2.2.6 Precipitable water

This is a term used, mostly by hydrometeorologists, to express the total mass of water vapour in a vertical column of the atmosphere. A statement that the air contains 3 cm of precipitable water signifies that each vertical column of 1 cm^2 cross-section from the surface to the "top" of the atmosphere contains 3 g of water in vapour form. If all the water vapour were to be condensed into liquid water and deposited at the base of the column, the accumulated liquid would be 3 cm deep, since the density of water is 1 g/cm^3. Precipitable water is, in fact, a misnomer, because no natural process will precipitate all the water vapour in the atmosphere. For this reason, the substitute term liquid equivalent of water vapour, or simply liquid water equivalent, is sometimes used.

Tables of precipitable water for saturated air with pseudo-adiabatic lapse rate as a function of the 1 000-hPa dewpoint are presented in Annex 1. These tables are used for moisture adjustments.

2.2.7 Determination of duration of maximum persisting dewpoint

For general storms at mid-latitudes, durations are more than 6 hours and periods of stable moisture inflows are long, so 12-hour time intervals are adopted for the selection of representative dewpoints of storms and historical maximum dewpoints. For local storms, storm durations are less than 6 hours, and storm moisture conditions and large-scale moisture inflow relations are not distinct, so 3-hour time intervals are adopted for selection (for example, in the north-west of the United States). In some tropical regions, storm durations are longer, the moisture supply is abundant and inflows are stable, so 24-hour time intervals may be adopted for selection (for example, India).

2.3 MOISTURE MAXIMIZATION

2.3.1 Seasonal limitations

Seasonal variations in storm structure place limitations on moisture maximization. For example, a winter storm would never be adjusted for the moisture content indicated by the maximum persisting 12-hour dewpoint for the year if that moisture maximum occurs in summer, which is almost always true. In practice, the moisture adjustments are made on the basis of the maximum persisting 12-hour dewpoint for the same time of year as the storm occurrence or, more often, the maximum persisting 12-hour dewpoint within 15 days of the seasonal maximum. For example, if the maximum dewpoint for maximizing a 15 May storm was being selected from the curve of Figure 2.3, one would use the higher dewpoint indicated for 30 May. Similarly, the maximum dewpoint indicated for 15 September would generally be used for maximizing a 30 September storm.

2.3.2 Depth of precipitable water

Tables A.1.1 and A.1.2 presented in Annex 1 show depth of precipitable water between the 1 000-hPa surface and various altitudes or pressure levels as a function of the 1 000-hPa dewpoint. In maximizing storm rainfall, only the depth of precipitable water from the ground to some arbitrarily selected level between 400 hPa and 200 hPa is used. The 300-hPa level is generally accepted as the top of the storm. From the 400-hPa level upwards, the selected level make little difference as there is very little moisture and the effect on the moisture adjustment is negligible. For convenience, Table A.1.3 gives the amount of precipitable water in the column between a specified height and 300 hPa for use in storm maximization. In cases where a mountain barrier lies between the storm area and the moisture source, the mean elevation of the ridge or crest is selected as the base of the moisture column. In most cases, it is advisable to select the storm and maximum dewpoints between the barrier and the storm location.

2.3.3 Applicability of persisting 12-hour dewpoints for all storm durations

The dewpoints from a set of stations used to obtain a representative persisting 12-hour storm dewpoint are unlikely to be in the most intense moisture inflow for more than 12–24 hours. After this time the stations where the dewpoints were observed are very likely to be in the cold air because of the displacement of the storm. The selection of different representative 12-hour dewpoints for every 12 hours of a storm is a very tedious task, especially for storm durations of 72 hours and longer. Storm rainfall values adjusted on the basis of 12-hour dewpoints from different sets of stations compared with values from a single set indicate that differences are too small to justify the additional time required in obtaining representative 12-hour dewpoints for different storm intervals.

It should be noted also that the use of different representative dewpoints for a storm requires different maximum dewpoints for the maximizing procedures described below. The use of