The adjustment of storm rainfall by the ratio between the moisture observed in the storm and the maximum that has been observed in the region assumes that storms do occur with varying moisture conditions. In some tropical regions, there may be little variation in the available moisture supply when this is evaluated using surface dewpoints. However, Brunt (1967) has found that cyclone rainfall is significantly correlated with dewpoint.

6.1.3.1 Sea-surface temperatures

Some studies have suggested that anomalous sea-surface temperatures play an important role in moisture variations and subsequent heavy rainfall events (Namias, 1969). Schwarz (1972) suggests the variation in sea-surface temperature needs to be considered when estimating PMP over broad regions where tropical storms are important. Pyke (1975) concluded in a study of heavy rainfall amounts over the south-western United States that sea-surface temperature anomalies were important in determining the magnitude of the rain event. Sea-surface temperature condition may be a more appropriate measure for moisture maximization of storms in tropical regions than observed surface dewpoints.

Statistical analysis of precipitable water amounts and dewpoint observations in temperate climates have shown the maximum observed values used for moisture maximization approximate the 1 per cent chance event (United States Weather Bureau, 1961*a*). For sea-surface temperatures, an anomalous value or some statistical measure might be more appropriate than mean values. One possibility would be the use of the standard deviation of the series of sea-surface temperatures – for example, one or two standard deviations above the mean. One study (Rakhecha and Kennedy, 1985) used a value of 3°C above the long-term mean sea-surface temperatures.

Whatever technique is used for moisture adjustment, extreme adjustments should be avoided. In most studies in the United States, adjustments in excess of 170 per cent have not been used. The average moisture adjustment for the major storms in the non-orographic eastern two-thirds of the United States is approximately 134 per cent with a range from 105 to slightly greater than 150 per cent. Significantly lower ratios might suggest either that there is little variability in storm potential or that simple moisture adjustment is inadequate and other maximizations steps might be required.

6.1.4 Wind maximization

The wind maximization technique is the same as that used in temperate regions. It was discussed in detail in section 2.4 and is not repeated here. Modification of the procedure would be required only if studies done to determine maximum inflow layers indicate a particular layer is most important for moisture inflow to the storm. If this were ascertained, then the wind maximization procedure should be restricted to that layer. Before a wind maximization process is applied to rainfall amounts, studies should be undertaken to validate the relation between increased wind speed and increased rain.

6.1.5 Storm transposition

The storm transposition procedures used in temperate latitudes are applicable to tropical regions. In temperate latitudes, where many storms occur over a region, it is usually possible to consider a meteorologically homogeneous region that is contiguous to the problem basin. In general, an adequate storm sample is available if the region encompasses several hundred thousand square kilometres and the period of record is at least 40 years. In most instances, contiguous homogeneous regions of this size do not occur in tropical climates. While storms from a nearby geographic region are preferable, knowledge of storm dynamics is becoming sufficiently advanced to permit a broadening of transposition limits to contain non-contiguous units large enough to contain an adequate storm sample. Schwarz (1972) suggested that data from many continents could be combined to develop reliable estimates of PMP. Figure 6.3 shows the extensive nature of the region Schwarz proposed based upon the occurrence of tropical cyclones.

The thunderstorm-infested fixed convergence area (TIFCA) is another storm type that has been found to occur over a large section of the tropics. It has been used in the development of PMP estimates in the Hawaiian Islands (Schwarz, 1963) and in South-East Asia (Kennedy, 1976). The assessment that these or other storm types would be important in a particular region would be determined in the comprehensive meteorological analysis of the major storms (section 6.1.1).

Transposition adjustments in temperate climates are based only on moisture variation between the storm location and the basin or region to which the storm is being transposed. This is appropriate in contiguous regions in temperate climates where there are significant moisture gradients. The