thunderstorm rains. Storm moistures mostly come from the west and the south-west. Regions featuring large-scale ascendant movements provide some conditions for thunderstorm rains, but strong ascendant movements also need support from convection activities. Convective storms, however, mainly depend on stable thermodynamic conditions, which play a critical role in the resulting convection intensity. Direct surface heating in the Pacific North-west region leads to strong convection instability, which causes local extraordinary thunderstorm rains. The main season (June–August) of thunderstorm rains in the region with a high frequency during the day (afternoon) support this view. Low-altitude convergence caused by storm gusts plays a critical role in the recurrence process of multi-grid storm bursts. The content of this section is taken from HMR No. 57 (Hansen and others, 1994). Steps applied in the Columbia River basin, the Snake River basin and the Pacific Coast watershed may be a guide for other regions.

#### 5.3.7.2 Moisture maximization

After studies of each characteristic of local storms in the Pacific North-west region and meteorological conditions influencing it, it is believed that the humidity required by local storms is not as pervasive and long-lasting as that required by non-local storms. Continuous moisture supplement is scarce, so the duration of representative dewpoints of storms should be consistent with cases in which storm time intervals are short. For storm moisture maximization and adjustment, methods similar to those for non-local storms are used, that is, moisture maximization and adjustment are performed with maximum durative surface dewpoints during a time interval as a scale of the moisture content of local storms. Nonetheless, different practices exist. First, the main rainfall time interval of local storms is 3–4 hours, so the maximum durative 3-hour dewpoints during the storm period are regarded as indicators of moisture maximization and adjustment. Second, the direction of moisture inflows is not certain during the local storm period, so the selection of locations of representative dewpoints is not restricted by inflow directions. Third, to better reflect characteristics of moistures of local storms, the selection of dewpoints should be at stations within 80 km of the storm site.

**Table 5.4. Values of *T/C* at the centroid of the drainage above Dewey Dam, Johns Creek, Kentucky**

| | *Duration (hours)* | | | | | |
|---|---|---|---|---|---|---|
| | *1* | *6* | *12* | *24* | *48* | *72* |
| *T/C* | 1.04 | 1.11 | 1.12 | 1.13 | 1.14 | 1.15 |

**Table 5.5. Estimated duration of intense precipitation *t* for selected total length of precipitation period (Fenn, 1985)**

| | *Duration (hours)* | | | | | |
|---|---|---|---|---|---|---|
| | *1* | *6* | *12* | *24* | *48* | *72* |
| *r (hours)* | 0.75 | 3 | 4.5 | 6 | 8.5 | 10.5 |

**Table 5.6. Storm intensity factor *M* for selected durations (Fenn, 1985)**

| | *Duration (hours)* | | | | | |
|---|---|---|---|---|---|---|
| | *1* | *6* | *12* | *24* | *48* | *72* |
| *M* | 0.881 | 0.788 | 0.776 | 0.774 | 0.773 | 0.772 |

**Table 5.7. PMP of the drainage above Dewey Dam, Johns Creek, Kentucky**

| | *Duration (hours)* | | | | | |
|---|---|---|---|---|---|---|
| | *1* | *6* | *12* | *24* | *48* | *72* |
| *PMP (mm)* | 190 | 492 | 591 | 607 | 760 | 779 |
| *Percentage of total estimation value* | 85 | 95 | 96 | 97 | 98 | 98 |

The largest local storms in the Pacific North-west region of the United States occur from April to October, especially June–August, during which time the amount of precipitation is also the greatest. Three-hour duration maximum dewpoints are highest in the south and the south-east in June–August, when they reach 24°C or 25°C. They are lowest in the north-west, but may still reach 16°C to 18°C.

#### 5.3.7.3 Elevation adjustment and horizontal transposition adjustment

The methods used for local storm elevation adjustment and horizontal transposition adjustment are identical to those for non-local storm adjustment.

#### 5.3.7.4 PMP precipitation depth–duration relation

During local extraordinary storms in the Pacific North-west region of the United States, continuous moisture supply is scarce due to regional geographical features. As a result, those local storms usually cause the largest storms in the first hour with their total precipitation durations seldom exceeding