on evidence comparing extreme rainfall over high and low topography in the GSAM database as well as evidence of truly extreme rainfall over the globe. As a result, a formula to calculate a modified topographic enhancement factor for PMP storms was devised and this is used for both generalized methods. The details are presented in Table 5.27.

Modified topographic enhancement factors were then calculated at each of the grid points within the catchment. The catchment average of these provided the catchment PMP topographic enhancement factor.

5.5.4.4 Catchment PMP estimates

Finally, total PMP depths were calculated by multiplication of the catchment PMP convergence components by the catchment PMP topographic enhancement factor. The total PMP depths were then plotted against duration and a final envelope drawn to these. Catchment PMP estimates are taken from this final envelope. An example is given in Figure 5.78.

The rationale for the final enveloping of the PMP estimates is that:

(a) the storm databases are necessarily incomplete and cannot provide the form of the PMP design storm in total;
(b) PMP estimates for different durations may derive from different seasons and there has been no attempt to envelope the database across seasons.

5.5.4.5 Design spatial distribution of the PMP storm

The design spatial distribution for the PMP storm is simply given by the field of modified topographic enhancement factors over the catchment. An example is given in Figure 5.79.

5.5.4.6 Design temporal distribution of the PMP storm

Design temporal distributions of the PMP storm were developed from the storm temporal distributions constructed by the method described in section 5.5.2.4.

For the GSAM, design temporal distributions were developed in a cooperative effort between the Australian Bureau of Meteorology and the Rural Water Commission of Victoria. The work is extensively documented in Nathan (1992). For each standard area and duration, and separately for each zone, the average variability method of Pilgrim and others (1969) was applied to the storm temporal distributions to derive design temporal distributions for the PMP storm. It was considered that the temporal distribution of rainfall in a PMP storm would be smoother than that of an average storm in the GSAM database. Accordingly, the temporal distributions derived by the average variability method were smoothed using the method described by Nathan (1992).

The GTSMR provides for two sets of temporal distributions that can be applied to the catchment PMP depths. Firstly, a set derived by applying the average variability method to the 10 storms with depths approaching closest to the PMP depth at each standard area and standard duration; and secondly, the real storm patterns for these 10 storms from the appropriate zone, which can be used for additional analysis.

In assigning a design temporal distribution to a catchment PMP depth, the distribution for the standard area closest to the area of the catchment is used; there is no interpolation between areas.

5.6 GENERALIZED ESTIMATION OF 24-HOUR POINT PMP IN CHINA

5.6.1 Brief introduction

A catastrophic cloudburst occurred in the west of Henan Province, China, from 5 to 7 August 1975. The maximum 24-hour rainfall amount reached 1 060 mm in Linzhuang, the storm centre. The maximum 3-day rainfall amount was as high as 1 605 mm and the 24-hour 10 000 km^2 areal rainfall was greater than 400 mm. The catastrophic cloudburst led to serious flooding. To ensure the safety of flood control at reservoirs, Chinese water and power departments and meteorological departments worked together in order to compile a 24-hour point PMP isoline map of China in 1976 and 1977 (Ye and Hu, 1979).

For PMP estimation, three types of methods were

Table 5.27. Topographic enhancement factors

Value of x	*Value of X*
$x \leq 1.0$	$X = 1.0$
$1.0 < x \leq 1.5$	$X = x$
$1.5 < x \leq 2.5$	$X = 0.5x + 0.75$
$x > 2.5$	$X = 2.0$