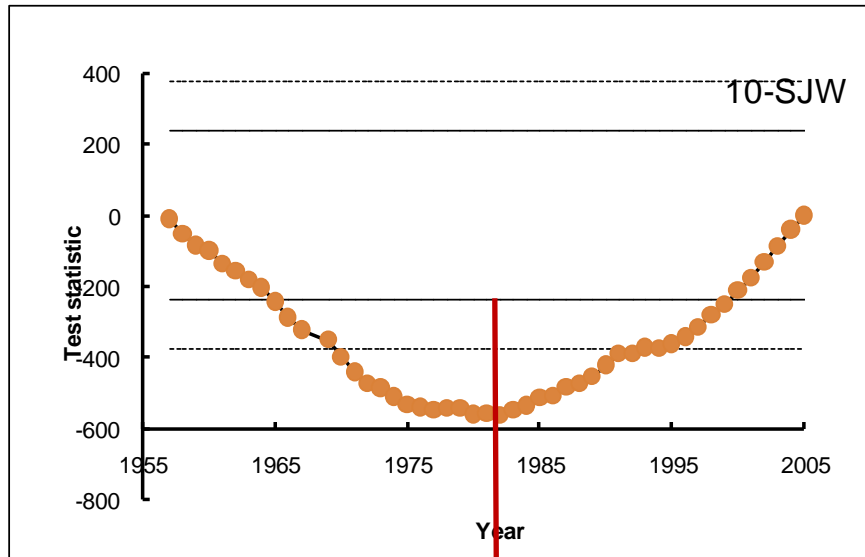
2. Tuweihe River Gaojiachuan gauging station, Standardized streamflow

2. 秃尾河高家川
径流



3. Jialuhe River Shenjiawan gauging station, Standardized streamflow

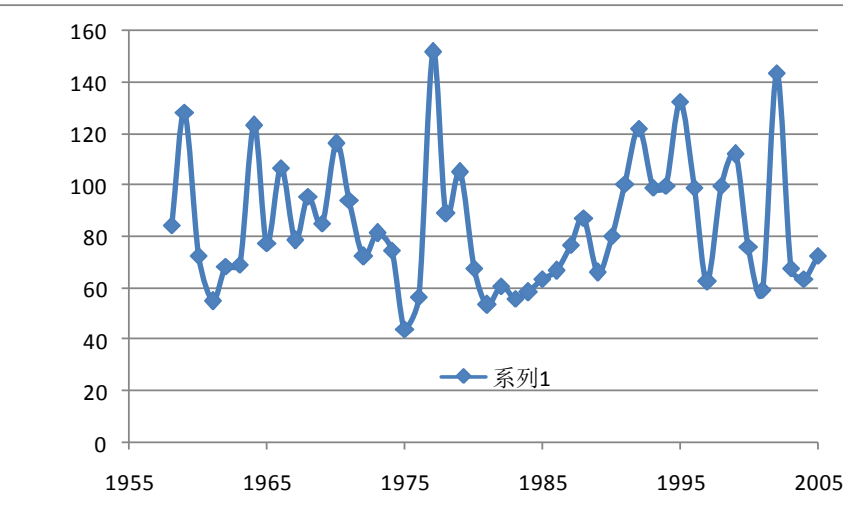
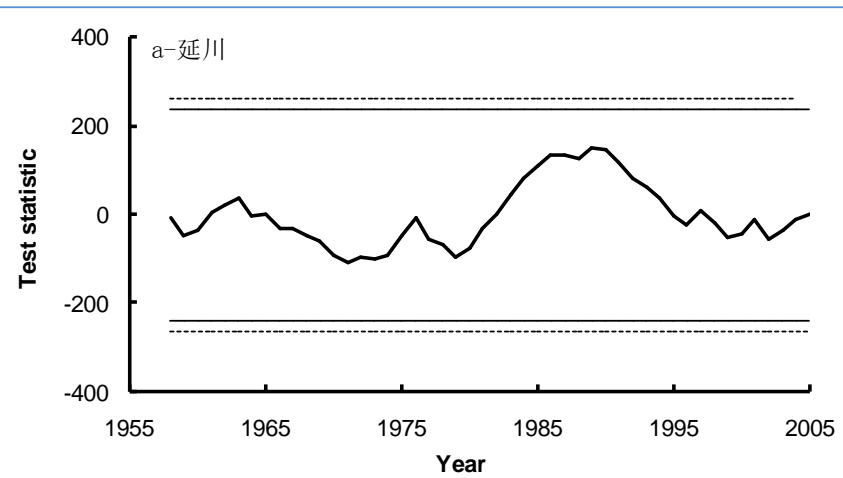
3. 佳芦河申家湾
径流



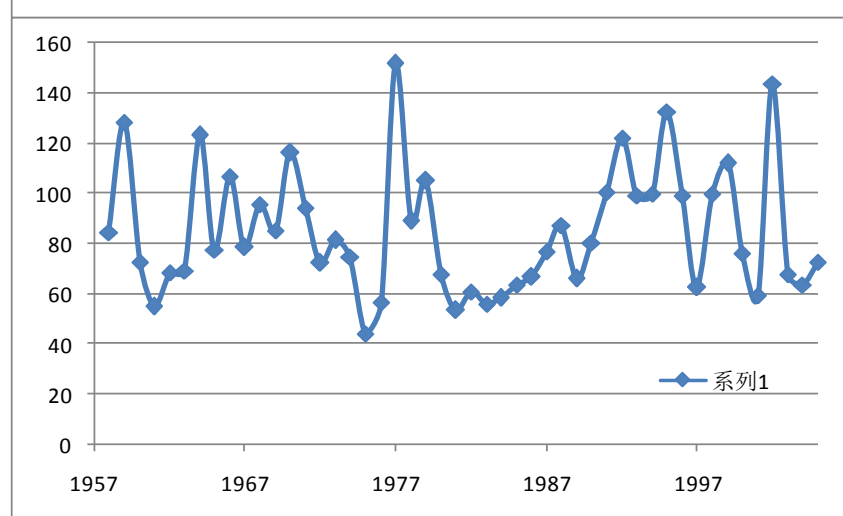
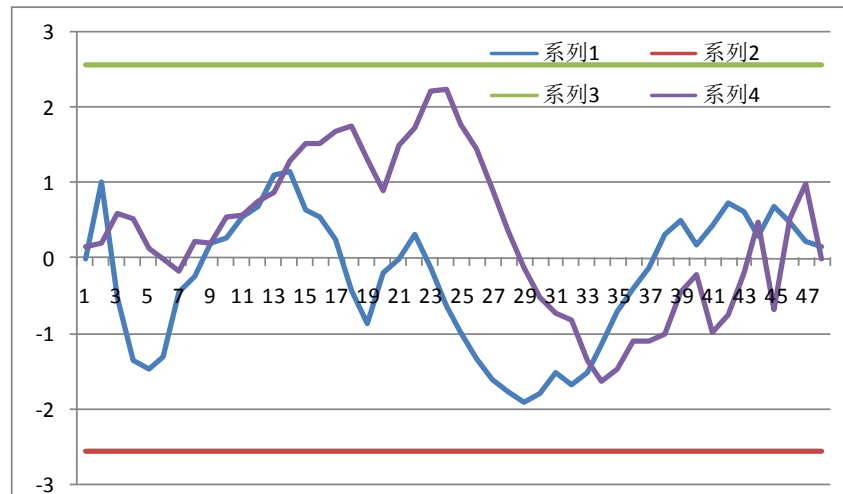
4. Qingjianhe River Yanchuan gauging station, Standardized streamflow

4. 清
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流



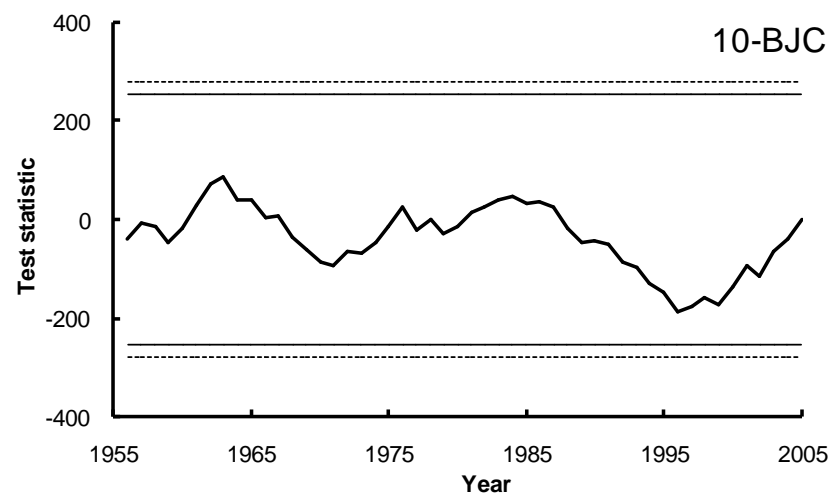
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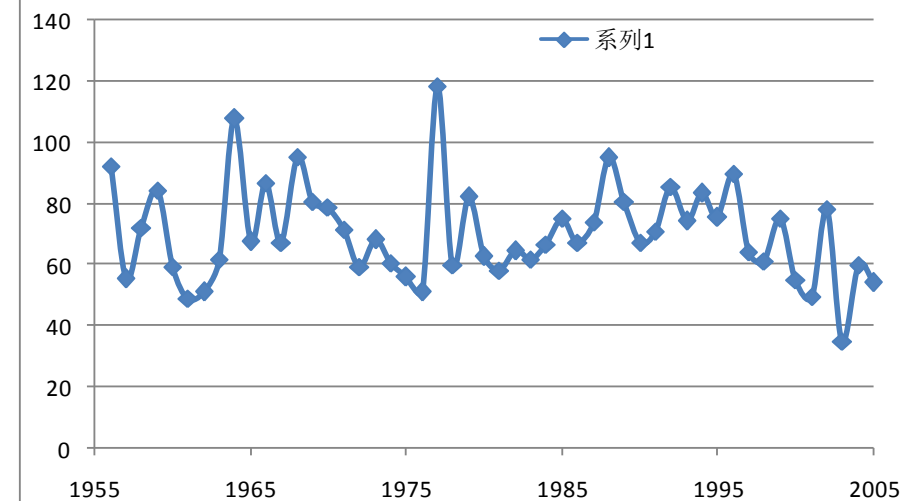
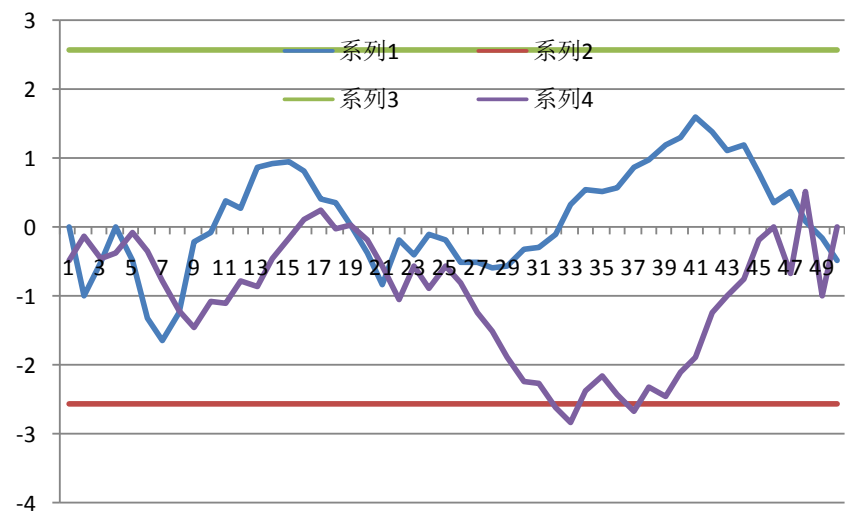
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5. Yanhe River Ganguyi gauging station, Standardized streamflow

5. 延河甘谷驿 径流



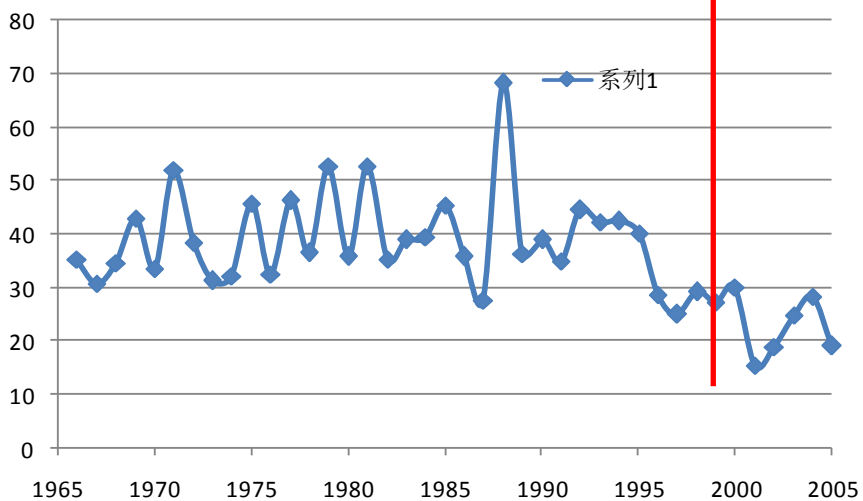
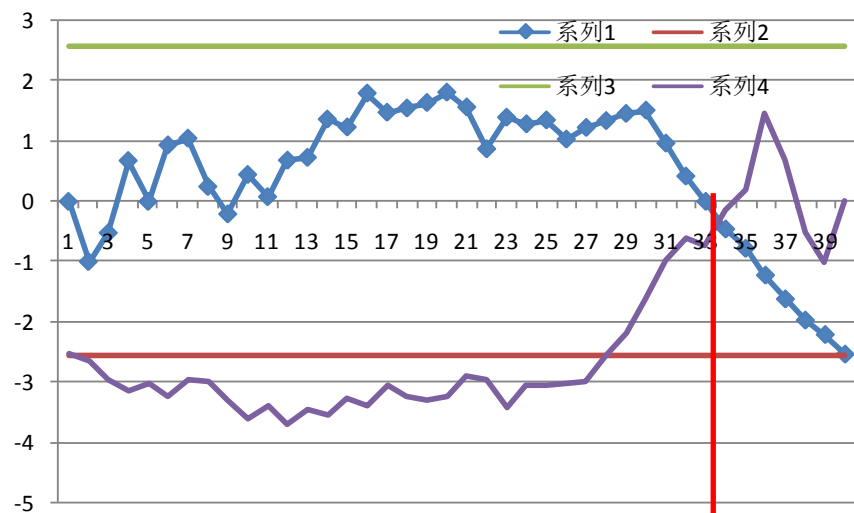
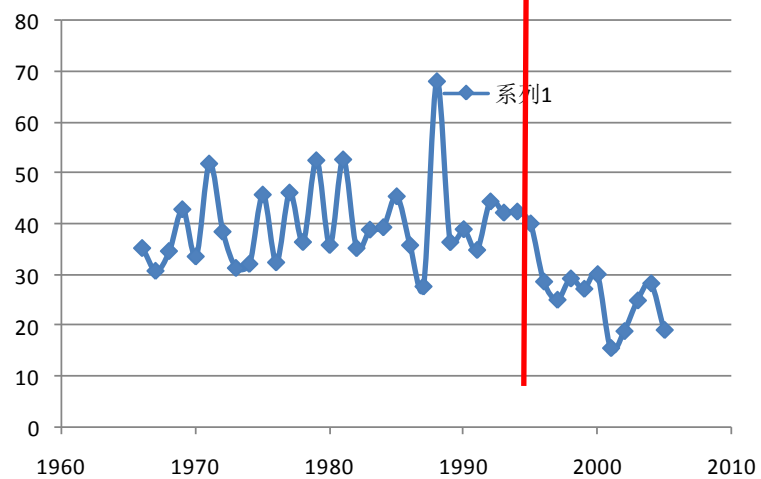
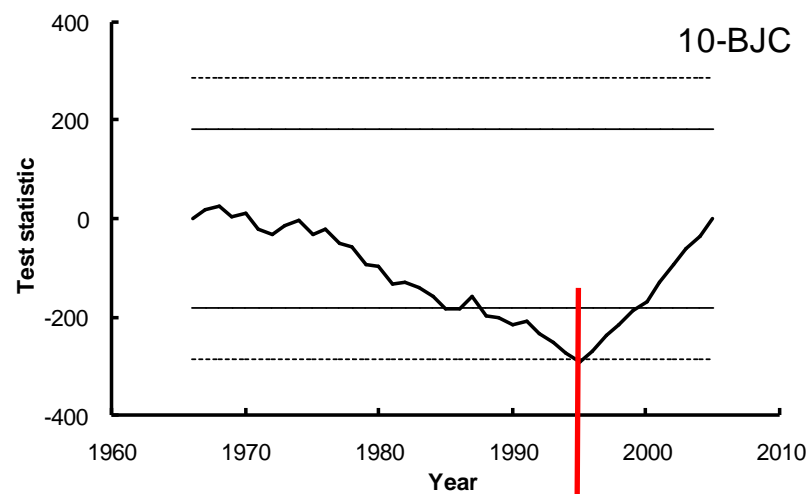
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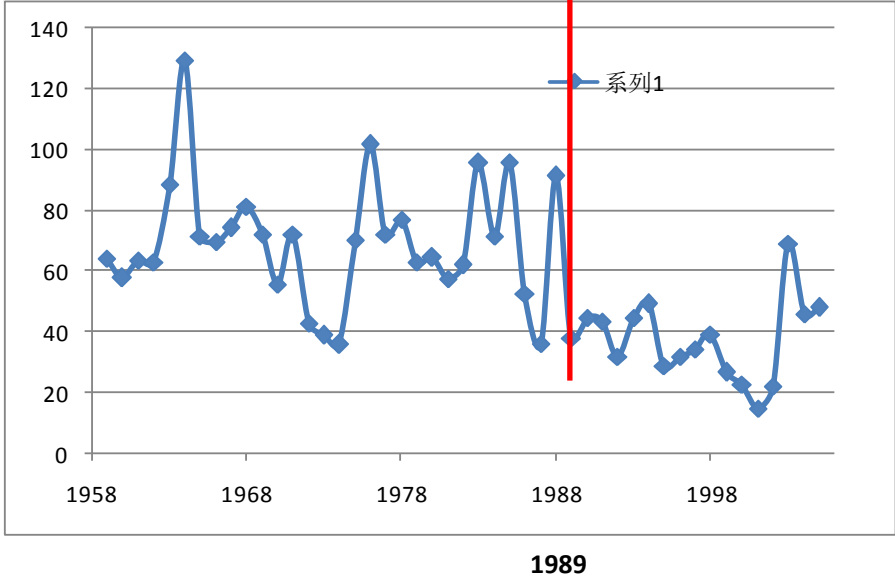
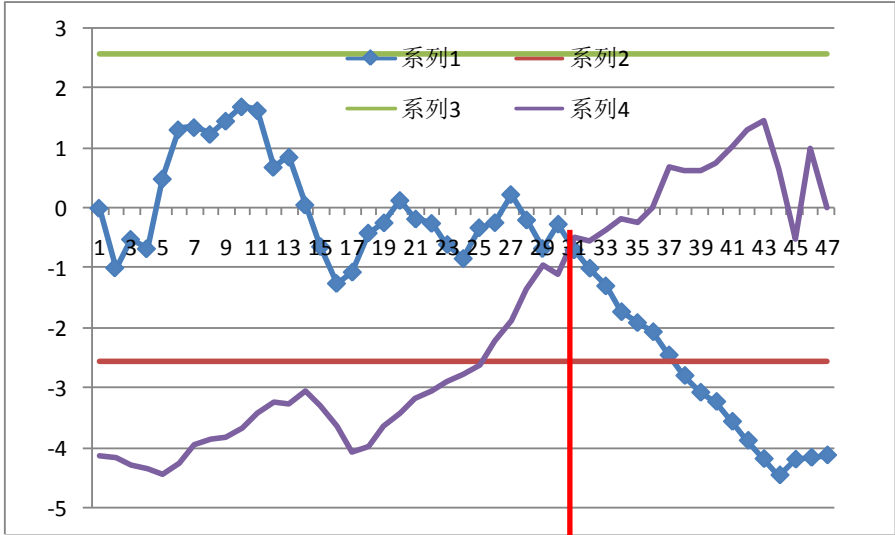
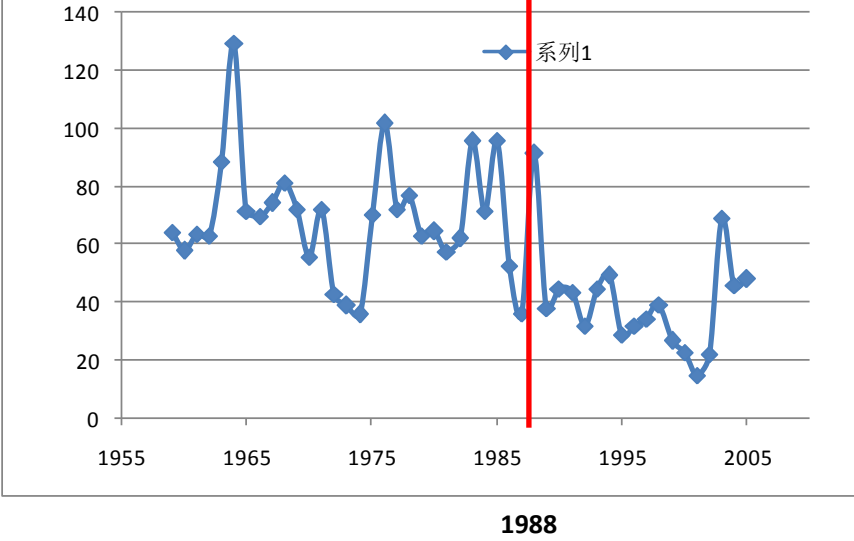
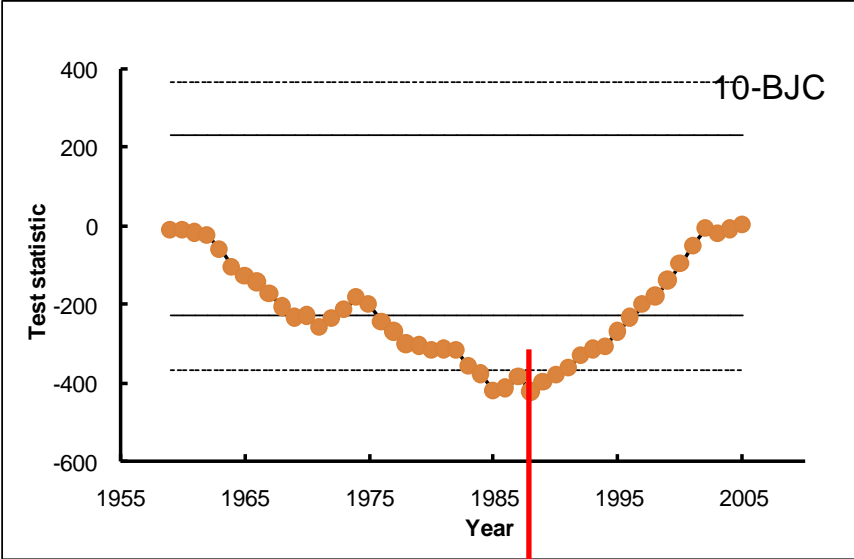
6. Yunyanhe River , Standardized streamflow

6. 云岩河
径流

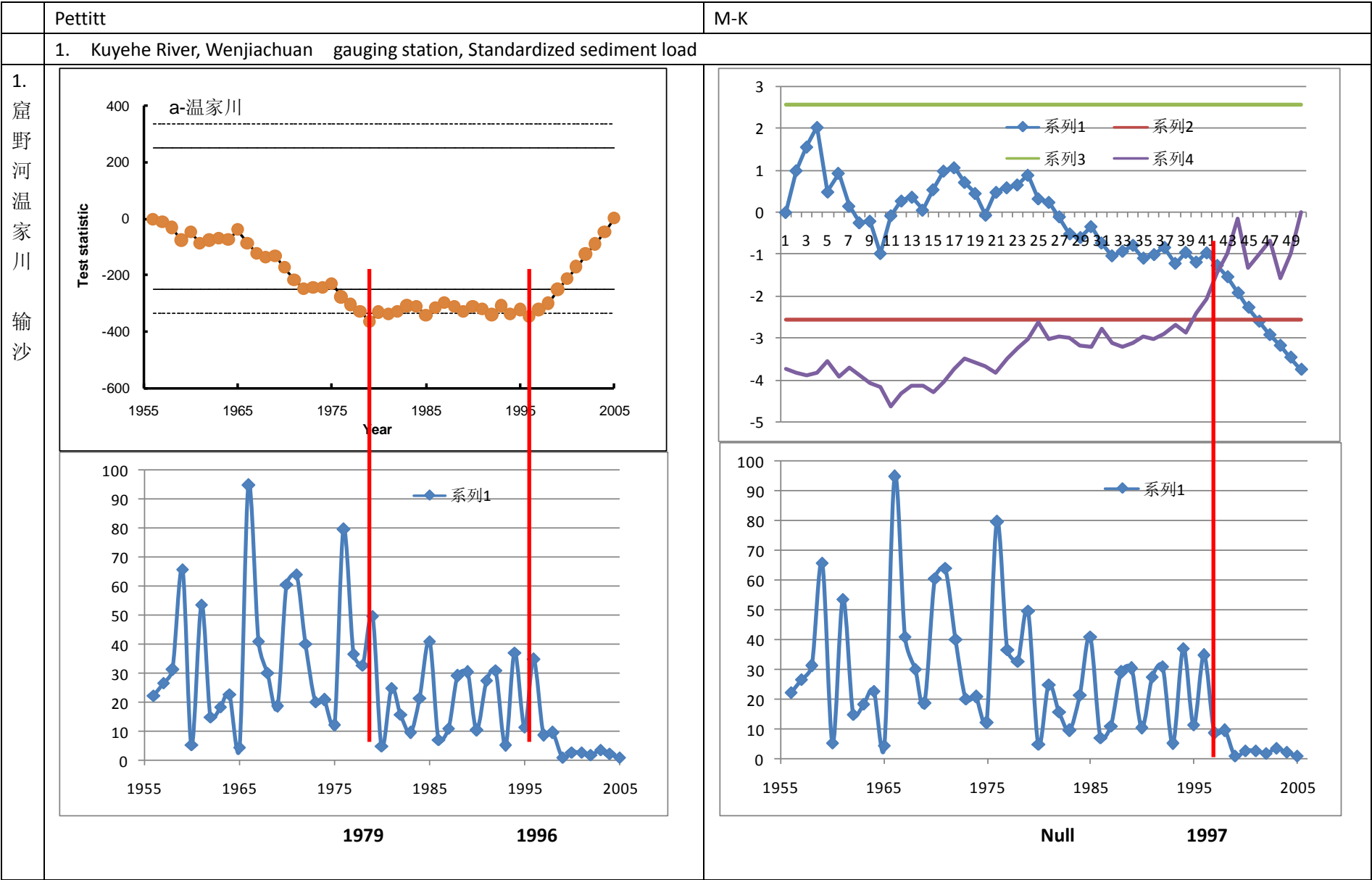


7. Shiwangchuan River , Standardized streamflow

7. 仕望川
径流

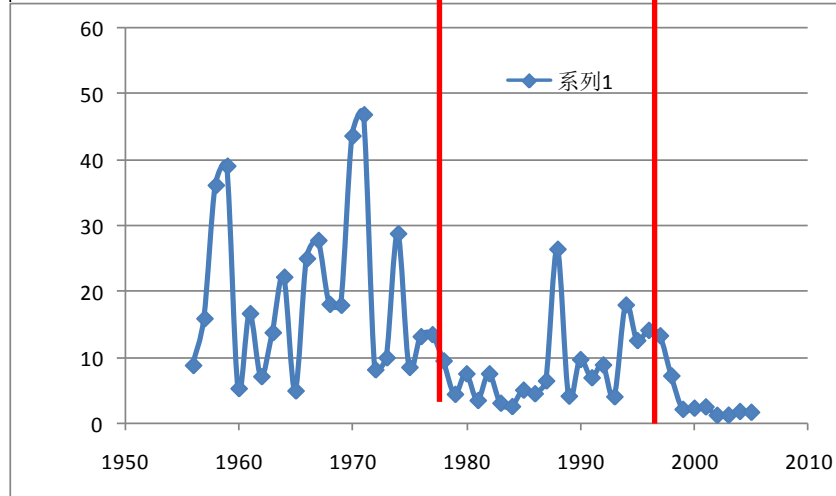
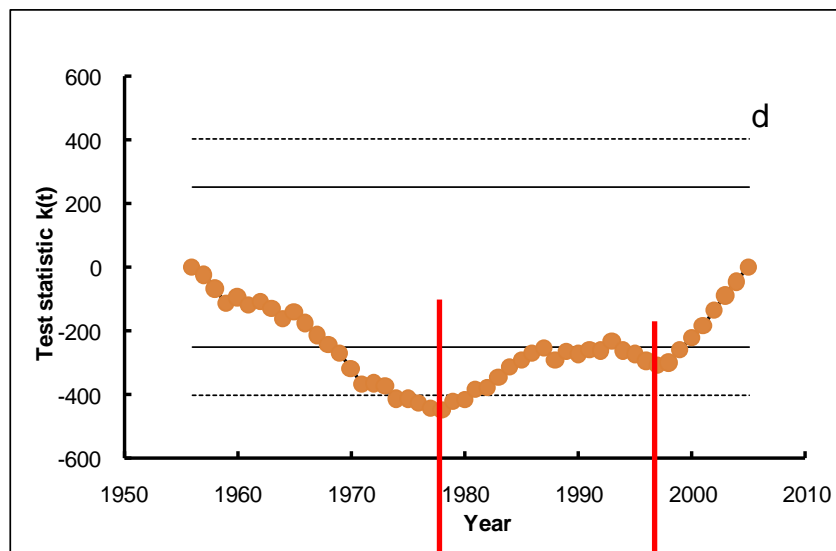


Standardized sediment load



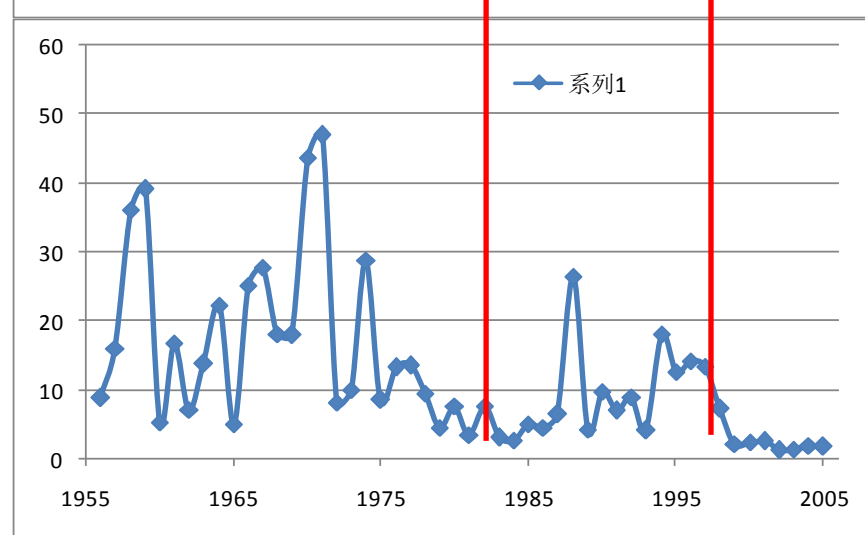
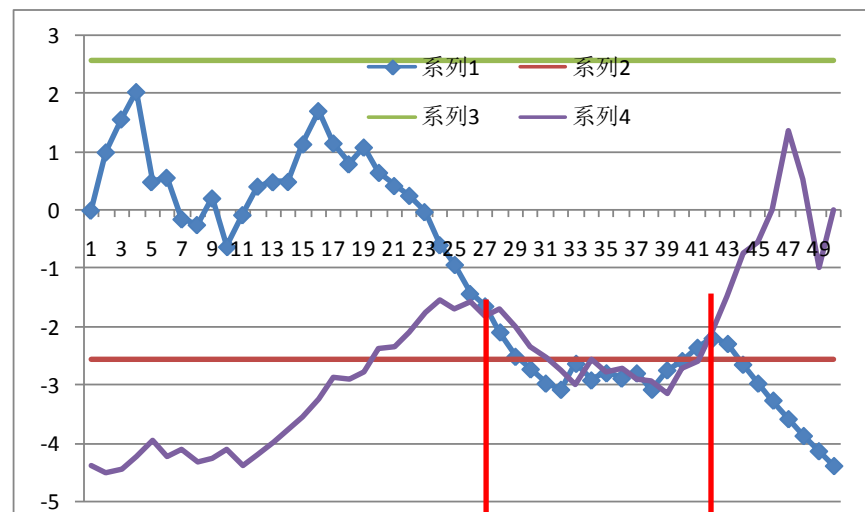
2. Tuweihe River, Gaojiachuan gauging station, standardization sediment load

2. 秃尾河高家川输沙



1978

1997

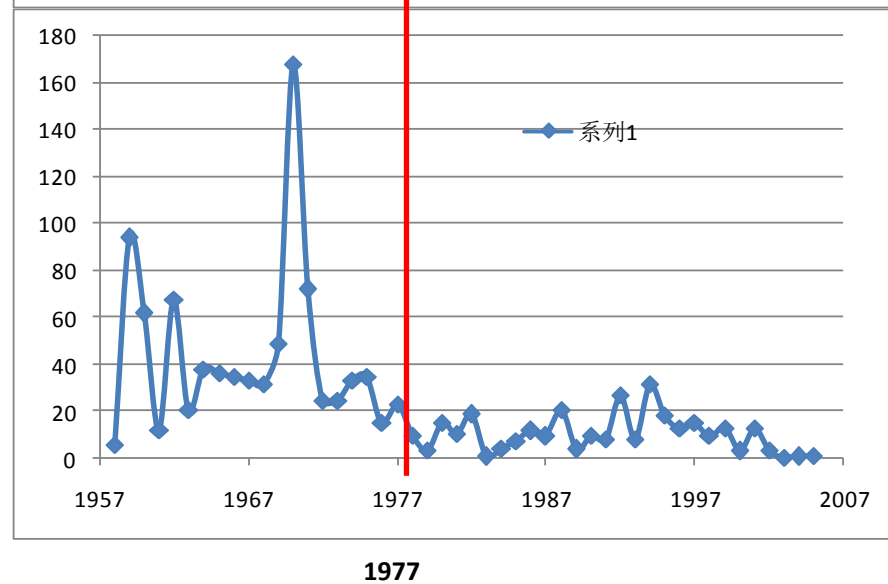
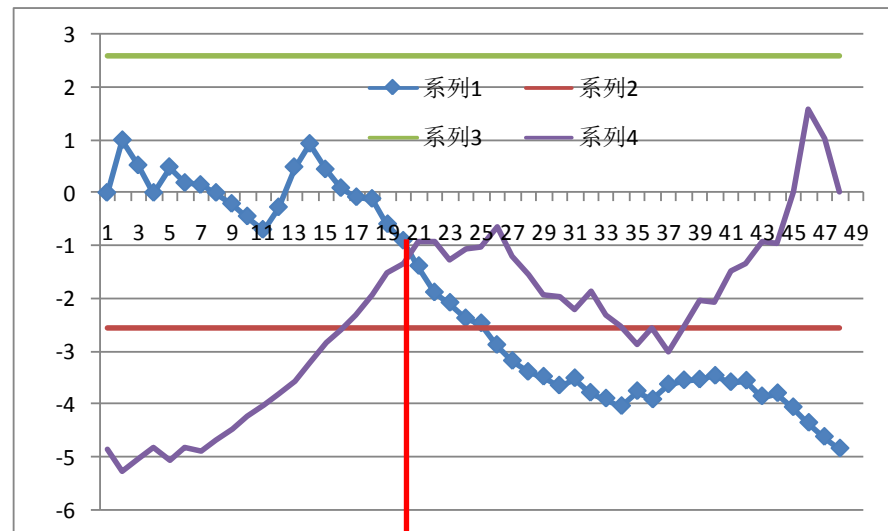
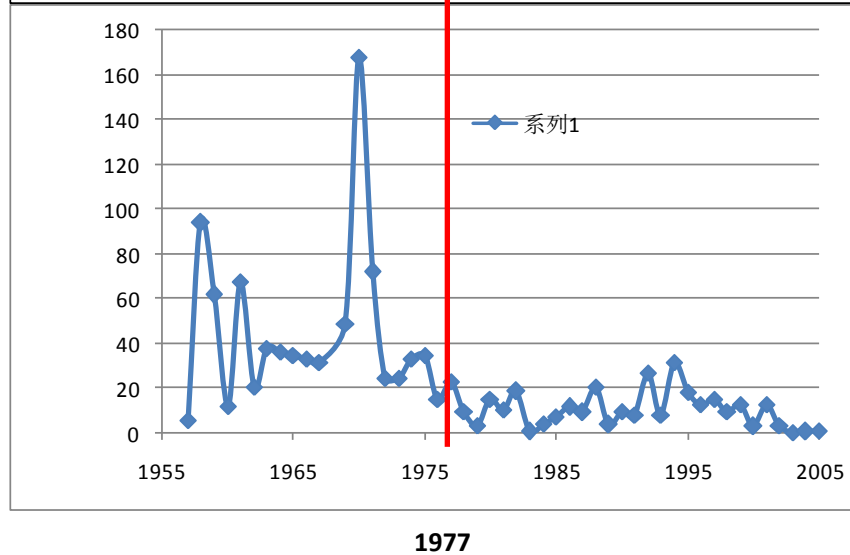
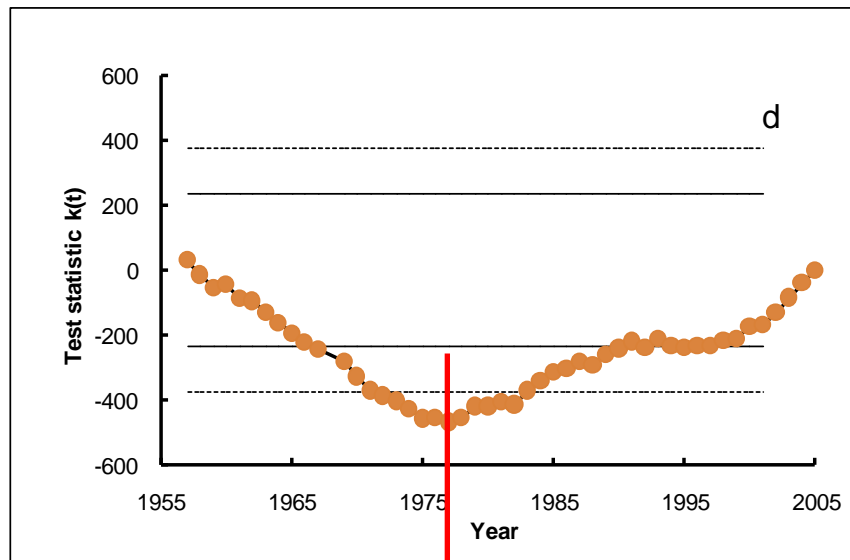


1982

1998

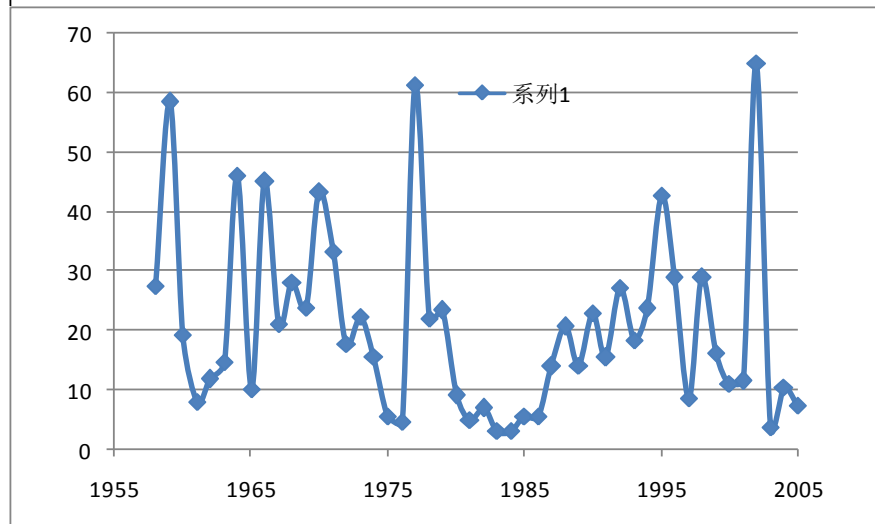
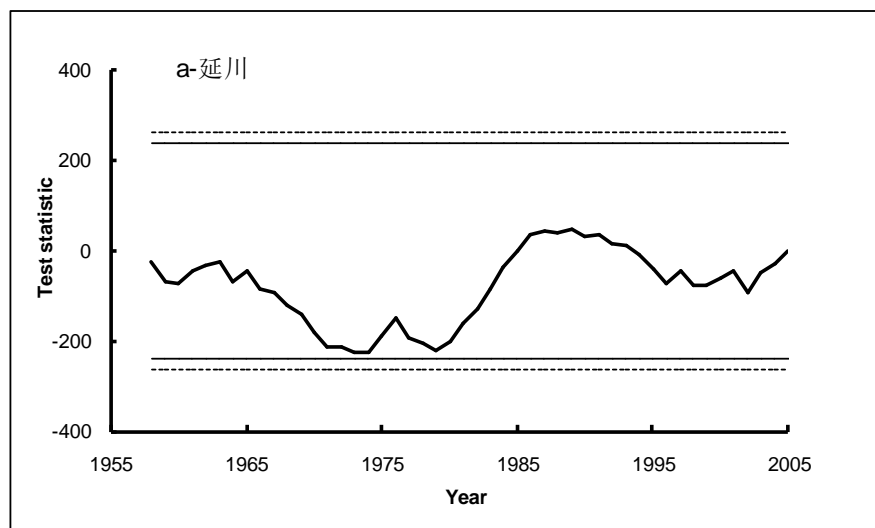
3. Jialuhe River, Shenjiawan gauging station, standardization sediment load

3. 佳芦河申家湾输沙

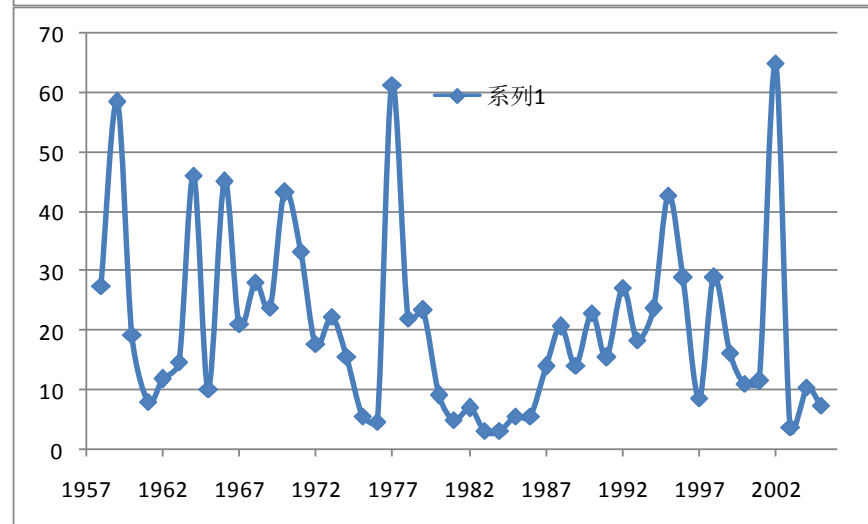
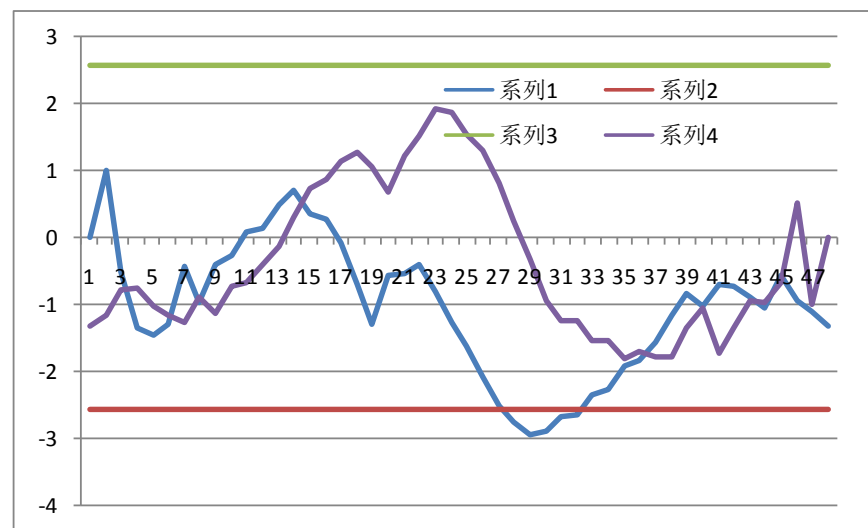


4. Qingjianhe River, Yanchuan gauging station, standardization sediment load

4. 清
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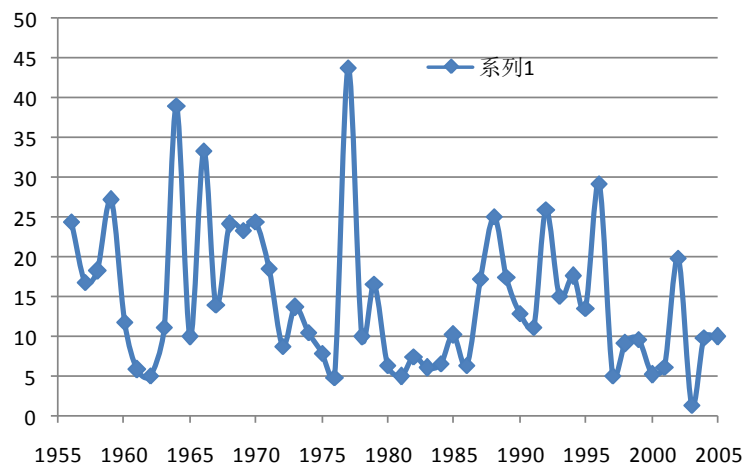
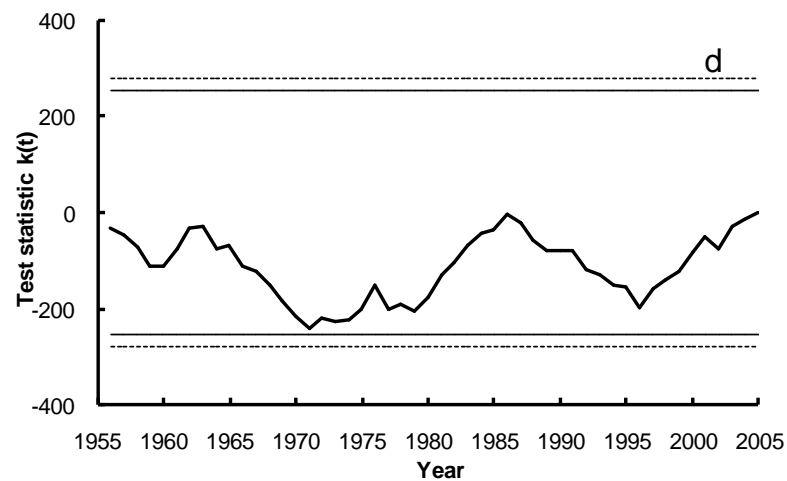
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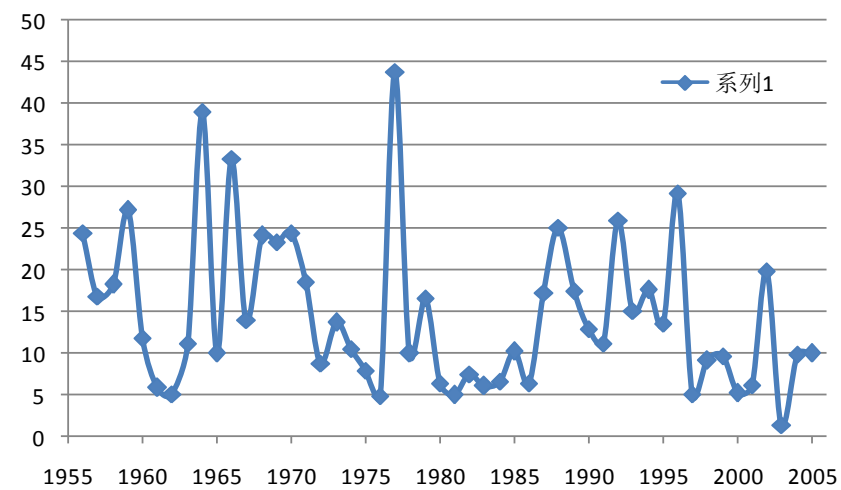
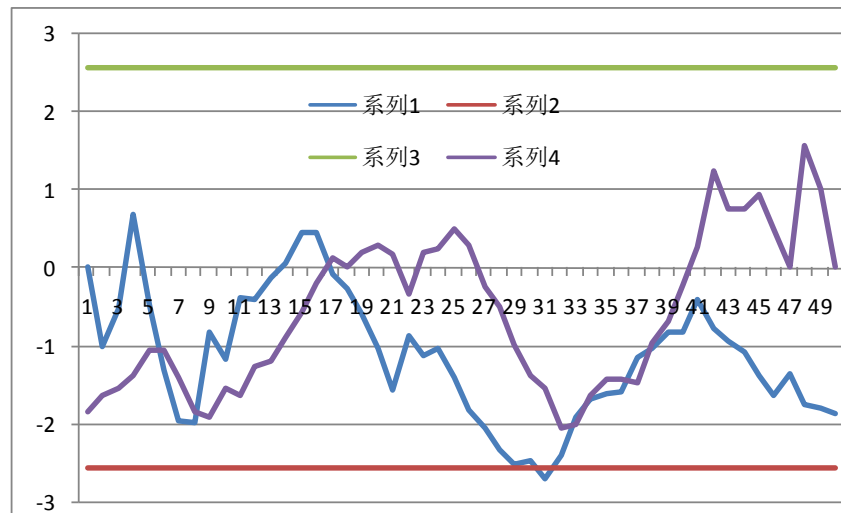
No change point detected

5. Yanhe River, Ganguyi gauging station, standardization sediment load

5.
延
河
输
沙



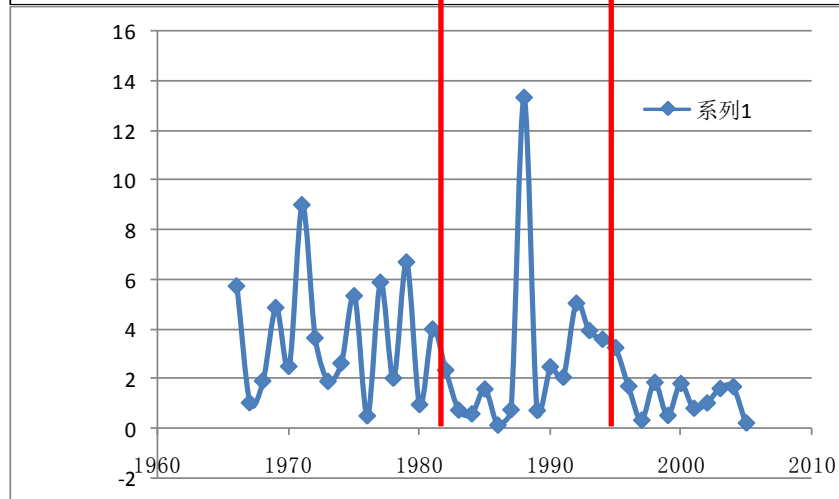
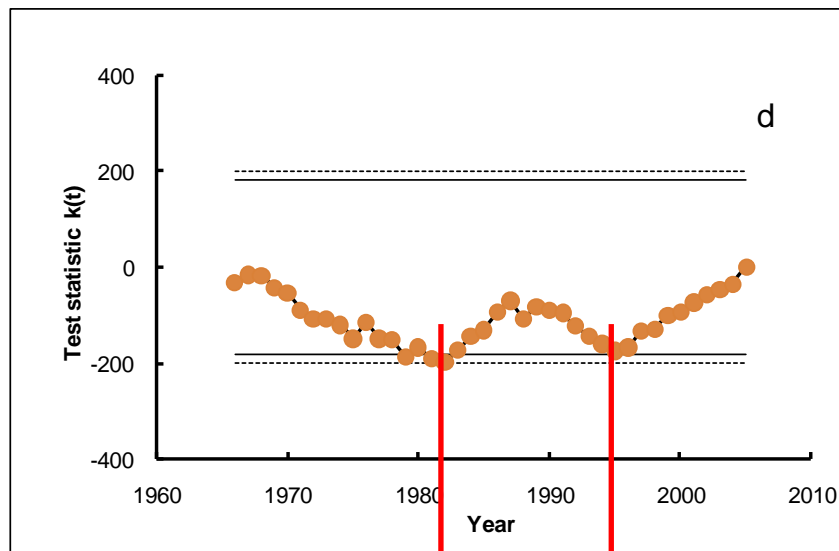
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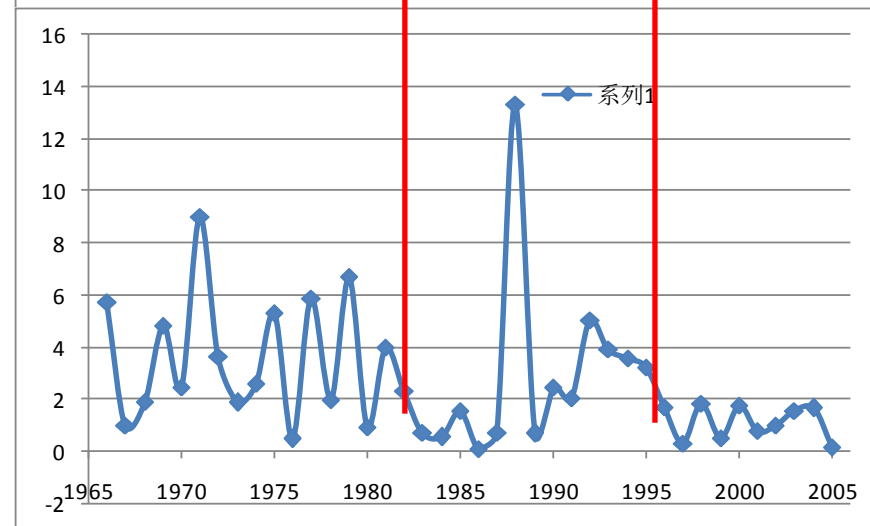
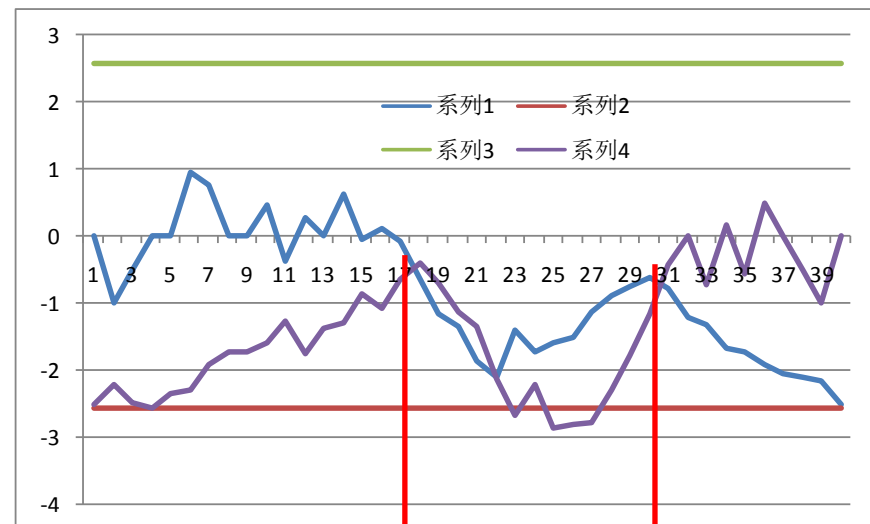
6. Yunyan River, standardization sediment load

6. 云岩河 输沙



1982

1995

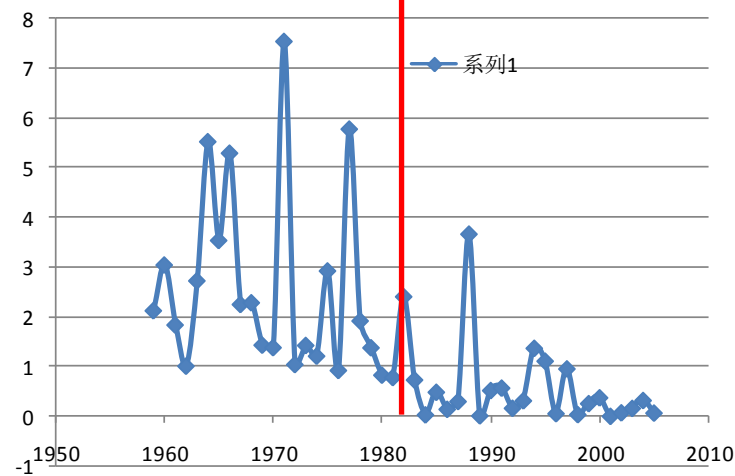
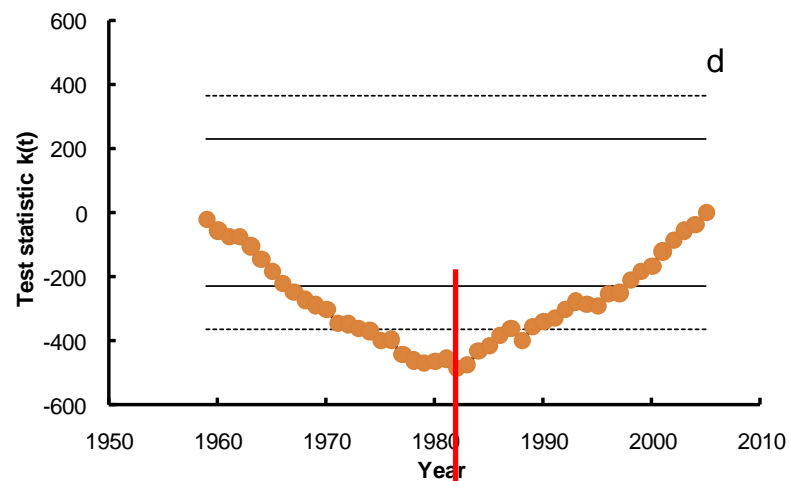


1982

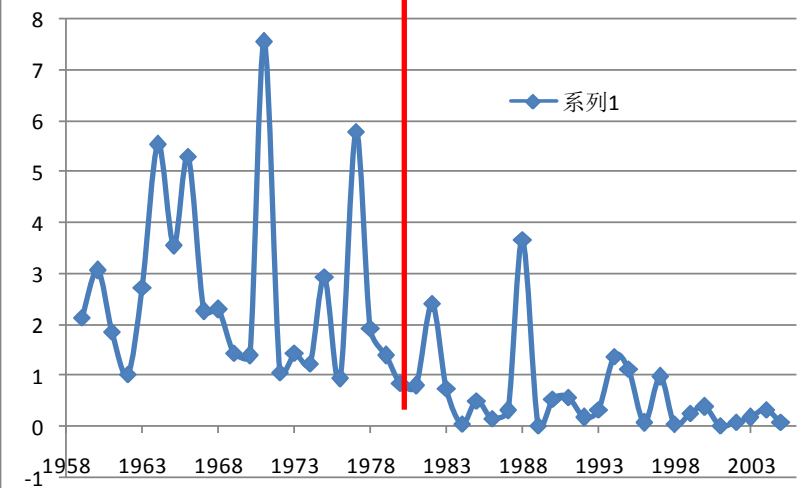
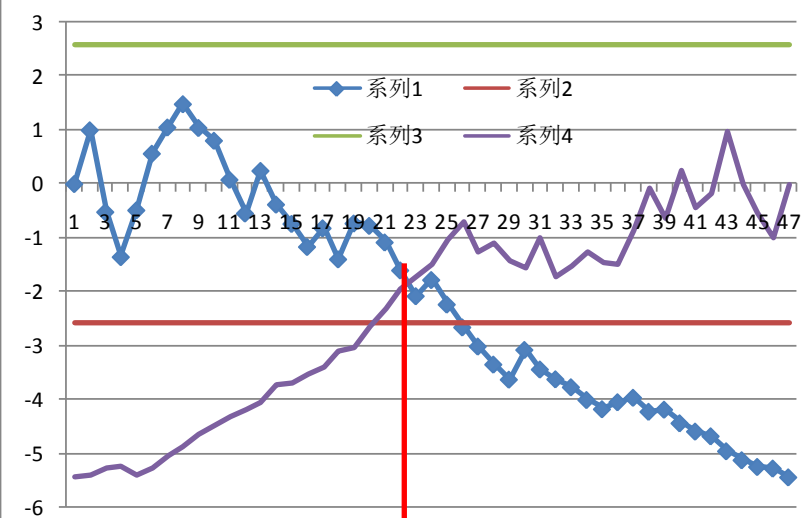
1996

7. Shiwangchuan River, standardization sediment load

7. 仕望川
输沙



1982



1981-1982