climatological summaries for a specific region of interest. Tracks of tropical and extratropical cyclones are generally available in published form, and these may be used to delineate the regions frequented by the various storm types.

2.5.2.3 Topographic controls

The third step is to delineate topographic limitations on transposability. Coastal storms are transposed along the coast with little restriction, but greater care must be used to determine the distance inland the storm should be transposed. This is determined by analysis of the meteorological factors causing the large rainfall amounts and the importance of proximity to the moisture source in this process. Transposition of inland storms is restricted to areas where major mountain barriers do not block the inflow of moisture from the sea unless such blocking prevailed at the original storm site. Adjustments for transposition behind moderate and small barriers are discussed in section 2.6.3. Some limitation is placed on latitudinal transposition in order not to involve excessive differences in air mass characteristics. In estimating PMP over a specific basin, it is only necessary to determine if a particular storm can be transposed to the problem basin, and delineation of the entire area of transposability is not required. It is required, however, in the preparation of generalized estimates discussed in Chapter 5.

2.5.2.4 Example of determining transposition limits

Heavy rainfall over western Kansas, United States, in July 1951, caused large floods over a major portion of the State. The rainfall from this storm was due to the occurrence of various meteorological factors that could just as easily have happened in other parts of mid-western United States (United States Weather Bureau, 1952). After a comprehensive analysis of the major causes of the precipitation in this storm, the weather maps were examined for all other major storms that have occurred between the Rocky Mountains and the Appalachians with characteristics similar to this storm. Specifically, the characteristics were:

(a) Absence of pronounced orographic effects;
(b) A general east-western orientation of the frontal system and rainfall pattern;
(c) No marked wave action or occlusion of a wave during and after the storm period;
(d) Storm duration of two days or longer;
(e) Storm precipitation of 180 mm or more at the centre;
(f) A polar high situated to the north of the storm centre during the rainfall; (g) Southward movement of the frontal system at the end of the rain period.

The location of the storms that met these criteria and the final transposition limits assigned for this storm are shown in Figure 2.6. Since a major portion of the rainfall during this July storm fell in nocturnal thunderstorms, the distribution of such storms and their frequencies were used as an additional guide. Study of the moisture inflow indicated that modifications would occur if the synoptic situation existed at elevations much higher than that at which the storm actually occurred.

To the west, transposition was limited to the 914-m contour, the slope is relatively gentle, and it is believed there would be little or no orographic effect on the storm mechanism below this elevation. This limit was set even though two storms synoptically similar were observed further west at higher elevations. However, examination of the isohyetal patterns for the northernmost of these two storms shows that topography was an important contributor to the rainfall. In the case of the more southerly storm, much of the rainfall fell in the outlined transposition limits. However, the main centre to the west was on a slope of the Rockies where orography played an important part. The 914-m contour also coincided closely with the western boundary of the area showing a high frequency of nocturnal thunderstorms.

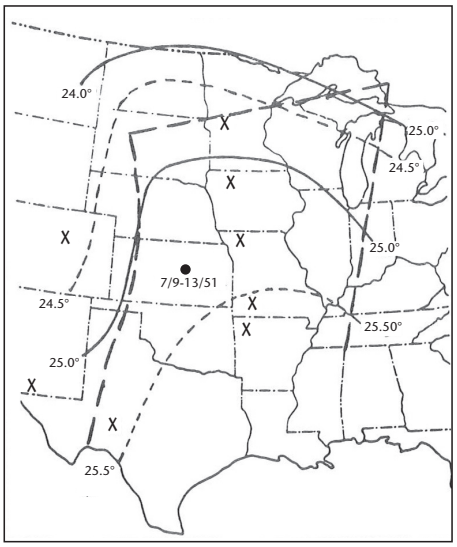

Figure 2.6 Transposition limits (heavy dashed line) of 9–13 July 1951 storm. Locations of synoptically similar summer storms marked by X. Light lines indicate maximum persisting 12-hour 1 000-hPa dewpoints (°C) for July.