Since the flood is very large under PMF conditions, special attention must be paid to the impact of dam-break and overtopping and rupturing of dykes along channels in the upper reaches during PMF conditions.

7.6.4 Methods for converting PMP into PMF

There are two types of methods for converting PMP into PMF.

The first type is the traditional unit hydrograph method. Sherman's unit hydrograph is used in most cases. Large watersheds are typically broken into a number of sub-watersheds, for which unit hydrographs are used to ascertain the outflow hydrographs. Then the Muskingum method is used to route the sub-watershed hydrographs to the outlet section. The base flow is also added to obtain the flood hydrograph or PMF.

The second type is the river-basin or hydrological process models. Such models are numerous, with the key differences relating to the number of factors considered for the runoff-production part. Minor differences also exist in the estimation of the flow concentration. Sherman's or Nash's unit hydrographs are commonly used to estimate discharge from the watershed, or sub-watershed, with the Muskingum method, or similar approaches, being used to route flows downstream. Given the extreme magnitude associated with PMP, it is often considered unnecessary to adopt complex models to describe the process for the estimation of the PMF.

7.6.5 Influence of antecedent conditions

Both Linsley and others (1975) and Zhan and Zhou (1983) assert that PMP is an unusually large event, and it is unnecessary that the most extreme initial conditions be adopted for the estimation of the PMF. Given the storms/floods that result in the PMP/PMF are very large, the influence of estimating antecedent rainfalls, base flow and moisture conditions will usually have little effect on PMF values.

Generally, the antecedent rainfall (P_a) for humid regions is set equal to the maximum watershed loss (I_m), or $P_a = I_m$. In other words, the initial losses are set as zero (Wang B.H., 1984, 1988). For arid and semi-arid regions, $P_a = \frac{2}{3} I_m$ as a safety measure (Wang G., 1999).

Base flow resulting from underground water reserves usually has a minor effect on PMF. Various approaches exist to estimate base flow contributions. For example, the base flow can be estimated as the minimum daily average discharge among the maximum monthly runoffs for the particular month of the year associated with the time of occurrence of the PMF (Wang B.H., 1988). It can also be determined using on the base flow for the observed typical flood hydrograph for that period of the year.

7.7 ESTIMATION OF PMP/PMF FOR LARGE WATERSHEDS

7.7.1 Introduction

Deriving PMP/PMF for large watersheds (above 50 000 km^2) poses specific difficulties. For large watersheds, especially those larger than 100 000 km^2, flood durations are typically as long as 5 to 10 days. Since existing storm data are not sufficient for such watersheds, neither the local model method nor the transposition model method works in most cases. As a result, the combination model method is usually used.

Major disadvantages of the combination model method are: when combined elements are excessive and combination durations are too long, it is not easy to demonstrate the rationality of the combined sequence; and when it comes to maximization, it is hard to determine which combined elements should be maximized.

Also, channels tend to be thousands of kilometres long, while the average watershed width is usually hundreds of kilometres. As a result – due to the large difference in geographical locations, plus the effects of mountains and other orographic features – climatic characteristics and causes of storm weather are different across the lower, middle and upper reaches, or between one part and another part of the watershed. It is difficult to reflect such differences when determining model storms and establishing appropriate model maximization.

In the 1970s and 1980s, some organizations in China provided two methods applicable to the above-mentioned situations. They are the major temporal and spatial combination method (MTSCM) and the storm simulation method based on an historical flood (SSMHF; Wang G., 1999).

7.7.2 Major temporal and spatial combination method

7.7.2.1 Introduction

The main idea of this method is to solve the part that has a great impact on PMF for the design region