larger basins. Direct use of the PMP values for all area sizes of a storm pattern within a basin may be unrealistic for the most critical design storm for two main reasons. First, the storm producing maximum rainfall over small areas within a project basin is usually of a different type from that producing maximum rainfall over the same basin as a whole. Similarly, in some climatic regions, different types of storms may provide maximum values for different durations over the isohyetal pattern for the same area size. Second, the shape and orientation of the isohyetal patterns may be different for small area storms than those permissible for the controlling isohyetal patterns for larger area storms.

2.11.2 Observed storm pattern

For the above reasons, the hydrometeorologist makes recommendations regarding the storm isohyetal patterns that can be applied to a basin. One or more transposed storms may provide a suitable pattern or patterns, especially when both basin and storm site are topographically similar. A limitation may be placed on the rotation or displacement of the isohyetal pattern. If, as often happens, the transposed or basin storms selected provide points on the PMP DAD curves, no further adjustment may be required. If not, they may be maximized using the sliding technique.

Storms not providing controlling points on PMP DAD curves may be maximized by separately plotting the storm and PMP DAD curves on the same logarithmic scale. The storm curve is then superimposed onto the PMP DAD curve and is slid to the right until the first apparent contact between curves for the same duration occurs, as shown in Figure 2.14. The ratio of any PMP scale value to the superimposed storm scale value is the maximizing factor. Obviously, this factor adjusts the observed storm for greater rain-producing efficiency, as well as for maximum moisture. In Figure 2.14, the first point of contact occurs for 72-hour curves between about 2 000 and 4 500 km^2, for a 5 000 km^2 basin, but different time and spatial distributions might show a point of first contact for another duration and/or area size.

The coincidence between the storm and PMP DAD curves should be at an area size that approximates that of the basin. Current practice, however, favours bringing average depths for all durations of the storm to PMP levels, as described in section 2.11.3, for an idealized pattern. In applying the procedure to actual storms, care must be taken to ensure that rainfall depths for areas smaller than the basin do not exceed PMP. If they do, the storm deptharea relations must be altered so that depths nowhere exceed PMP.

2.11.3 Idealized storm pattern

An alternative method for fixing the areal distribution of PMP over a basin is based on the assumption that the PMP values for all durations at the total area of the basin could occur in a single storm. This may introduce an additional degree of maximization, because controlling values for all durations at a particular size of area may be from several storms. In order to counter this possibility, the precipitation values for the smaller areas within the basin are maintained at less than PMP, usually being patterned after the deptharea relations of major storms that have occurred over or near the project basin. For example, the dashed within-storm curves of Figure 2.15 (only two shown) set the concentration of rain within a 3 000 km^2 basin for the 6- and 24-hour durations. These curves are generally drawn for all durations by 6-hour intervals. For further discussion of the development of idealized isohyetal patterns see sections 5.2.7.2 and 5.2.7.4.

2.11.3.1 Areal distribution

The areal distribution of a basin's PMP involves the shape and orientation of its isohyetal pattern, and this may be based on observed storms. For basins up to about 1 500 km^2 in flat terrain, an elliptically-shaped pattern with almost any orientation is adaptable and the pattern is usually centred over the basin. For larger basins (up to and even above the limiting size considered in this report), in the middle latitudes of the northern hemisphere, the orientation of the pattern tends to be controlled in a general way by the flow in the middle to upper troposphere. Studies should be performed to determine preferred isohyetal orientation for an individual basin (section 5.2.7.3). The pattern may or may not be centred over the basin, depending on what the history of major basin storms in the region indicates.

2.11.3.2 Example

The critical storm pattern is usually constructed on the assumption that the largest volume of rain over the basin will produce the most critical design flood. This principle also applies to the division of a larger basin into sub-basins for flood computations. In some cases, other centrings may be important. For example, a storm pattern centred over a portion