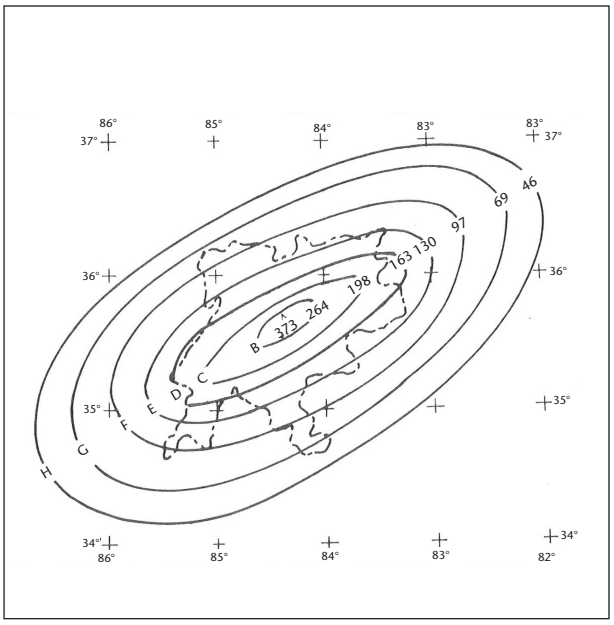

Figure 3.26. PMP storm pattern for maximum 6-hour increment for sub-basin (21 000 km^2; Schwarz, 1965); isohyet values are applicable to March

3.5 CAUTIONARY REMARKS ON ESTIMATING PMP IN OROGRAPHIC REGIONS

The cautionary remarks of section 2.13 apply also to orographic regions concerning adequacy of storm sample, comparison with record rainfalls, consistency of estimates, regional, areal, and durational smoothing, seasonal variation, and areal distribution. As stated in section 1.3.3, the examples given are not intended for direct application. In addition, the following cautionary remarks must be considered.

3.5.1 Basic data deficiencies

Precipitation networks in orographic regions are relatively sparse compared with those in non-orographic regions, which are generally more heavily populated. Furthermore, in mountainous areas, most gauges are located in settlements at relatively low elevations along rivers or in broad valleys. Very few are located on steep slopes or at high elevations. To these shortcomings may be added the usual deficiencies of gauge measurements, which are likely to be at a maximum in mountainous terrain. Consequently, precipitation data are not only relatively sparse and sometimes inaccurate, but are generally biased and therefore do not represent adequately the effects of orographic influences on precipitation distribution. This shortcoming affects the reliability of various relationships required for estimating PMP, such as precipitation–elevation and depth–area relations. The situation may be alleviated by referring to orographically adjusted seasonal precipitation maps or precipitation-frequency maps prepared considering topographic effects in determining distribution of precipitation (sections 3.1.3 and 3.1.4). Also, it is sometimes possible to use rainfall–runoff relations to obtain areal estimates of storm rainfall that may be more accurate than indicated by observed precipitation data alone.

3.5.2 Orographic separation method

The orographic separation method for estimating PMP (section 3.3) involves additional problems besides those just mentioned, since it requires enough upper-air data to obtain reliable extreme values. Model test requirements for upper-air soundings near the inflow side of the test area and for sufficient concurrent precipitation data for the test area further limit the applicability of the model.

Of the regions where the orographic model has been tested, best results were obtained for the continuous, high and favourably oriented (with respect to moisture inflow) Sierra Nevada in California. The model computes orographic precipitation under the assumption of laminar airflow. Orographic regions, where major storms occur in the cool seasons, are more likely to meet the required conditions.

This model is not well suited for regions or seasons with predominantly unstable atmospheric conditions. Studies for regions near the tropics indicate that the laminar flow model may be particularly unsuited for estimating PMP there as well. Indirect approaches, such as that used for the Tennessee River basin study (section 3.4.2), are more likely to yield reliable estimates of PMP for such regions.

Section 3.3.5 cautioned against over-maximizing and cited some precautions. To these may be added the use of conservative envelopment of the various factors involved in the procedure whenever this technique is required.