distribution for the non-orographic PMP over the drainage.

Since most orographic precipitation is likely to occur over ridges and slopes surrounding or within the drainage in orographic regions, the areal distribution procedure for total PMP in the Tennessee River drainage relocates the non-orographic pattern centre toward the maximum 2-year 24-hour amount within the basin. This is in agreement with storm experience in this region. When applying this warping method in other regions, one should carefully evaluate the criteria for storm relocation. The following steps describe the orographic warping of the non-orographic elliptical pattern.

(h) The non-orographic PMP storm pattern is displaced to the location of the maximum 2-year 24-hour precipitation amount within the basin in such a manner as to have the greatest proportion of central isohyets contained within the basin. The relocated pattern centre is kept at least 16 km inside the basin border. The orientation may be the same as, or different from, the non-orographic pattern. No further reduction for orientation is made for orientations differing from preferred storm orientations.

(i) The 6-hour incremental pattern in (h) is adjusted to maintain the same volume of PMP as obtained for the basin-centred pattern from the procedure for non-orographic precipitation discussed above (Hansen and others, 1982). The adjustment is done by multiplying the isohyet labels by the ratio of the displaced volume to the basin-centred volume.

(j) The displaced adjusted pattern from (i) is overlayed onto the 2-year 24-hour precipitation analysis from Figure 5.24. The 2-year 24-hour isohyets covering the basin are converted into a percentage of the 2-year 24-hour isohyet that passes through the centre of the displaced elliptical pattern.

(k) For a fine grid of points, or at intersections of the 2-year 24-hour isopercental analysis and the displaced elliptical isohyetal pattern, the product of the two analyses is computed.

(l) The resulting values obtained from (k) are analysed, considering both the 2-year 24-hour analysis and a topographic map as guidance. The resulting analysis should provide a pattern that is warped considerably from the elliptical pattern (the degree of warping changes with each 6-hour increment).

(m) The warped pattern in (l) is replanimetered to obtain a new volume and compare this with the volume in (i). If differences of more than a few per cent occur, the isohyet values are adjusted to correct the volume to that of (i).

Steps (h) to (m) are repeated for each 6-hour incremental pattern.

When displacing and warping isohyetal patterns, two procedural cautionary steps should be taken. First, isohyetal patterns over sub-basins within the total basin should be planimetered to ensure the results for the total basin PMP do not provide a larger volume over the sub-basin than a PMP computed specifically for the sub-basin. Second, the central isohyets should be reviewed against the small-area PMP (section 5.3.2) for the location of the isohyetal pattern to ensure that these isohyet values do not exceed the PMP for those smaller areas.

5.3.4 PMP estimates for the United States between the Continental Divide and the 103rd meridian

This is a topographically complex region that extends from the western edge of the Great Plains of eastern Montana, Wyoming, Colorado, and New Mexico through the slopes of the eastward-facing Rocky Mountains, to the crest that separates the Pacific Ocean and Gulf of Mexico drainages, the Continental Divide. The mountainous portion of this region contains narrow and broad valleys, some exposed directly to moisture-bearing winds and others almost completely sheltered. It is also a complex region meteorologically. The extreme rainfall amounts in this region result from a wide range of storm types: for example, the southern portion of the region is primarily influenced by decadent tropical storms, while farther north the extreme rainfall events result from extratropical cyclones. In all portions of the region, extreme convective events are an important factor in extreme rainfall events for short durations over small areas. The terrain within the study region had a marked effect upon the procedures used to develop the PMP estimates (Miller and others, 1984*b*). A procedure was developed that enabled PMP for this diverse terrain to be analysed in a consistent fashion. The procedure has some similarities to those which have been used in other studies for the western United States. First, the convergence precipitation in all major storms in the region are estimated. The convergence precipitation amounts are then moisture-maximized and transposed to all regions where similar storms have occurred. The moisture-maximized transposed