tracks, moisture barriers, etc. – need to be considered. Some plotted values may be undercut while others may be over-enveloped. This is done when data appear inconsistent with nearby values, and to draw for them would result in unwarranted bulges or dips in otherwise smooth isohyets. If there are geographic factors, such as an extended range of rough hills in a plains region, to support suspected inconsistent data, isohyets should, of course, be drawn to the data. If data at individual grid points have been smoothed properly (sections 5.2.3.1.1 and 5.2.3.1.2), little over-envelopment or undercutting is required.

5.2.3.2 Data smoothing (envelopment) for the storm limit transposition technique

In using the procedure in which moisture maximized transposed values are computed for the explicit storm transposition limits, regional smoothing for a particular area size and duration is completed first. At selected locations, depth–area and depth–duration curves are prepared and durational smoothing is accomplished second, followed by areal smoothing.

5.2.3.2.1 *Regional smoothing*

Isohyets of PMP are drawn to the storm rainfall values plotted along the explicit storm transposition limits on the map for a particular area size and duration. In drawing smooth isohyets, meteorological factors – such as moisture source, storm tracks and moisture barriers – need to be considered. Some plotted values may be undercut, though these should be few. Some values may be enveloped. This is done when data appears inconsistent with nearby values, and to draw for them would result in unwarranted bulges or dips in otherwise smooth isohyets. If there are geographic factors, such as an extended range of rough hills in a plains region, to support apparently inconsistent values, isohyets should, of course, be drawn to the data. The isohyets should be drawn with a minimum of over-envelopment, and with smooth regular gradients. Sharp gradients should be supported by the meteorological factors or topographic gradients.

5.2.3.2.2 *Depth–duration smoothing*

At selected locations on the series of maps prepared, the precipitation values are read from the smooth isohyets drawn for durations for a specific area size. A representative number of locations should be selected. These need not be so plentiful as the number of points selected in the grid point method, but should be representative geographically. These values are plotted on the graph with the duration on the horizontal axis and the rainfall amounts on the vertical axis. The values should be identified with a controlling storm wherever possible. A smooth curve is drawn to these data (Figure 2.10). If the data on the individual maps have been smoothed properly, little over-envelopment or undercutting of values from the maps is required.

5.2.3.2.3 *Depth–area smoothing*

Smoothing and envelopment across area sizes is similar to depth–duration smoothing. In this case, however, all precipitation depths for a particular duration from the series of maps for a particular area size are selected. The values should be from the same locations as used for the depth–duration smoothing. The values for the various area sizes are plotted on a semi-logarithmic graph, the size of area being plotted on the log scale. The plot is similar to that used for the grid point screening technique, except that enveloping values from the series of maps are plotted. If a particular storm provides a controlling value for a particular area size, this point is labelled on the graph. Again if the data on the individual maps have been smoothed properly, little over-envelopment or undercutting of the values is required.

5.2.3.2.4 *Combined depth–area–duration smoothing*

Depth–area and depth–duration smoothing are sometimes performed in one operation in this method as with the grid point procedure. This is normally done by plotting the data for the different area sizes and duration on one graph. Each point is labelled with the appropriate duration, and if a particular storm is controlling, that notation is made. A smooth set of curves is then drawn. Since the initial regional smoothing eliminates all but the most important storms, the depth–duration and depth–area smoothing are normally done simultaneously.

5.2.3.3 Preparation of final map

The depth–duration, depth–area and regional smoothing using transposition to grid points or explicit storm transposition limits can rarely be accomplished with a single step. Rather the process should be viewed as an iterative procedure where the steps are repeated until the best relation is developed for all relations. Generally, other physiographic factors are used in the regional smoothing to aid in establishing isohyetal gradients and patterns on the PMP charts (section 5.2.4).