regarded as independent. The probability of two independent events (each with a probability of 0.01) occurring simultaneously is 0.0001. Hence, the two factors are used to ensure the PMP represents very rare conditions.

7.3.4.2 Selection of maximum moisture adjustment factor

An annual series of dewpoints corresponding to the largest storm in the watershed for each year in the record can be identified. The 100-year value of the dew point is used in the estimation of the PMP.

7.3.4.3 Selection of maximum dynamic adjustment factor

7.3.4.3.1 *Methods for denoting the dynamic factor*

There are many methods for denoting the dynamic factor. For example, the precipitation efficiency η (hereinafter called the efficiency), is a useful representation. It can be defined as follows (Wang G., 1999):

$$\eta = \frac{K_F(V_{12}W_{12} - V_{34}W_{34})}{W_{12}} \tag{7.1}$$

where K_F is the watershed constant; V_{12}, V_{34}, W_{12} and W_{34} are the wind speed and the precipitable water of the inflow and the outflow respectively (as shown in Figure 7.4).

This can be approximated by:

$$\eta = \frac{P}{W_{12}t} = \frac{I}{W_{12}} \tag{7.2}$$

where P is the watershed's average precipitation depth with duration of t; I is the rainfall intensity.

Based on Equation 7.2, the efficiency is the precipitation-moisture ratio (P/W_{12}) with duration of t.

7.3.4.3.2 *Advantages of the efficiency factor*

(a) This representation of the dynamic factor is physically conceptualized clearly.
Equation 7.1 shows that the efficiency η is the ratio of the net moisture input to the design watershed per unit time ($V_{12}W_{12} - V_{34}W_{34}$) and the precipitable water for the inflow, W_{12}. In other words, the efficiency is the ability of the storm weather system to convert the precipitable water of the inflow W_{12} into rainfall.
Equation 7.2 shows that the efficiency η is the ratio of the rainfall I amount in the design watershed per unit time and the precipitable

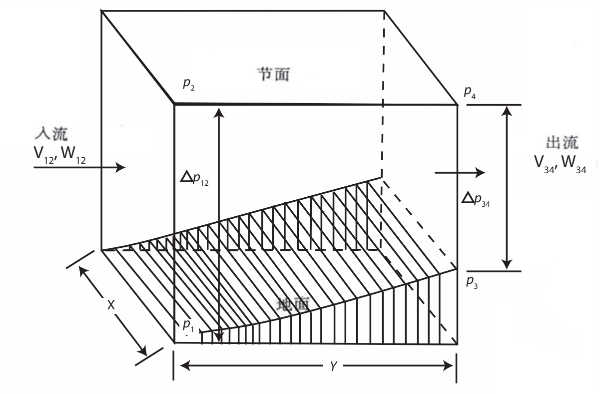

Figure 7.4. Watershed sketch

water for the inflow W_{12}. Essentially, it is also the ability of the storm weather system to convert the precipitable water of the inflow W_{12} into the rainfall I.

(b) The efficiency calculation is based on the average rainfall amount in the watershed, as it is the only indicator that is able to indirectly reflect air convergence and vertical motion in the entire design watershed.
Such an indicator is necessary as there are currently no methods of directly determining optimal air convergence or vertical motion.

(c) Since the efficiency calculation is based on rainfall data and dewpoints observed at the surface, it is relatively easy to calculate to a high degree of precision. There are a large number of ground observation stations, where measurements are easily taken and there are long series of relatively high-precision data. Upper air data are measured with much greater difficulty and expense at a small number of stations and thus exhibit generally shorter series and lower precision.

7.3.4.3.3 *Selection of probable maximum efficiency*

Based on storm and flood data observed in the design watershed, the efficiency of the storm resulting in the largest flood each year is determined. Then a frequency analysis is performed and the 100-year value is regarded as the probable maximum efficiency.

7.3.4.4 Model maximization

The moisture maximization P_m follows the formula:

$$P_m = \frac{\eta_m}{\eta} \cdot \frac{W_{12m}}{W_{12}} \cdot P \tag{7.3}$$