2.2.5 Maximum persisting 12-hour 1 000-hPa dewpoints

Maximum values of atmospheric water vapour used for storm maximization are usually estimated from maximum persisting 12-hour 1 000-hPa dewpoints. These dewpoints are generally obtained from surveys of long records – 50 or more years – at several stations in the problem area. In some regions, the maximum dewpoints for each month of the year or critical season may be adequate to define the seasonal variation of maximum atmospheric moisture, but it is generally advisable to select maximum persisting 12-hour dewpoints using semi-monthly or 10-day intervals.

Dewpoint records appreciably shorter than approximately 50 years are unlikely to yield maximum values representative of maximum atmospheric moisture. The usual practice in such cases is to perform a frequency analysis on an annual series of monthly or shorter interval maximum persisting 12-hour dewpoints.

Since values for the 100-year return period have been found to approximate maximum dewpoints obtained from surveys of long records, it is the 100-year values that are generally used for defining the seasonal variation curve, although 50-year values have been used sometimes.

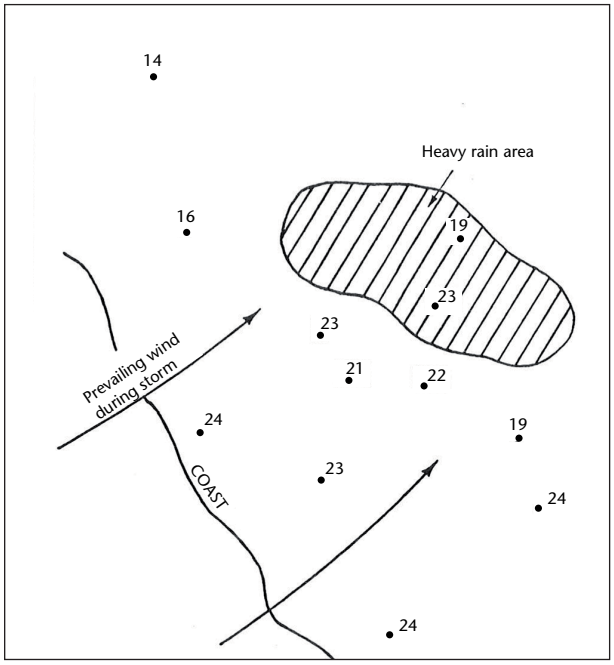

Figure 2.2. Determination of maximum dewpoint in a storm. Representative dewpoint for this weather map is the average of values in boxes.

Certain precautions are advisable when selecting maximum dewpoints intended as indices of maximum moisture for storm maximization. These precautions apply regardless of whether the maximum dewpoints are used directly as surveyed, or subjected to frequency analysis. In places and seasons characterized by ample sunshine, sluggish air circulation, numerous lakes, rivers and swamps, a locally high dewpoint may be a result of local evaporation of moisture from the surface and may not be at all representative of atmospheric moisture at upper levels. Such dewpoints should be discarded. To eliminate dewpoints so affected, the surface weather charts for the dates of highest dewpoints should be examined and the dewpoints discarded if they appear to have occurred when the observing station was clearly in an anticyclonic or fair weather situation rather than in a cyclonic circulation with tendencies towards precipitation.

Another precaution is to avoid dewpoints that are too extreme. With very long record lengths, values of dewpoints may occur that are higher than optimum for the processes that produce extreme precipitation amounts. If dewpoints are found that substantially exceed 100-year values, the weather situation accompanying them should be carefully evaluated to ascertain that they are capable of causing extreme precipitation amounts.

All values of maximum persisting 12-hour dewpoints selected directly from surveys of long records are plotted against the date observed, and a smooth envelope drawn, as illustrated in Figure 2.3. When dewpoints from short records are subjected to frequency analysis, the resulting values are usually plotted against the middle day of the interval for which the series is compiled. For example, if the frequency analysis is for the series of semi-monthly maximum persisting 12-hour dewpoints observed in the first half of the month, the resulting 50- or 100-year values would be plotted against the eighth day of the month.

It is advisable to prepare monthly maps of maximum persisting 12-hour 1 000-hPa dewpoints, especially where numerous estimates of PMP are required. Such maps not only provide a ready, convenient source of maximum dewpoints, but also help in maintaining consistency between estimates for various basins. The maps are based on mid-month dewpoint values read from the seasonal variation curves and adjusted to the 1 000-hPa level. These values are plotted at the locations of the observing stations, and smooth isopleths are then drawn, as in Figure 2.4.