TABLE 1.10. Ambient 24-Hour Average Pollutant Concentrations.

	Sulfur Dioxide, $\mu g\ m^{-3}$				Ozone, ppm			
Date	Raling	Milwaukee	Waukesha	Chicago	Raling	Milwaukee	Waukesha	Chicago
8/14/76	52	47	—	62	—	—	—	—
8/19/76	—	—	—	—	0.094	0.077	0.052	0.027
8/20/76	60	36	—	52	0.087	0.060	0.051	0.029
8/21/76	57	42	—	83	0.105	0.061	0.050	0.038
8/22/76	42	26	—	44	0.067	0.060	0.023	0.036
8/23/76	34	18	—	29	0.029	0.019	0.022	0.010

GRAPHICAL INTERPRETATION OF NUMERICAL MODEL RESULTS

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Computer software has been developed to produce high quality graphical displays of data from a numerical grid model. The code uses an existing graphical display package (DISSPLA) and overcomes some of the problems of both line-printer output and traditional graphics. The software has been designed to be flexible enough to handle arbitrarily placed computation grids and a variety of display requirements.

Interpretation of gridded data generated by computer (numerical) models is often hampered by the inherent inability of the computer line-printer to display simultaneously several aspects of the situation being modeled. Traditional graphical methods are able to display several of these aspects simultaneously, but are often impeded by the necessary communication link between modeler and graphical artist. Both of these problems, however, are beginning to find their solutions in the recent expansion of computer graphics. Reliable, efficient software packages are now available to produce high quality graphical representations of the results obtained from computer models. Furthermore, the graphical results are available essentially in real time, that is, without having to be interpreted and rendered by an illustrator. Such a technique has been applied to the analysis of results of a computer model that simulates dispersion of atmospheric pollutants from a number of sources at various locations in the western half of the United States.

The model overlays a grid on a map of the region of interest. The sources postulated are then located with respect to this grid, and the model calculates various pollutant concentrations for each grid square. Computer printouts of these values are difficult to interpret since they do not show explicitly the source locations and other geographical information (see Figure 1.18). By sacrificing some of the precision of the direct printout and segregating the results into several categories (say A, B, and C), it is possible to produce a printer plot of "contours" of the concentrations and even to roughly define the geographical information (see Figure 1.19). Even this substantial improvement has basic limitations, however: the source locations cannot be included (except at the expense of other information); the overlaid map is imprecise; and the character spacing on the printer makes the grid appear skewed. The graphical software developed to display these data overcomes these defects and produces a high quality, easy-to-analyze picture (see Figure 1.20) of both the input

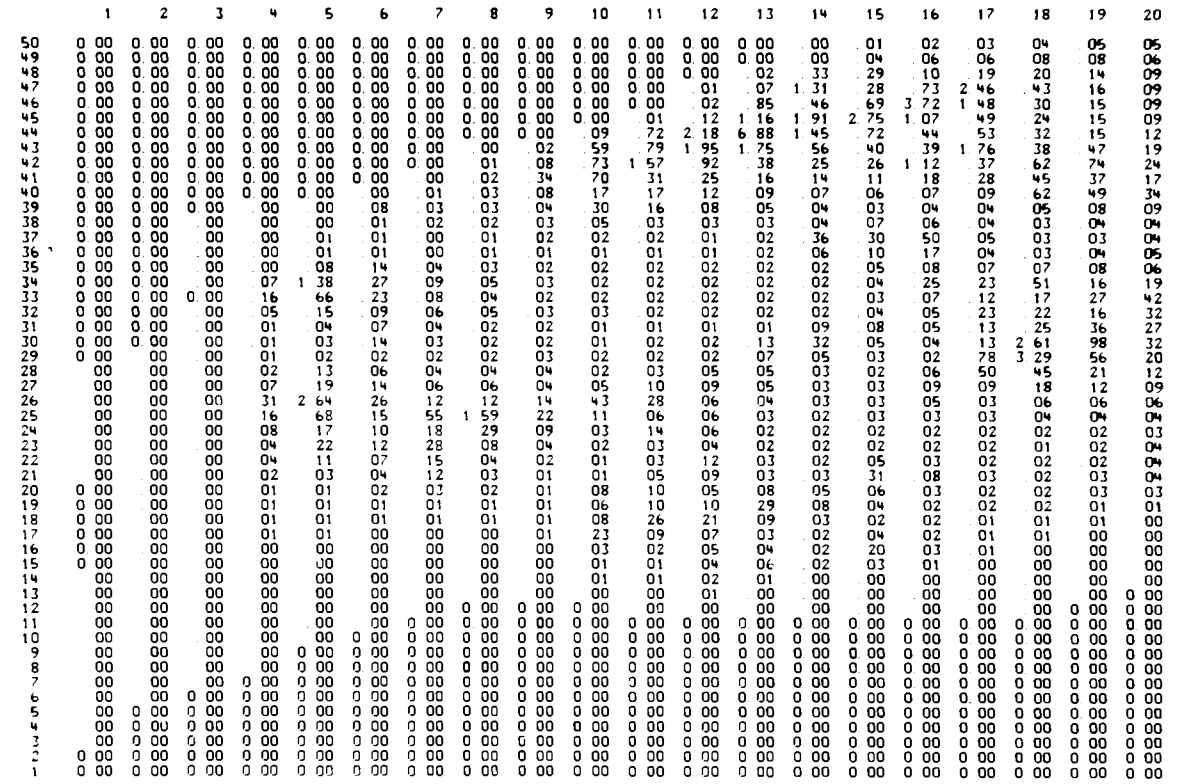

FIGURE 1.18. Numerical Output of Model Results

(source locations and relative sizes), output (concentration contours), and physical relationships (the map basis). Colored analogs, which are especially useful during oral presentations, can also be produced.

The software developed for these displays is not limited to the grid system used for this model. Coordinate strings to define all the state outlines are available. The grid spacing is completely arbitrary, and while the plots are defined relative to the NMC grid,(a) the computation grid may be rotated and translated in any manner desired. Furthermore, the plot may, at the user's option, cover a greater (or lesser) portion of the map than that covered by the grid. Thus, the software is useful for producing graphical displays of gridded numerical data regardless of the geographical orientation of the grid. Because of its modular nature, other pertinent data can also be included, depending on the needs of the user.

(a) Jenne, R. L. "The NMC Octagonal Grid." National Center for Atmospheric Research, Boulder, Colorado.

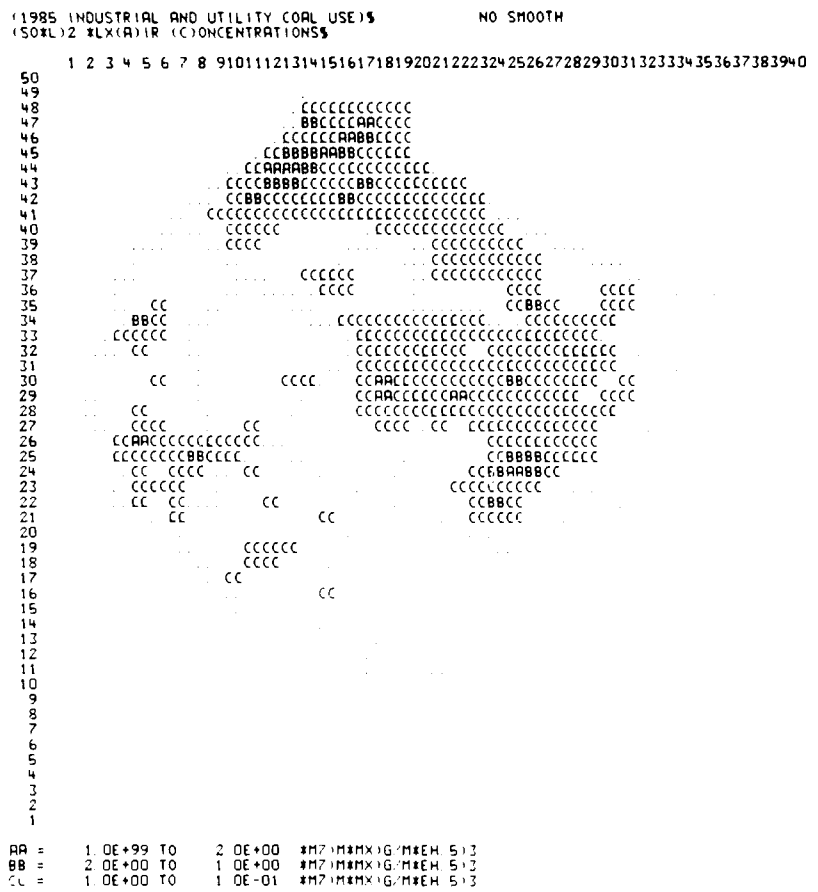

FIGURE 1.19. Printer Plot of Model Results

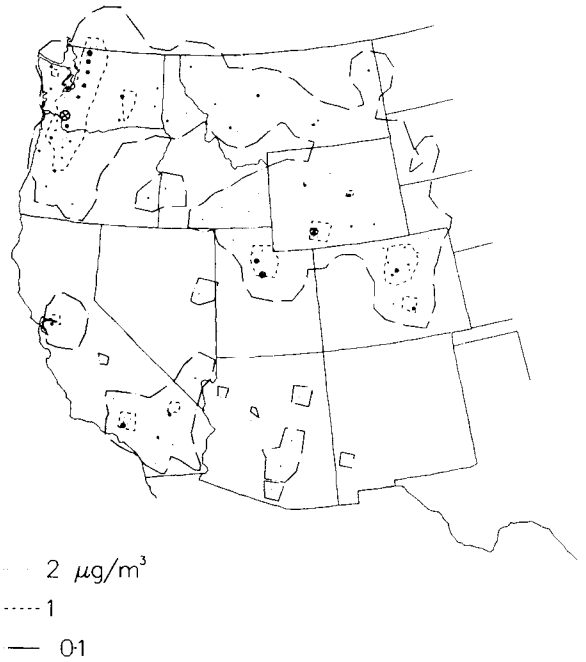

FIGURE 1.20. Contour Plot of Model Results for SO_2 Air Concentrations for 1985 Industrial and Utility Coal Use