The orography in the upper reaches of the Baihe River was less favourable for the August 1975 typhoon system than it was for the August 1975 storm area. Nonetheless, there is no large orographic barrier higher than 1 000 m between the two regions, so transposition is possible. Orographic correction may be performed for the difference in orographic conditions.

(c) Spatial distribution of rainfall map:
The distribution is determined by placing the Linzhuang storm centre in a belt in the watershed where storms occur frequently and optimizing the amount of precipitation that would occur over the basin. This is achieved by turning the storm axis 20° clockwise. The measured 24-hour areal mean precipitation depth of the design watershed is 560 mm.

(d) Transposition correction:
Since the two regions are at the same geographical location and share the same moisture conditions, no location correction is needed. Barrier elevation correction is needed, since there are barriers with an average elevation of 800 m between the storm area and the design watershed, and the average elevation of the storm area is 200 m. A tracing of air particles tracks over the storm location shows that most of the moisture comes from the south-east. The average sea level 12-hour dew point of multiple stations on the south-eastern edge of the storm area (25.8°C) is selected as the representative dew point. The two regions share the same historical maximum dew point (28°C). The correction coefficient of barrier elevations is calculated as follows:

$$K_2 = \frac{(W_{Bm})_{ZB}}{(W_{Bm})_{ZA}} = \frac{(W_{28})_{800}}{(W_{28})_{200}} = \frac{105 - 20.0}{105 - 5.00} = 0.85 \quad (7.5)$$

where K_2 is the water vapour corrected coefficient of elevation or inflow barrier elevation, W_{Bm} is the maximum precipitable water of the design watershed, $(\ )_{ZB}$ is the surface elevation or barrier elevation of the design region, and $(\ )_{ZA}$ is the transposed region surface elevation.

(e) Maximization calculation:
Since the August 1975 storm is a rare extraordinary storm, it may be regarded as a high-efficiency storm. Therefore, only moisture maximization is needed. Its maximum coefficient is given by:

$$K_3 = \left(\frac{W_{Bm}}{W_B}\right)_{200} = \left(\frac{W_{28}}{W_{25.8}}\right)_{200} = \frac{105 - 5.00}{86.6 - 4.80} = 0.85 \quad (7.6)$$

where K_3 is the maximum coefficient, and W_B is the precipitable water of the design watershed.

After barrier correction and maximization, the comprehensive correction coefficient of the design watershed is:

$$K = K_2 \times K_3 = 0.85 \times 1.22 = 1.04 \quad (7.7)$$

The areal rainfall measured after the August 1975 storm multiplied by the above coefficient and transposed to the design watershed with its axis turned gives the required PMS.

7.4.7 Storm transportation for arid and semi-arid regions

7.4.7.1 Storm characteristics

The moisture content of sand is low and precipitation is scarce in arid and semi-arid regions, where storms show the following characteristics:

(a) Storms of long durations and large areas have low frequencies. Meanwhile, storms of short durations and small areas have high frequencies and much sharper rainfall intensities, some of which even exceed those in humid regions.
(b) Storms change greatly from year to year. Extraordinary storms seldom occur in long-term observations at stations. These storms are only occasionally observed at a minority of the stations and come with rare frequencies – the return periods can be from several hundred to ten thousand years.
(c) Either the spatial or the temporal distribution of a storm is somewhat uneven. In addition, the station density is far smaller than in humid regions. As a result, it is hard to observe violent local storms of short durations, especially the storm centre.

Due to these characteristcs, estimation of PMP for arid and semi-arid regions primarily depends on storm transposition (Wang Y. and Wang W., 2000).

7.4.7.2 Characteristics of PMP estimation

(a) Surveyed data on extraordinary storms should be used as control point data for extension and amplification.
(b) There are large differences in terms of causes and characteristics between storms with long dura-