The Delaunay triangulation has the property that the lines drawn from a point are fairly well distributed in all directions, regardless of the distance to the neighbors. This property may be used to define a neighborhood hierarchy in irregularly distributed point-sets. In regular grids, the first order neighborhood of a point $(i, j)$ consists of the points $(i-1, j), (i, j-1), (i+1, j), (i, j+1)$, and the second order neighborhood consists of the first order neighborhood and the corners $(i-1, j-1), (i+1, j-1), (i+1, j+1), (i-1, j+1)$. Increasing the order is similar to including a set of points in the neighborhood which have equal Euclidean distances to $(i, j)$ and are well balanced around $(i, j)$. In the case of irregularly distributed points a similar neighborhood hierarchy may be defined in the following way: all points connected directly to the center-point are denoted first order neighbors, points which are connected through first order neighbors are denoted second order neighbors etc.

When performing interpolation by e.g. kriging the application of the Delaunay triangulation to set up the interpolation support introduces a problem of establishing the correct neighborhood for an new point not included in the original triangulation. This problem is solved in Conradsen, Nielsen, Windfeld, Ersbøll, Larsen, Hartelius, & Olsson (1993). This application of the Delaunay triangulation in choosing the kriging support set is believed to be new.

## 1.9 Case Studies

An interesting case is a regional study with nearly 34,000 stream sediments samples analyzed by ICP for the contents of 26 geochemical elements covering nearly 10,000 square kilometers given in Conradsen, Nielsen, & Windfeld (1992). An example on application of geostatistical methods in indoor surface sampling is Schneider, Petersen, Nielsen, & Windfeld (1990).

### 1.9.1 2-D Semivariograms

Figures 1.5 and 1.6 show 2-D semivariograms for 2,625 samples analyzed for the contents of 16 geochemical elements in an area in central Spain (data from





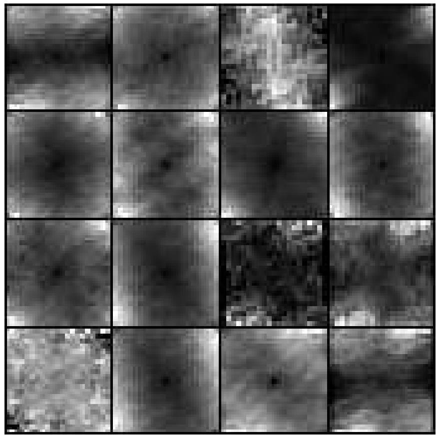

Figure 1.5: 2-D semivariograms for 16 geochemical elements in central Spain, 21×21 1 km pixels

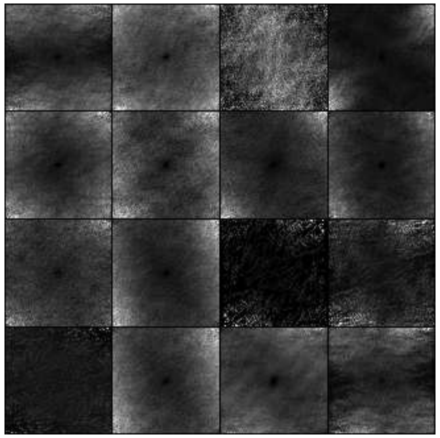

Figure 1.6: 2-D semivariograms for 16 geochemical elements in central Spain, 81×81 250 m pixels