

7.7.3.4.1 Flood specifications

The flood that occurred in the upper reaches of the Changjiang River in July 1870 was a rare extraordinary flood. There was a large amount of data available for the flood. A large-scale field survey found more than 500 flood mark points along the Changjiang River and its branches. 91 inscriptions were found along the 754-km reach, from Hechuan to Yichang. In addition, there were reports to the Imperial Palace, history books about water conservancy and literature published by nearly 800 counties and prefectures. According to an analysis of these data, the flood was primarily from the Jialingjiang River and the reach from Chongqing to Yichang. Its storm characteristics included: long duration, high intensity and wide coverage; the storm location was steady and slowly moved eastward. The storm was a result of several consecutive strong south-west low vortexes moving along south-west-north-east shear lines under a steady meridional environment background and favourable topographic conditions. It was representative of an extreme flood-generating storm on the Changjiang River.

According to surveys and analysis of data from the literature, the flood process was of the double-peak type, with the major peak ahead and the minor peak behind. The flood peak and the flood volume at the Yichang station (near the dam site of the Three Gorges Project) are shown in Table 7.11.

According to the literature and archival research, the flood was the largest observed since 1153, more than an 840-year period, along the Three Gorges reach. According to research on ancient floods, this event was the worst for 2 500 years.

7.7.3.4.2 Storm simulation

According to the literature, the extraordinary flood on the Changjiang River in July 1870 was a result of rainfall along the lower portion of the Jinshajiang River plus a seven-consecutive-day storm over a large area of Sichuan Province. In terms of temporal and regional distribution, the storm could be broken down into two processes: one from 13–17 July and the other from 18–19 July. The first process focused on the Jialingjiang River region, and the other focused on south-east Sichuan and the Chongqing–Yichang section in the upper reaches of the Changjiang River. The storm was in a south-west–north-east belt distribution, covering a wide range from the lower portion of the Jinshajiang River to the middle reaches of the Hanjiang River. The storm centre was somewhere in the middle reaches of the Jialingjiang River and the Qujiang River.

Table 7.11. Peak and volume of the flood at Yichang station in 1870 (CJWRC, 1997)

Flood peak (m^3/s)	Flood volume (10^9 m^3)			
	3-day	7-day	15-day	30-day
105 000	26.5	53.7	97.5	165.0

According to dates in rainfall records of county annals, the storm moved slowly from west to east: it was on the Fujiang River on 13 July; moved to Hechuan County on the Jialingjiang River on 14 July, lasting 3 days there; then moved to the east of Sichuan after 15 July; finally focusing on the east of Sichuan and Wan County from 17–20 July. The overall storm duration was about 7 days.

The spatio-temporal distribution of the storm corresponding to the flood can be quantitatively simulated based on the qualitative descriptions about the duration–area distribution of the storm in July 1870 and the flood hydrograph of the Yichang station. The procedure used is described below.

Records made in 1870 were compared with twentieth-century records about storm processes to find a number of large storms of the low shearing

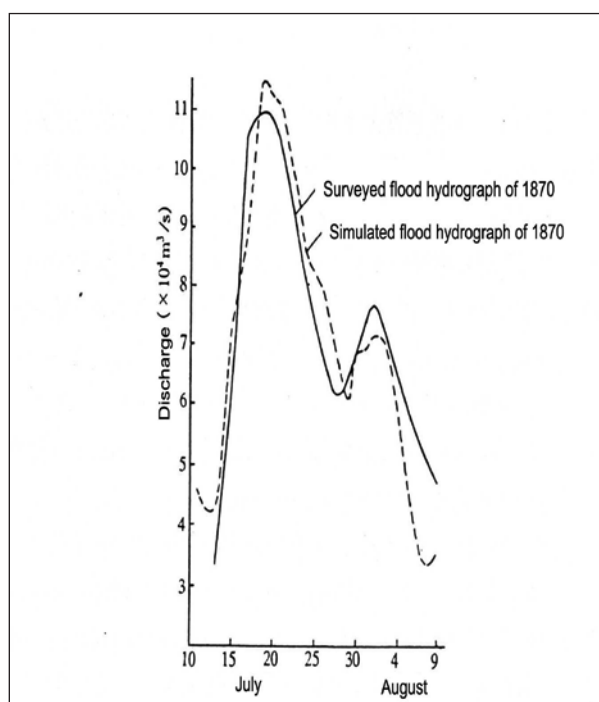


Figure 7.15. Flood hydrograph of Yichang station in 1870 (Zhao and others, 1983)