In the study (Riedel and others, 1969) from which the example of section 2.7.3 was taken, the two rainfall bursts were not only maximized spatially by superimposing centres and rotating one of the isohyetal patterns, but also the time interval between them was shortened.

The actual times of the bursts depicted in Figure 2.8 were from 1 p.m. to 7 p.m., 16 June, and from 2 p.m. to 8 p.m., 17 June. Examination of a large number of similar storms occurring in relatively close succession indicated that the interval between the two bursts could be reduced to 12 hours. This shortening of the time interval resulted in assigning an overall duration of 24 hours to the total rainfall for the two bursts, 7 hours less than the observed total storm period of 31 hours.

Examples of the use of sequential and spatial maximization in deriving hypothetical maximum flood-producing storm sequences for large basins may be found in Lott and Myers (1956), Myers (1959) and Schwarz (1961).

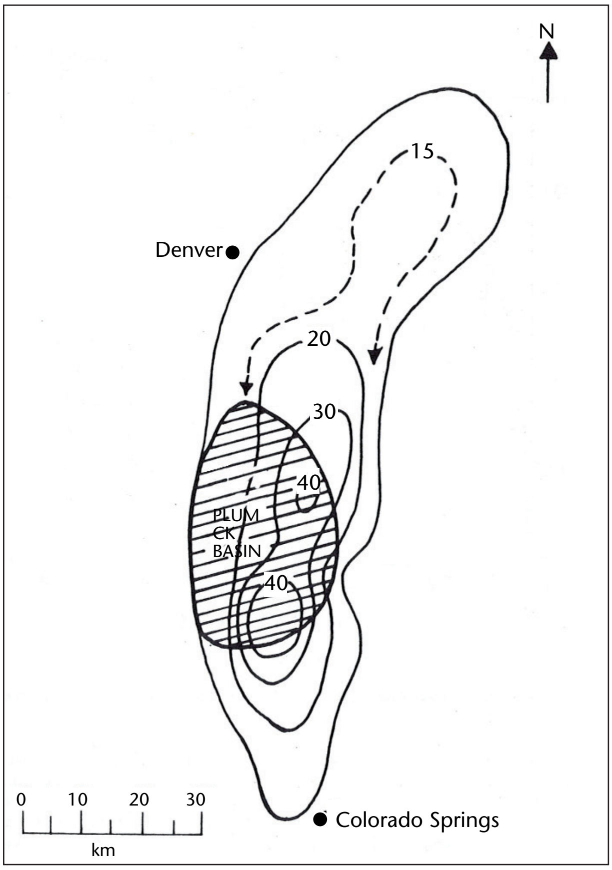

Figure 2.9. Isohyets (cm) resulting from the combination of patterns of the 6-hour storms of 16–17 June 1965 shown in Figure 2.8 (Riedel and others, 1969)

2.8 ENVELOPMENT

2.8.1 Introduction

The maximization of a single storm and its transposition to a basin presumes that a certain precipitation volume could fall over that basin. Nothing about the relation of this precipitation volume to PMP is revealed, and it could be far less than PMP magnitude. To consider only fewer than a half-dozen or so storms or storm sequences, no matter how sophisticated the maximization and transposition adjustments might be, gives no assurance that the PMP level has been obtained.

The question of adequacy of storm sample for estimating PMP is a difficult one to answer, especially with limited data. It seems logical, however, to expect that an envelope of many rainfall values that have been maximized and transposed to a basin is very likely to yield values indicative of PMP magnitude. This is especially true since no storm is likely to yield extreme rainfall values for all durations and area sizes. It is for these reasons that envelopment is considered a necessary final step in estimating PMP. Any PMP estimates that do not include envelopment, and areal, durational and regional smoothing, might provide inadequate values.

2.8.2 Envelopment

Envelopment is a process for selecting the largest value from any set of data. In estimating PMP the maximized and transposed rainfall data are plotted on a graph, and a smooth curve is drawn through the largest values. Figure 2.10 shows a durational envelope of transposed, maximized precipitation values for durations up to 72 hours over a 2 000-km^2 area. The variables are changed in Figure 2.11, which is an areal envelope of transposed, maximized 24-hour rainfall values for areas ranging up to 100 000 km^2. In developing a full array of PMP DAD data for a basin, it is necessary to envelope both ways, as shown in Figures 2.10 and 2.11. Values read from the enveloping curves (Figures 2.10 and 2.11) are then used to construct a set of DAD curves, as shown in Figure 2.12.

It should be noted that the controlling points determining each curve are usually from different storms. In Figure 2.12, for example, with the exception of the 6- and 12-hour curves, the points controlling the curves at about 2 500 km^2 are typically from different storms than those at 50 000 km^2. Similarly, the points controlling the short-duration curves are usually from different storms than those controlling the long-duration curves.