

6.2.1.1 Non-orographic PMP

A basic non-orographic station, or point, 24-hour PMP of 1 000 mm shown in Figure 5.1, was based on the following considerations:

- The value agreed with worldwide extreme observed non-orographic rainfalls in tropical and subtropical regions influenced by tropical cyclones, with due consideration for Hawaii's location and limitation on moisture availability;
- It enveloped maximum observed rainfall amounts in Hawaii by a reasonable margin;
- It approximated the value obtained from multiplying the enveloping P/M ratio (ratio of storm precipitation to maximum moisture) and appropriate cool-season moisture.

Additional support was provided by an earlier estimate of PMP for Puerto Rico (United States Weather Bureau, 1961*b*), which is located at about the same latitude as Hawaii.

6.2.1.2 Slope intensification of rainfall

An empirical relation showing rainfall intensification with slope was developed from observed rainfall data in somewhat comparable terrain. These data indicated a decrease in the elevation of maximum rainfall amounts as rainfall intensity increased and an increase of rainfall with ground slope. Precipitation data from various parts of the world were used to determine the general variation in rainfall intensification with ground slope shown in Figure 6.4.

Greatest intensification is shown for intermediate values of slope (about 0.10–0.20). There is almost no intensification for slopes greater than about 0.25. Such steep slopes in this region are generally found at the higher elevations, where winds tend to circumvent the peaks so that there is little large-scale lifting of air over the peaks.

The dashed lines in Figure 6.4 apply to a column of saturated air with a 1 000-hPa temperature of 23°C, and show the depletion of moisture with increasing ground elevation. Thus, for any point on the intensification curve, or any given slope, the elevation at which moisture depletion negates rainfall intensification can be determined readily. For example, the critical elevation for a slope of 0.17 is about 1 000 m. Above 1 500 m, moisture depletion outweighs slope intensification for all slopes. This is shown in Figure 6.5, which combines the effects of slope intensification and moisture depletion to provide a slope and elevation adjustment to the basic 24-hour point PMP of 1 000 mm.

6.2.1.3 Generalized PMP estimates

Generalized estimates of 24-hour point (2.6 km^2) PMP are presented in Figure 5.1. Climatological data showing spillover and other orographic effects were used to modify the results indicated by the relation in Figure 6.5. Ratios of PMP to 100-year rainfall were examined and adjustments made to avoid unrealistically high or low ratios.

DAD relations (Figure 6.6) for extending the basic PMP values to durations of 30 minutes–24 hours

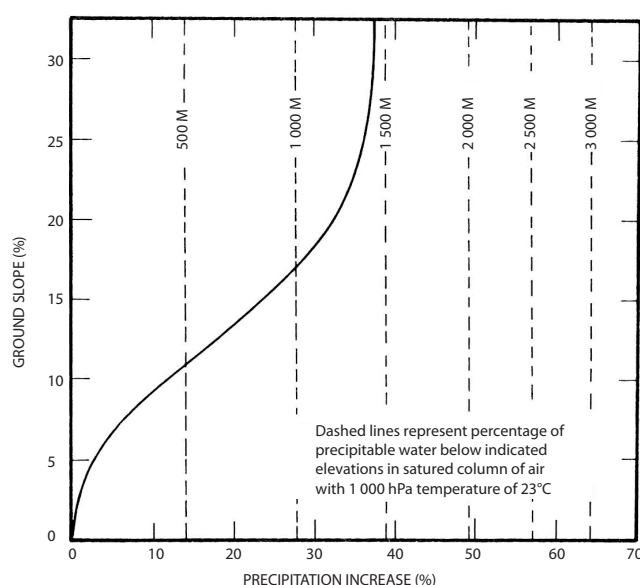


Figure 6.4. Rain intensification for ground slopes (Schwarz, 1963)