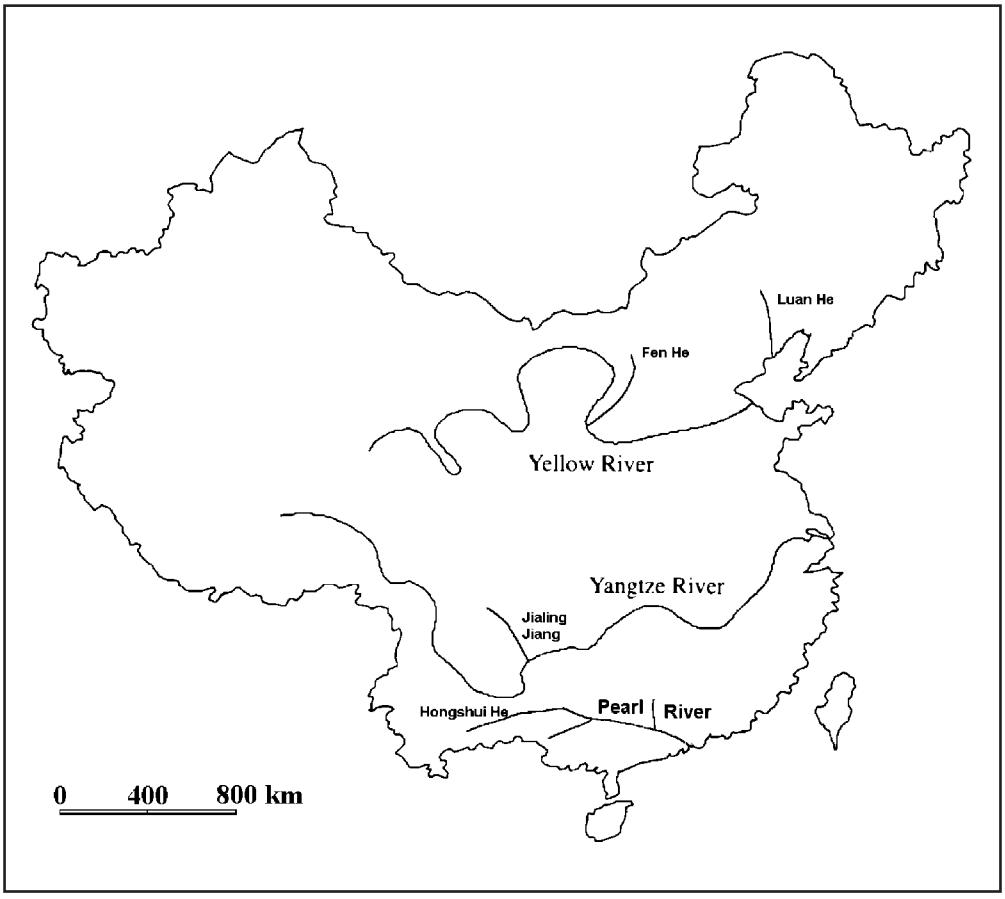
China

China-10: Fen He

China-11: Hongshui He

China-12: Jialing Jiang

China-13: Luan He



Introduction

The four rivers catalogued in this volume are the Fenhe, the Hongshuihe, the Jialing Jiang and the Luanhe.

The Fenhe is a main tributary of the Yellow River. The catchment area is 39,472 km^2 and the length of the main channel is 693 km. Upstream, the river zigzags through the Luliang mountains. The middle and downstream reaches flow though the Taiyuan and Lingfen basins. In these basins the depth of yellow soil is about 10-30 m, and it is the main source of soil erosion in Shanxi province. The average annual precipitation for the basin is 544 mm. The annual discharge at the Hejin station was 48.7 m^3/s for the period of 1934-1979.

The Hongshui is the upper stream of the Xijiang River, a main tributary of The Pearl River. It is located in the south of Guizhou, southeast of Yunnan province and west of the Guangxi Autonomous Region. The catchment area is 138,340 km^2 and the length of the main channel is 1,573 km. The area of the upper stream belongs to Yunnan-Guizhou Plateau. The annual precipitation for the catchment varies along the main stream. The average annual precipitation is about 1100-1300 mm in Yunnan and Guizhou, while it can reach 1500-1800 mm in Guangxi. The maximum recorded annual precipitation is 2300 mm in the Daming mountains in the downstream part of the basin. The annual evaporation is relatively stable between 1100-1200 mm. Annual discharge at the Shilongkou station is 2,151 m^3/s.

The Jialing Jiang is a large upstream tributary of the Yangtze River. The Bailong Jiang, which was catalogued in Volume 3 of the Catalogue of Rivers, is upstream of the Jialing Jiang. The catchment area is 159,800 km^2 and the length of the main channel is 1,119 km. The annual average precipitation is 965 mm. The precipitation increases from upstream to downstream. It is 1200 mm in the downstream tributary Qujiang and Fujiang rivers. The precipitation of the basin is concentrated in May-October, when, typically, more than 80% of the annual rainfall occurs. The annual discharge at the Beipei station is 2,120 m^3/s.

The Luanhe flows directly to the Bo Sea. Usually it is combined with the Haihe and is called the Hailuanhe, because both rivers are hydraulically connected. The Luanhe basin is mainly in Hebei province, with some flow coming from Inner Mongolia. The main river originates north of Mt. Bayanguer. The catchment area is 44,900 km^2 and the main channel length is 888 km. About 800 km^2 and 167 km of the river channel are in Inner Mongolia. The average annual precipitation is 564 mm. Annual discharge at the Luanxian station is 147 m^3/s.

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Pearl River Water Resources Commission, MWR
Yangtze River Water Resources Commission, MWR
Yellow River Water Resources Commission, MWR
Hydrology and Water Resources Bureau of Guangxi Zhuang Autonomous Region

Jialing Jiang

Map of River

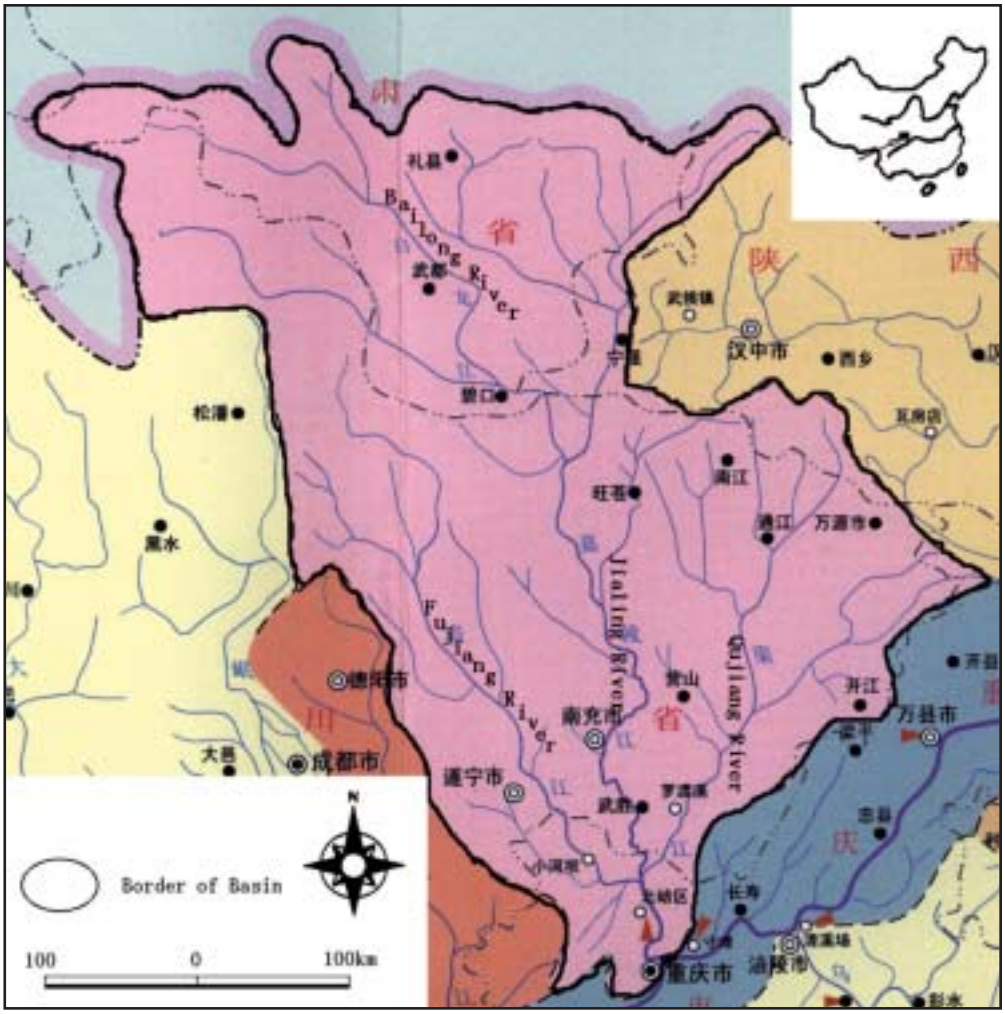


Table of Basic Data

Name(s): Jialingjiang		**Serial No. :** China-12
Location: Sichuan Province, southwest China	N 29° 34' ~ 34° 31'	E 102° 34' ~ 109° 02'
Area: 160,000 km^2	**Length of the main stream:** 1,120 km	
Origin: Mt. Qinlingnanlu (2,819 m)	**Highest point:** Mt. Qinling (2,819 m)	
Outlet: Changjiang	**Lowest point:** 198 m	
Main geological features: Mild hard layered clasic rocks, tabular metamorphic rocks, carbonate rocks		
Main tributaries: Qujiang, Fujiang, Bailong Jiang, Xihanshui		
Main lakes: ----------		
Main reservoirs: Baozhusi (2,451$\times 10^6 m^3$, 1996), Bikou (521$\times 10^6 m^3$, 1976)		
Mean annual precipitation: 998 mm (1971 ~ 1990) (basin average)		
Mean annual runoff: 2,120 m^3/s		
Population: 38,000,000 (1998)	**Main cities:** Nanchong, Guangyuan, Wudu, Mianyang	
Land use: Forest (19%), Rice paddy (7.1%), Other agriculture (10.2%),Waste (15.3%), Others (48.4%) (1991)		

1. General Description

The Jialing Jiang is a major tributary of the Yangtze River. The Bailong Jiang, which was catalogued in volume 3 of the Catalogue of Rivers, is a tributary of the Jialing Jiang. The Jialing Jiang is located on the border of Ganshu, Sichuan and Shanxi provinces. One of the sources of the river is Mt. Min in the Xiqing mountains. The Jialing Jiang flows from north to south. Two large tributaries join the main stream in its downstream reaches. One is the Qujiang, which flows from northeast to southwest. The other flows from northwest to southeast. The main stream joins the Yangtze River at the city of Chongqing after flowing through Guangyuan, Wangcang, Jian'ge, Cangxi, Nanchong, and Wusheng. The catchment area is 159,800 km^2 and main channel length is 1,119 km. Forests cover 55% of the total basin area. The area of the upper river drains from the Tibetan Plateau, where the average elevation is 3,500 m. The city of Nanchong separates the middle and downstream reaches, which are both in Sichuan province.

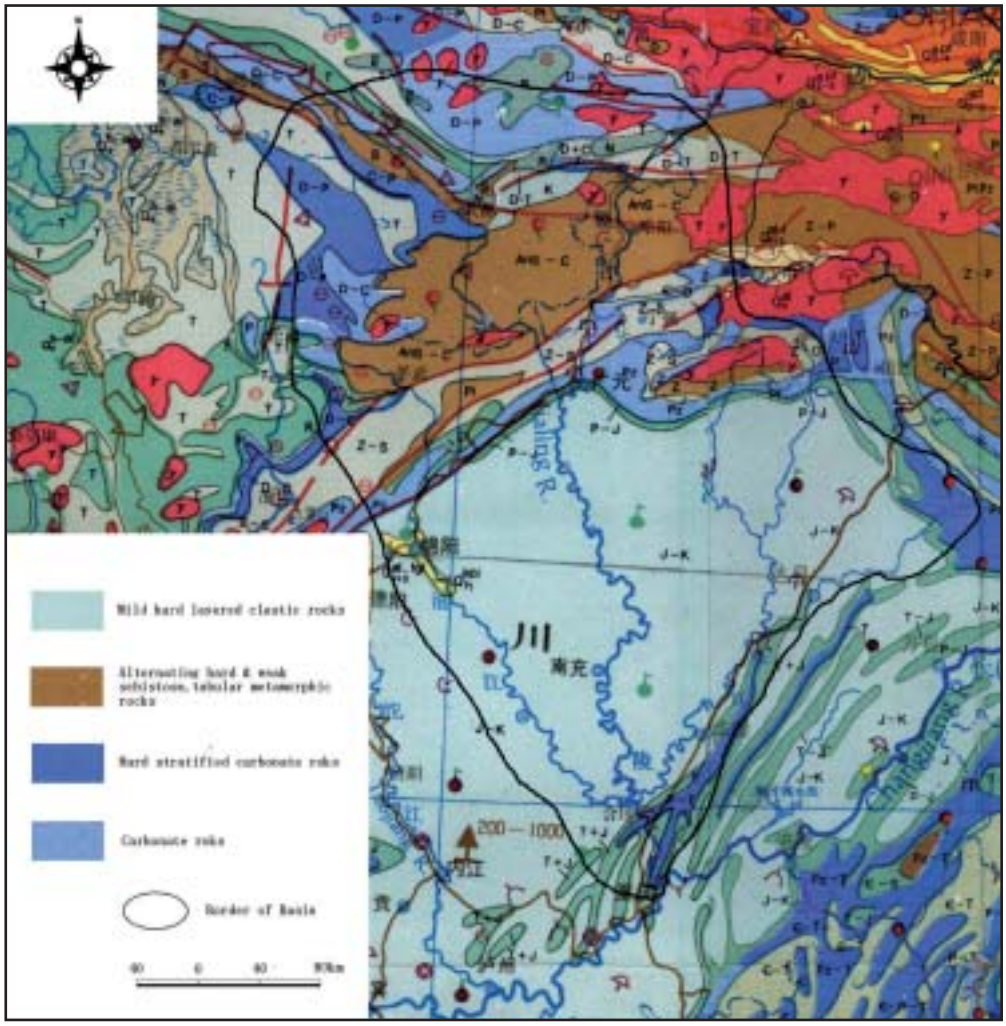
The annual average precipitation is 965 mm. The average precipitation for the upper basin is about 600 mm. The precipitation increases from upstream to downstream. It is 1,200 mm upstream of Qujiang and Fujiang. The precipitation of the basin is concentrated in May-October, when, typically, more than 80% of the annual rainfall occurs. The annual discharge at the Beipei station is 2,120 m^3/s.

Two large cascading reservoirs, the Bikou and the Baozhushi, lie in the upstream Bailong Jiang tributary river. The floods, caused by summer storms, are mainly experienced in the downstream part of the basin. The Yangtze flood of 1870 was primarily caused by flow from the Jialing Jiang. Sixty-six large floods were recorded from 653 to 1991. Intense rainfalls cause flooding in the basin while higher water demand for agriculture has led to agricultural droughts. Water-born soil erosion from the Jialing Jiang basin is the main source of sedimentation in the Yangtze River.

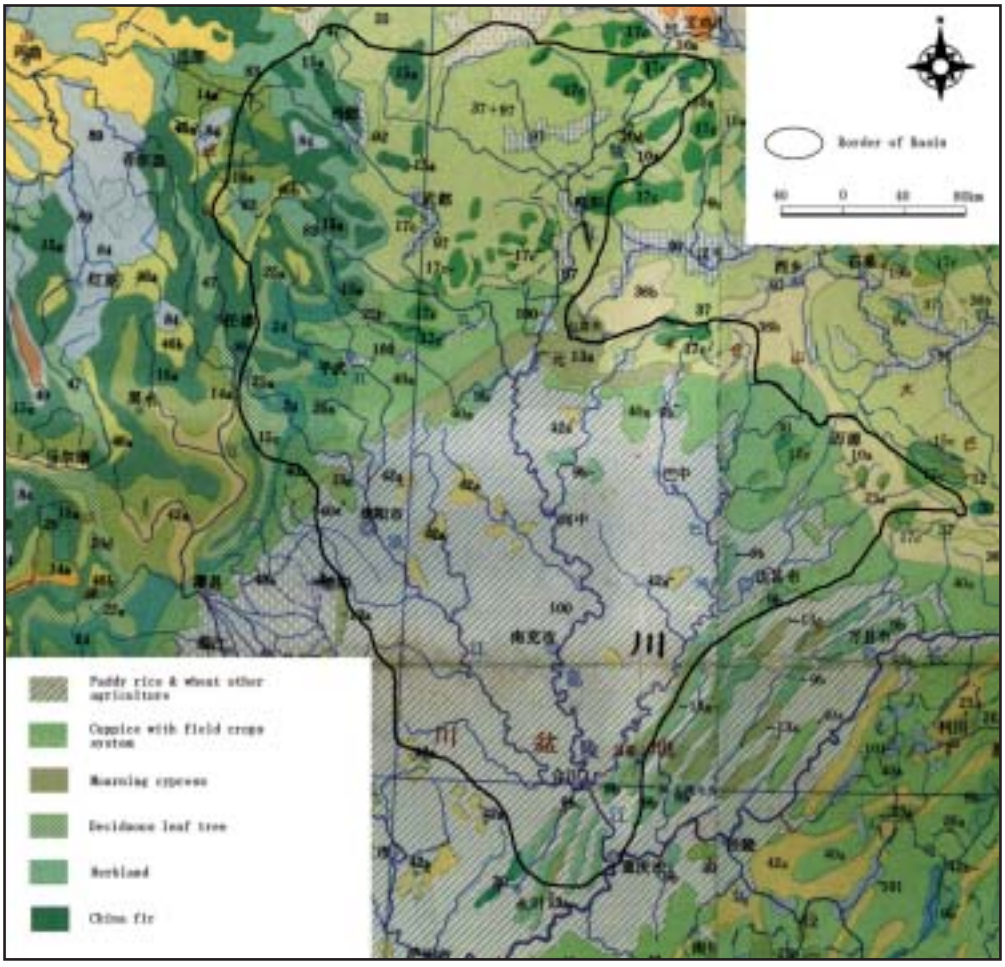
Sichuan is an agriculture province of China. The population of the catchment was 38,000,000 in 1998. The downstream part of the basin is the main grain production area in Sichuan. Besides wheat and corn, potato and rice are also important crops. The upper basin is predominantly in pasture.

2. Geographical Information

2.1 Geological Map



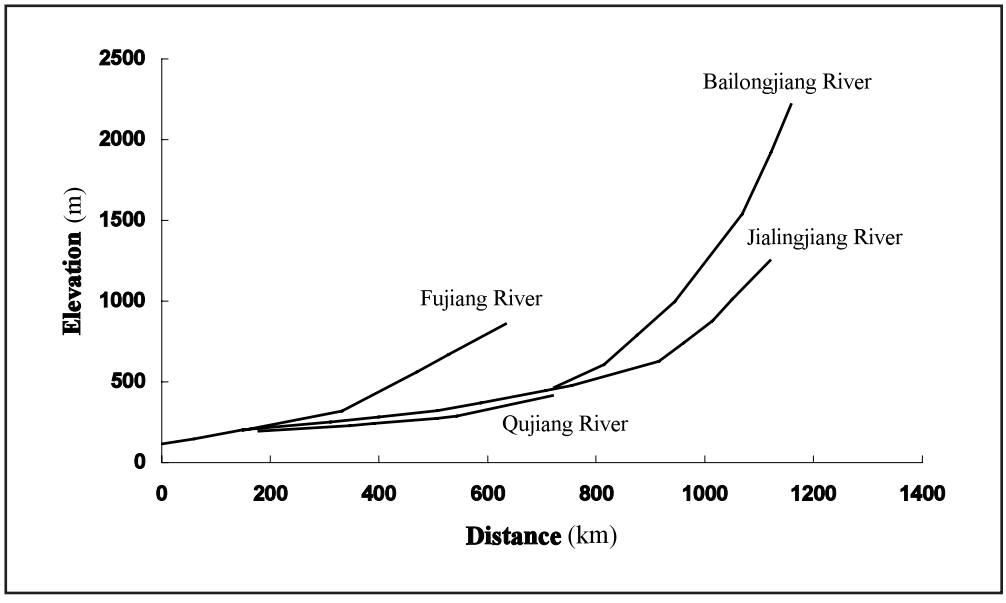
2.2 Land Use Map



2.3 Characteristics of the River and the Main Tributaries

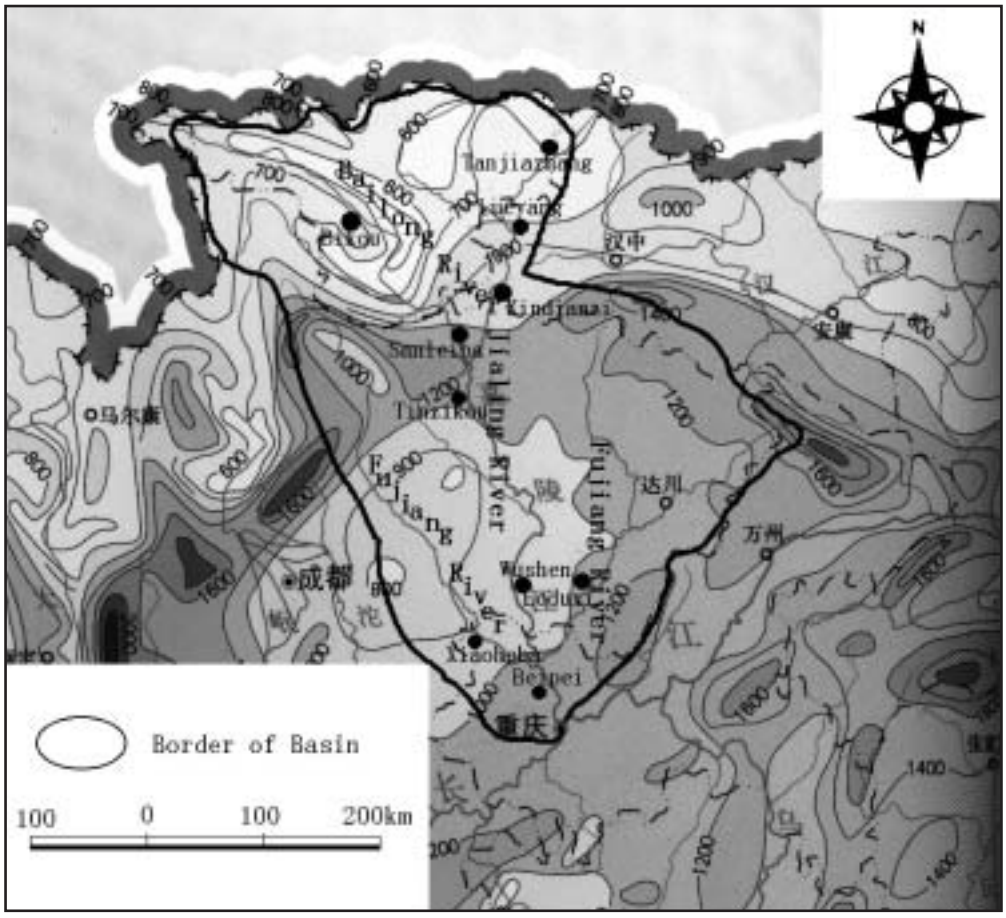
No.	Name of river	Length [km] Catchment area [km^2]	Highest peak [m] Lowest point [m]	Cities Population (1990)	Land use [%] (1985)
1	**Jialingjiang** (Main River)	1,120 160,000	Mt.Qinling 2,819 180	Nanchong, Hechuan, Guangyuan (Total = 2,530,000)	Forest (19%) Rice paddy (7.1%) Other agriculture (10.2%) Waste (15.3%) Others (48.4%)
2	**Xihanshui** (Tributary)	246 10,103	Mt.Maijishan 2,000 700		
3	**Bailong Jiang** (Tributary)	576 31,808	Mt.Wugongshan 4,288 460	Wudu 471,166	
4	**Qujiang** (Tributary)	720 39,211	Mt.Dabashan 2,500 200		
5	**Fujiang** (Tributary)	700 36,400	Mt.Minshan 5,588 210		

2.4 Longitudinal Profiles



3. Climatological Information

3.1 Annual Isohyetal Map and Observation Stations



3.2 List of Meteorological Observation Stations

No.	Station	Elevation [m]	Location	Observation period	Mean annual precipitation[1] [mm]	Mean annual evaporation[1] [mm]	Observation items[2]
	Ciba	888	N 33° 51' E 106° 25'	1959 ~ present	682.0	750.1	P (TB), E
	Tanjiazhuang	860	N 33° 42' E 106° 12'	1956 ~ present	773.9	797.4	P (TB), E
	Shunlixia	1,400	N 34° 06' E 105° 07'	1953 ~ present	521.9	873.6	P (TB), E
	Daqiao	1,080	N 33° 45' E 105° 17'	1963 ~ present	466.6	841.2	P (TB), E
	Tanjiaba	900	N 33° 35' E 105° 46'	1958 ~ present	683.6	662.1	P (TB), E
	Lueyang	645	N 33° 19' E 106° 07'	1934 ~ present	815.6	713.7	P (TB), E
	Xindianzi	510	N 32° 35' E 105° 51'	1951 ~ present	1,105.2	991.3	P (TB), E
	Sanleiba	480	N 32° 27' E 105° 38'	1954 ~ present	1,154.4	840.2	P (TB), E
	Shangsi	510	N 32° 17' E 105° 29'	1957 ~ present	1,165.3	978.9	P (TB), E
	Tingzikou	400	N 31° 51' E 105° 49'	1954 ~ present	1,109.1	814.8	P (TB), E
	Qingquanxiang	370	N 31° 43' E 106° 04'	1953 ~ present	988.2	902.0	P (TB), E
	Jianshexiang	310	N 31° 16' E 106° 06'	1953 ~ present	961.1	720.3	P (TB), E
	Wusheng	240	N 30° 16' E 106° 16'	1938 ~ present	998.9	724.3	P (TB), E
	Beipei	220	N 29° 51' E 106° 25'	1943 ~ present	1,142.1	797.0	P (TB), E
	Pingwu	880	N 32° 25' E 104° 31'	1951 ~ present	843.9	759.6	P (TB), E
	Fujiangqiao	485	N 31° 31' E 104° 43'	1956 ~ present	892.9	708.5	P (TB), E
	Santai	374	N 31° 04' E 105° 09'	1937 ~ present	898.1	769.2	P (TB), E
	Shehong	331	N30° 52' E 105° 24'	1951 ~ present	938.7	751.2	P (TB), E
	Xiaoheba	240	N 30° 06' E 106° 03'	1951 ~ present	1,030.1	692.0	P (TB), E
	Wanglituo	320	N 31° 41' E 106° 59'	1954 ~ present	1,129.9	570.1	P (TB), E
	Fengtan	315	N 31° 06' E 107° 06'	1953 ~ present	1,137.6	---------	P (TB)
	Huangjinkou	320	N 31° 37' E 107° 51'	1958 ~ present	1,206.8	767.2	P (TB), E
	Donglin	310	N 31° 17' E 107° 41'	1954 ~ present	1,241.3	764.7	P (TB), E
	Goudukou	260	N 30° 51' E 117° 00'	1954 ~ present	1,074.5	673.8	P (TB), E
	Luoduxi	240	N 30° 20' E 106° 35'	1953 ~ present	1,067.9	--------	P (TB)

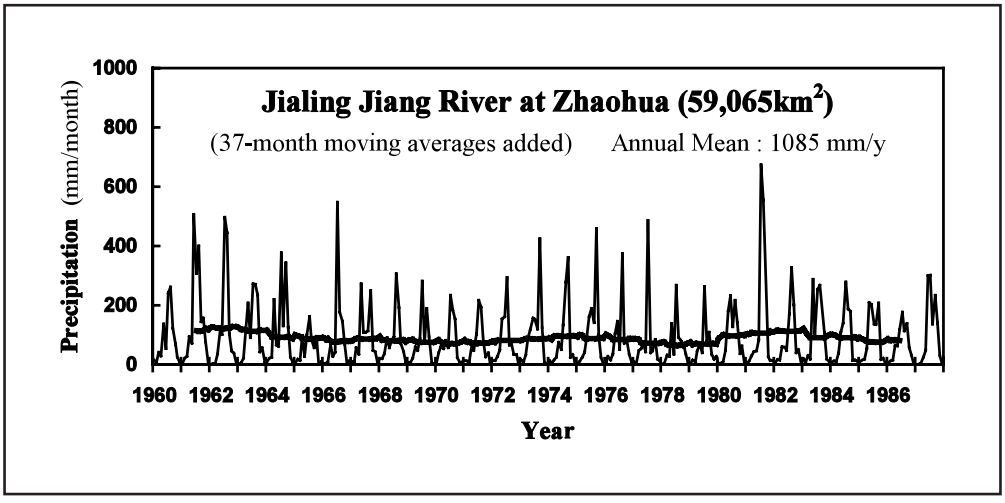
Evaporation used with Φ20 Evaporation vessel
1) Period for the mean is from 1956 to 1979 2) P: Precipitation, E: Evaporation, TB: Tipping bucket with recording chart

3.3 Monthly Climate Data

Station: Nanchong

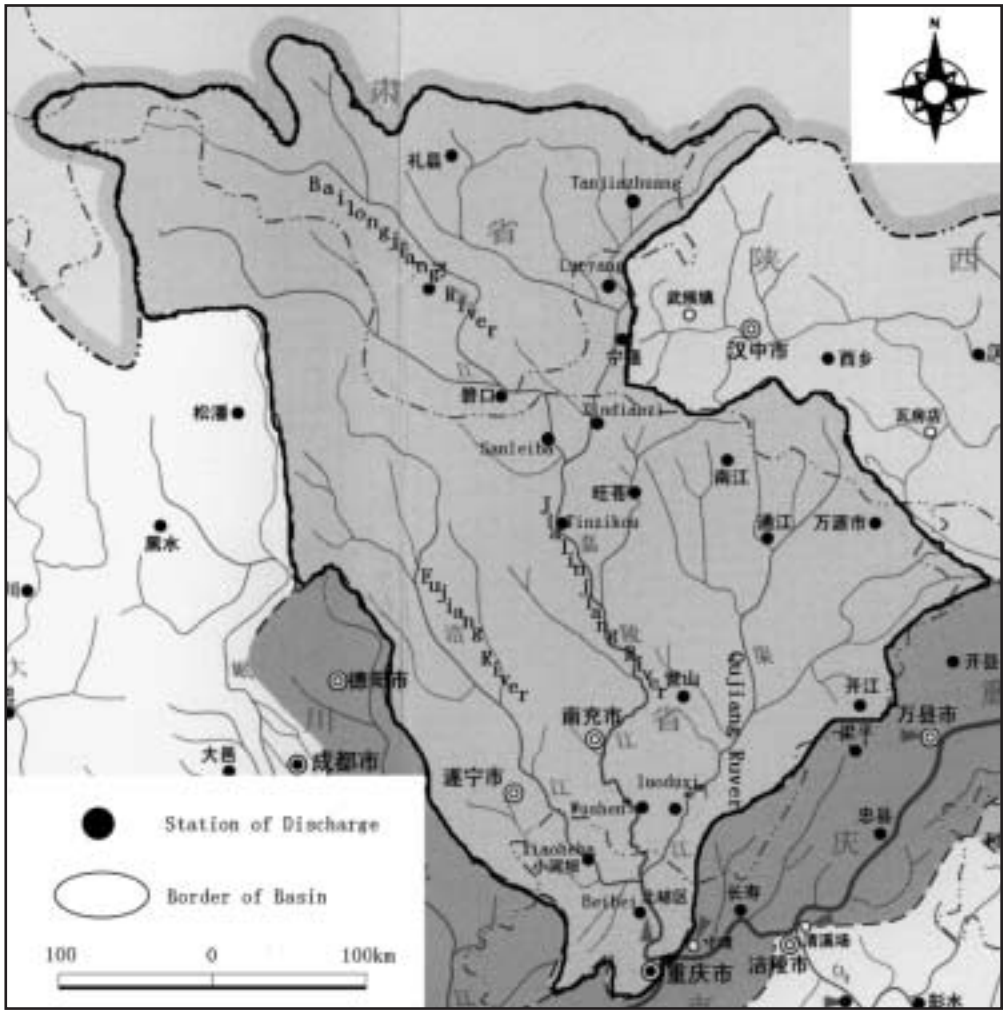
Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	6.6	8.3	12.8	17.8	22.0	24.8	27.4	27.7	22.5	17.8	12.8	8.1	17.4	1961~1990
Precipitation [mm]	17.3	16.5	30.7	74.5	126.6	131.6	179.0	136.9	161.3	91.4	37.6	17.5	1,020.8	1961~1990
Evaporation [mm]	18.3	25.3	51.7	74.1	89.1	81.2	106.3	130.3	66.6	42.7	28.1	20.2	733.9	1965~1987
Solar radiation [MJ/m^2/day]	4.50	6.56	9.19	13.1	13.8	14.2	16.2	17.7	9.74	7.30	5.24	4.18	10.1	1973~1985
Duration of sunshine [hr]	45.5	51.6	98.0	129.5	141.3	137.5	184.4	210.0	98.8	73.9	57.1	39.2	1,266.7	1961~1990

3.4 Long-term Variation of Monthly Precipitation



4. Hydrological Information

4.1 Map of Streamflow Observation Stations



4.2 List of Hydrological Observation Stations

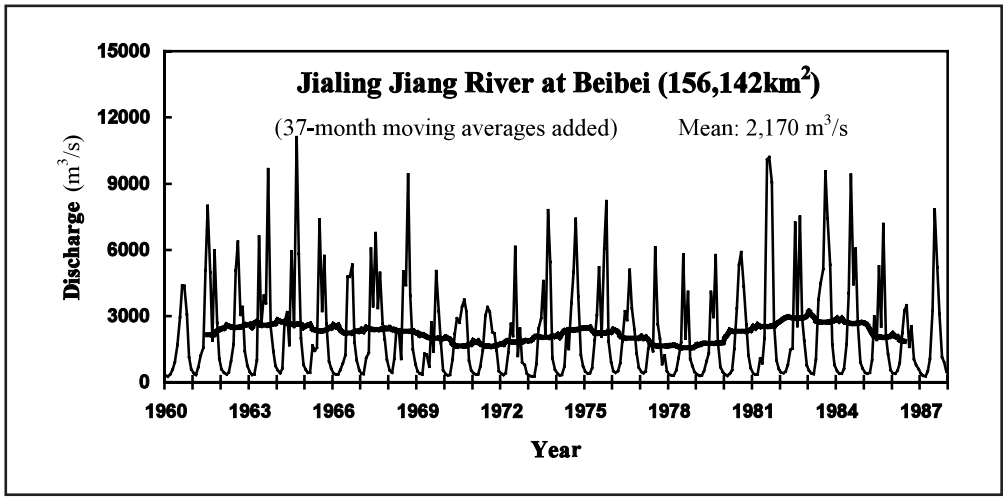
No.	Station	Location	Catchment area (A) [km^2]	Observation period	Observation items (frequency)
	Tanjiazhuang	N 33° 42' E 106° 12'	6,694	1975 ~ present	H2, Q
	Tanjiaba	N 33° 35' E 105° 45'	9,538	1958 ~ present	H2, Q
	Lueyang	N 33° 19' E 106° 07'	19,206	1939 ~ present	H2, Q
	Xindianzi	N 32° 35' E 105° 51'	25,367	1951 ~ present	H2, Q
	Sanleiba	N 32° 27' E 105° 38'	29,247	1953 ~ present	H2, Q
	Tingzikou	N 30° 51' E 105° 49'	61,089	1954 ~ present	H2, Q
	Wusheng	N 30° 16' E 106° 16'	79,714	1940 ~ present	H2, Q
	Luoduxi	N 30° 20' E 106° 35'	38,071	1953 ~ present	H2, Q
	Xiaoheba	N 30° 06' E 106° 03'	29,420	1951 ~ present	H2, Q
	Beipei	N 29° 51' E 106° 25'	156,142	1939 ~ present	H2, Q

H2: water level by manual Q: discharge

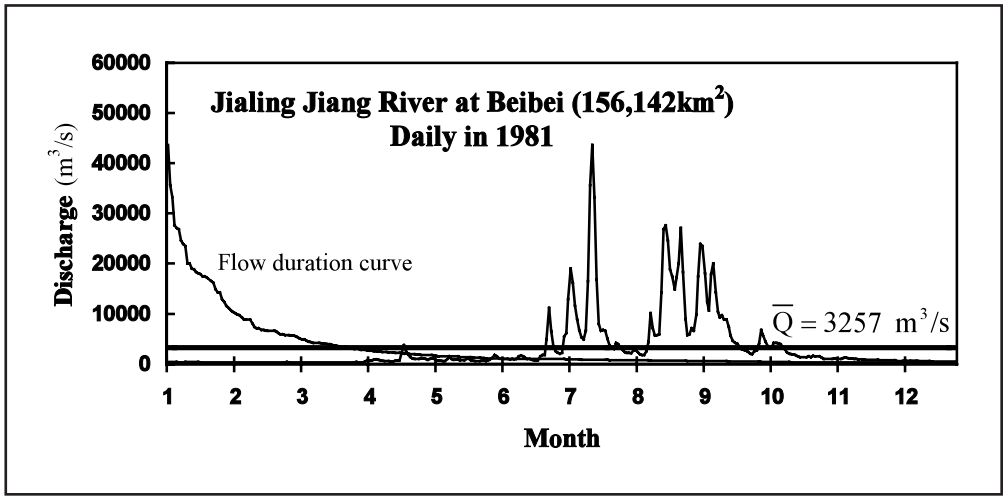
No.	$\overline{Q}$[1)] [m^3/s]	Qmax[2)] [m^3/s]	$\overline{Q}$max[3)] [m^3/s]	$\overline{Q}$min[4)] [m^3/s]	$\overline{Q}$/A [m^3/s/100km^2]	Qmax/A [m^3/s/100km^2]	Period of statistics
	48.6	8,340	1,990	7.37	0.726	124.6	1975 ~ 1987
	44.2	4,970	905	8.77	0.464	52.1	1971 ~ 1987
	118	8,630	2,330	20.0	0.614	44.9	1940 ~ 1987
	196	10,200	4,180	32.7	0.773	40.2	1964 ~ 1987
	331	8,960	4,280	80.8	1.132	30.6	1954 ~ 1987
	647	23,700	10,900	141	1.060	38.8	1955 ~ 1987
	879	28,900	13,100	170	1.103	36.3	1944 ~ 1987
	728	24,000	15,200	48.4	1.912	63.1	1954 ~ 1987
	482	28,700	9,250	81.7	1.638	97.6	1952 ~ 1987
	2,170	44,800	24,600	338	1.390	28.7	1940 ~ 1987

1) Mean annual discharge 2) Maximum discharge
3) Mean maximum discharge 4) Mean minimum discharge

4.3 Long-term Variation of Monthly Discharge Series



4.4 Annual Pattern of Discharge Series



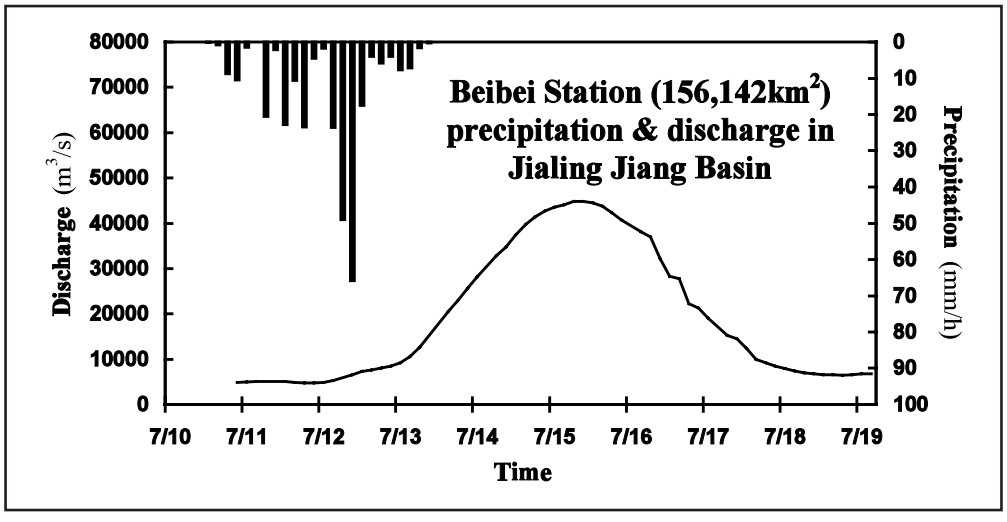
4.6 Annual Maximum and Minimum Discharges

Station: Lancun (7,705 km^2)

Year	Maximum[1)]		Minimum[2)]		Year	Maximum[1)]		Minimum[2)]	
	Date	[m^3/s]	Month	[m^3/s]		Date	[m^3/s]	Month	[m^3/s]
1960	9.07	18,600	2	260	**1974**	9.15	26,100	3	265
1961	6.29	24,700	2	323	**1975**	10.03	37,100	3	360
1962	7.29	22,800	4	334	**1976**	8.27	16,500	2	354
1963	5.26	29,200	3	318	**1977**	7.12	24,100	3	366
1964	9.16	21,200	3	378	**1978**	7.06	26,700	2	255
1965	9.01	27,800	2	382	**1979**	7.17	20,000	2	277
1966	7.18	18,600	4	262	**1980**	8.25	26,600	2	242
1967	5.19	24,600	2	338	**1981**	7.16	44,800	2	316
1968	7.04	28,800	2	409	**1982**	7.29	25,300	2	384
1969	9.29	25,300	3	350	**1983**	8.01	32,200	2	355
1970	9.29	12,800	2	305	**1984**	7.08	36,200	3	362
1971	6.12	18,500	3	303	**1985**	9.16	28,800	2	362
1972	7.12	23,400	3	290	**1986**	6.17	12,400	2	367
1973	9.09	35,600	3	244	**1987**	7.20	34,100	3	238

1), 2) Instantaneous observation by recording chart

4.7 Hyetographs and Hydrographs of Major Floods



5. Water Resources

5.1 General Description

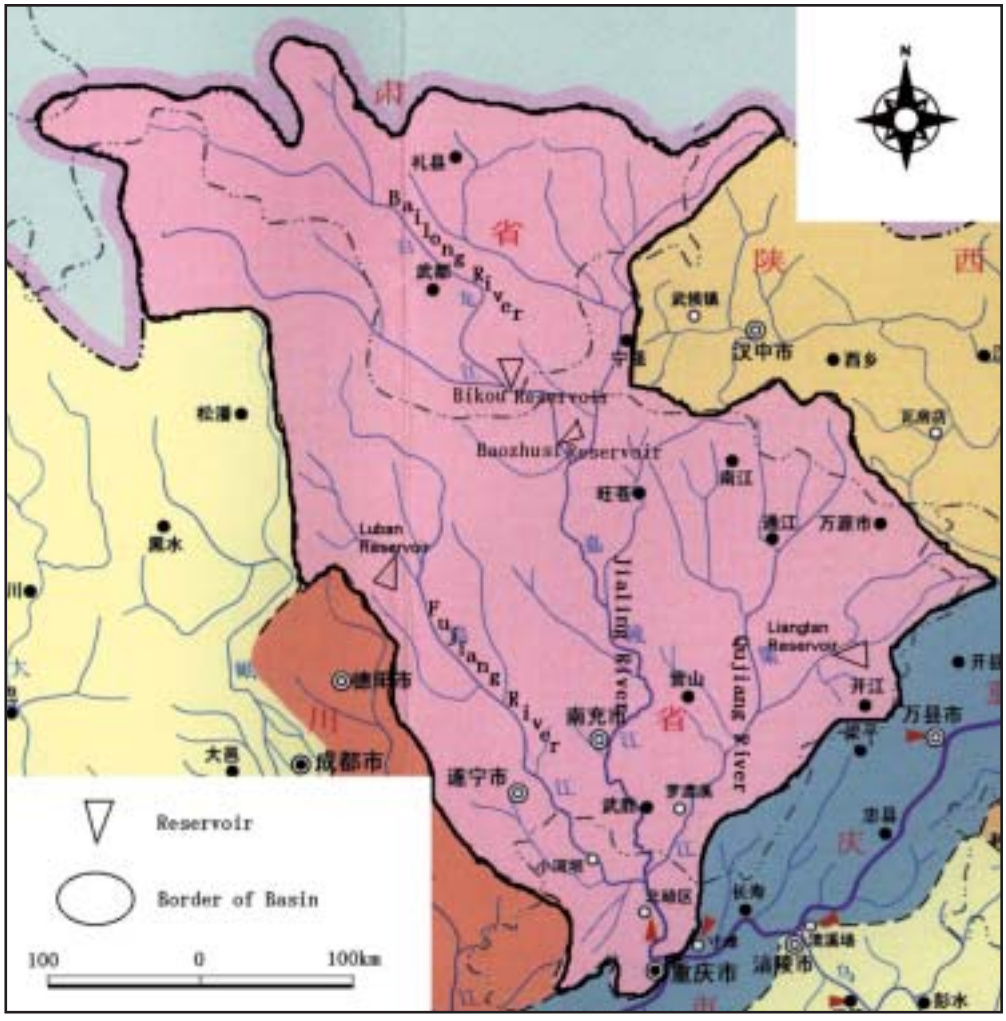
The Jialing Jiang is a major tributary of the Yangtze River. The Bailong Jiang, which was catalogued in volume 3 of the Catalogue of Rivers, is a tributary of the Jialing Jiang. The main river and tributaries of the Jialing Jiang originate in the north-western mountains of Sichuan and the Tibetan Plateau.

The annual average precipitation is 965 mm. The precipitation of the basin is concentrated in May-October, when, typically, more than 80% of the annual rainfall occurs. The precipitation increases from upstream to downstream. In the Bailong Jiang basin, in the upstream part of the river, annual precipitation is only 600 mm, while it is more than 1,200 mm in the Qujiang and Fujiang Rivers. Most of area in the river basin belongs to the Sichuan basin, and precipitation is relatively small compared to other rivers in the Yangtze River basin.

Floods are mainly caused by summer storms. The Jialing Jiang is one of main sources of Yangtze floods, e.g., discharge at Beipei station was 57,300 m^3/s and 44,800 m^3/s in 1870 and 1998. Historically, the Jialing Jiang has also experienced large floods in 1903, 1921, and 1938.

Two large man-made cascading reservoirs, the Bikou and the Baozhushi, lie in the upstream Bailong Jiang tributary river. These reservoirs were completed in 1976 and 1997 and have capacities of 521 x 10^6 m^3 and 2,450 x 10^6 m^3 respectively. Two other large reservoirs, the Luban and the Liangtan were constructed in tributaries in 1980 and 1964. Many middle and small scale reservoirs have been constructed in tributaries to exploit the abundance of hydro-electric power in the basin.

5.2 Map of Water Resource Systems



5.3 List of Major Water Resources Facilities

Major Reservoirs

Name of river	Name of dam	Catchment Area [km^2]	Gross Capacity [10^6m^3]	Effective Capacity [10^6m^3]	Purposes[1)]	Year of completion
Bailongjiang River	**Bikou**	26,010	521	450	F, P	1976
Bailongjiang River	**Baozhusi**	28,896	2,451	1,307	F, P	1996
Fujiang River	**Luban**	21	278	270	A	1980
Qujiang River	**Liangtan**	36,300	500		P, A	1964

1) F: Flood control, A: Agriculture, P: Hydro-power

5.4 Major Floods and Droughts

Major Floods at Sanleiba (Catchment area 29,247 km^2)

Date	Peak discharge [m^3/s]	Rainfall [mm] Duration	Meteorological cause	Dead and Missing	Major damages (Districts affected)
1956.6.27	33,500	230 6.22 ~ 6.28	Frontal rain	---	Nanchong City, etc.
1981.7.16	44,800	292.6 7.11 ~ 7.14	Frontal rain	---	Sichuan Province

Major Droughts

Period	Affected area	Major damages and counteractions
1961.7 ~ 10	Mianyang City	Water supply cut to 75%
1978.7 ~ 10	Mianyang City	Water supply cut to 75%
1979.7 ~ 10	Mianyang City	Water supply cut to 75%

6. Socio-cultural Characteristics

The Jialing Jiang flows across the Sichuan basin or plain. It is an important grain producing area in China. In the downstream reaches of the river, channel width varies between the flood and dry seasons, e.g., between Langzhong and Hechuan the width of river in the dry season is between 100-300 m, while it is between 500-1,000 m in the flood season. The famous scenic area of the Libi, Wentang, and Guanying gorges is called the “mini Three-Gorges”. It provides good rafting conditions for tourists. There are also many dangerous sand shoals and rocks in the river and these hamper navigation. The upstream is very steep, with an average grade of 3.8%. The Jialing Jiang is the main connecting waterway between Chongqing and the areas to the north. The very special natural scenery with mountains, water, terrace, forestry and many cultural antiquities of the region have attracted tourists from around the world.

Chongqing is a city constructed in a mountainous area. The lack of flat land and the lack of continuous sunny days have earned it the nicknames of Mountain City and Fog Capital.

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