States Weather Bureau, 1966; United States National Weather Service, 1977, 1984) and in Wang B.H. (1986).

Two basic concepts are introduced: the primary concept is that storm is divided into two parts, that is a part due to convergence and a part due to topographic influences, while the secondary concept is that rainfall frequency analyses can be used as a measure of the topographic influences operating in an area.

Rainfall intensity frequency analyses have been constructed for the Australian region as part of *Australian Rainfall and Runoff* (Institution of Engineers, 1987) and the Australian Bureau of Meteorology holds a gridded version of the maps in a package called computerized design IFD (intensity–frequency–duration) rainfall system (CDIRS). An example of these data is given in Figure 5.72.

Variation in rainfall intensity over the area of this figure is largely an indication of the average variation in the topographic influences on rainfall production, in relatively rare (the average recurrence interval (ARI) is 50-years), medium duration (72 hours) rainfall events. The rainfall intensities over areas that are not affected by topography can be considered as deriving from convergence precipitation alone. The values over areas that are affected by topography derive from both convergence and topographic precipitation. The ratio of values from topographic to non-topographic areas in the same general region is a measure of the average enhancement of rainfall due to topography.

To estimate the topographic enhancement factor of a storm the following approximate equality has been used:

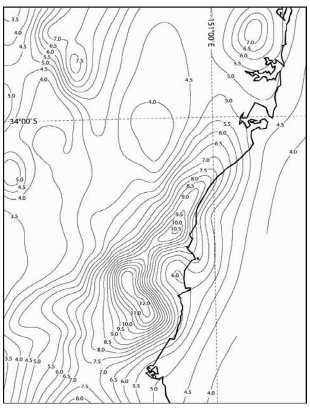

**Figure 5.72. Seventy-two-hour 50-year rainfall intensities over central NSW coast. Isopleths in mm/hour.**

$$\frac{\text{Total rainfall intensity}}{\text{Convergence rainfall intensity}} \approx \frac{\text{Total storm depth}}{\text{Convergence storm depth}}$$

In practice, the ≈ was replaced by =, but the approximate nature of the relationship was kept in mind. Thus, the convergence and topographic components of a storm were defined as:

$$\text{Convergence storm depth} = \text{Total storm depth} \,\#\, \frac{\text{Convergence rainfall intensity}}{\text{Total rainfall intensity}}$$

$$\text{Topographic storm depth} = \text{Total storm depth} - \text{Convergence storm depth}$$

In the course of the development of the methods, a number of approaches to evaluating the convergence component were tried. Ultimately, it was decided to construct a map of the convergence component of the 72-hour 50-year rainfall intensities over the whole continent. This was done by pinpointing those locations where values were considered to be unaffected by topographic influences and manually interpolating between these points. For inland Australia this was a relatively simple task but over the mountainous areas far more judgement was required. A section of the resulting field is shown in Figure 5.73.

The isopleths of this field were then digitized and gridded using the technique established for the gridding of the storm isohyets. The ratio of the total rainfall intensity field to its convergence component could then be calculated on a grid point by grid point basis. Likewise, the convergence component of each storm could be calculated by dividing the total storm rainfall depth at each storm grid point by the coincident rainfall intensity ratio. Depth-area curves can now be drawn for both the total storm and convergence component of each storm.

The decision to use the 72-hour 50-year rainfall intensity field to estimate the topographic enhancement factor for all storms was based on the following considerations:

(a) The 72-hour 50-year field is the most accurate of the six basic rainfall frequency analyses developed for *Australian Rainfall and Runoff;*
(b) A duration of 72 hours is about the middle of the duration range required for the GSAM;
(c) An ARI of 50 years is about the mean of the range of ARIs for storms of the GSAM storm database.

#### 5.5.3.4 Moisture maximization and standardization

Moisture maximization is "the process of adjusting observed precipitation amounts upward based