PROBLEM 1

? *The ozone concentration in California becomes more and more one of the most important environmental problems. At approximately 200 spots, spread over the whole state, the concentration was measured and is now available to you.*
Are there any obvious trends ? Use ArcMap to create a map of California visualizing the regions of extraordinary high values.

The *Geostatistical Analyst* was not enabled in the default installation. It can be found in the *Tools → Extensions* menu, then the according toolbar has to be added to the program via *Views → Toolbars → Geostatistical Analyst*. Once I did it, I do not have to redo it – similar to the Spatial Analyst known from the assignment 2 to 4.

The initial map contains a heightmap (serves as a background image, no further role), California's border, the majority of its medium-sized to big cities and finally the measured ozone concentration.

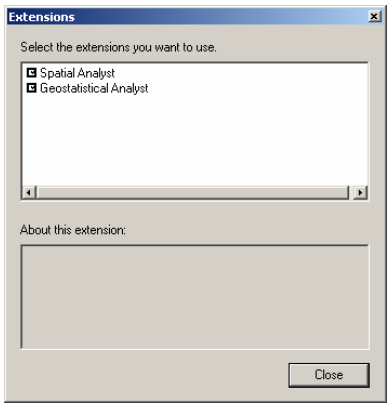

Figure 1 *Activating the Geostatistical Analyst*

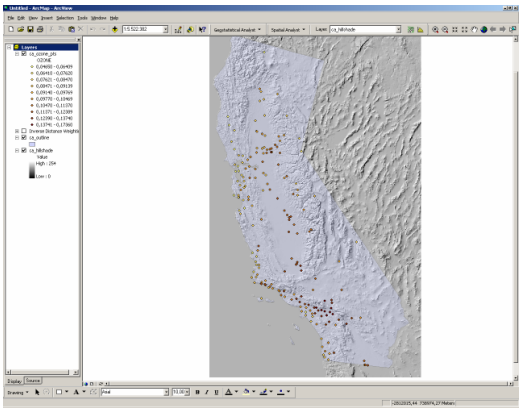

Figure 2 *Initial map*

A *Trend Analysis* shows changes over space. It draws all observations along the coordinate axes and computes a trend line (it applies an algorithm unknown to me).

In the following images the x-axis stands for West-East (i.e. longitude), the y-axis for South-North (i.e. latitude), and the z-axis represents the ozone concentration.

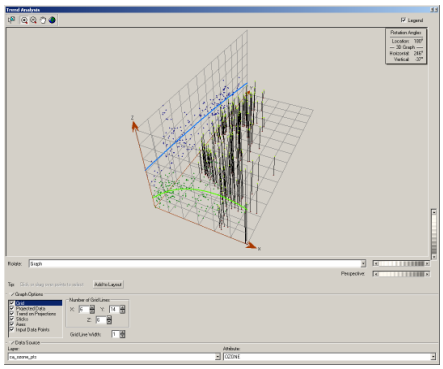

Figure 3 *Trend Analysis*

The trend becomes even more obvious when rotating the scene by 30° and removing the sticks and input data points:

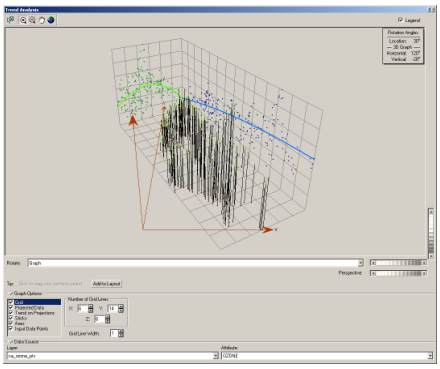

Figure 4 *Rotated by 30°*

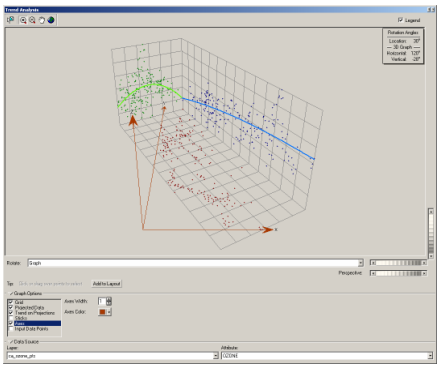

Figure 5 *Removed superfluous items*

There is a significant peak in the East-West centre of California and a slight increase towards the southern part.

To be honest, I have some difficulties in reading these ominous trend analyses and prefer a “not-that-abstract” map. The problem is to generate a map covering the whole state of California out of just 192 measured values. Kriging is the tool of choice when it comes to interpolating. It is part of the *Geostatistical Wizard* and very flexible - I merely wish it would contain less functionality ☺.

Five dialog guide me through the overwhelming options. Fortunately, the default settings usually perform the desired tasks and only need to be changed in special cases. An important selection of mine is to choose a *Second Order Trend Removal* in step 1 (Figure 7).

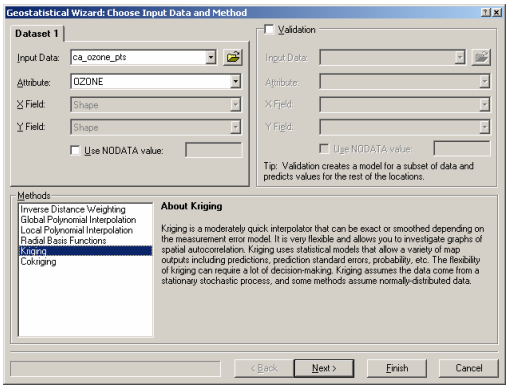

Figure 6 *Choosing Kriging*

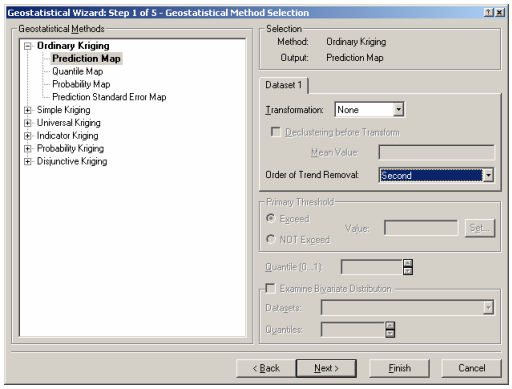

Figure 7 *Step 1 – Second Order Trend Removal*

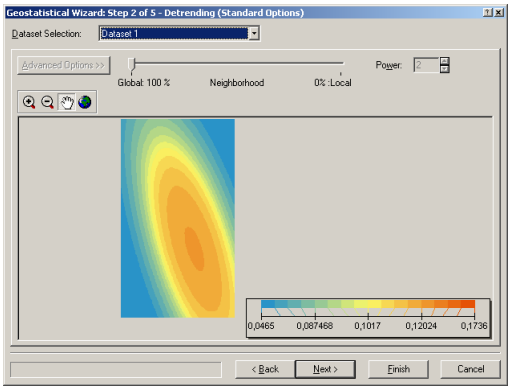

Figure 8 *Step 2 – no changes*

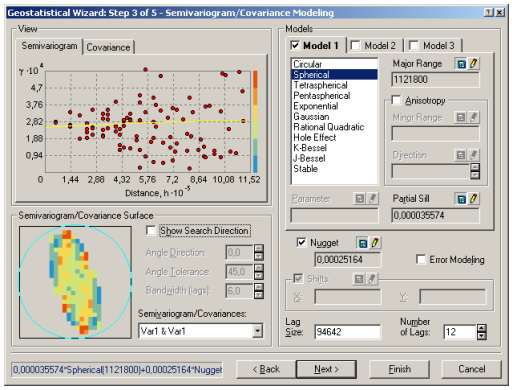

Figure 9 *Step 3 – no changes*

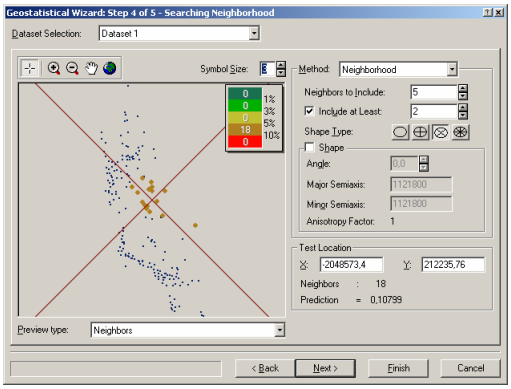

Figure 10 *Step 4 – no changes*

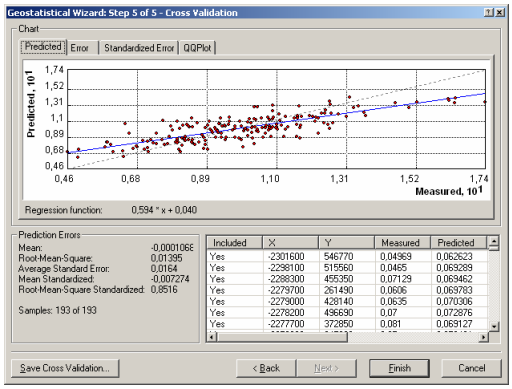

Figure 11 *Step 5 – no changes*

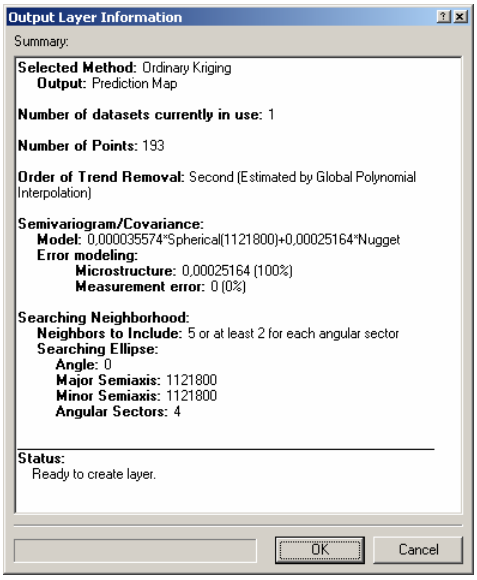

Figure 12 *Summarized settings*

The Geostatistical Analyst outputs a new layer which is added to the current project. I did not like the image and played a bit with the visual appearance. In my eyes, the ozone concentration can be easier obtained from the visualization when just the contours are drawn (not filled !).

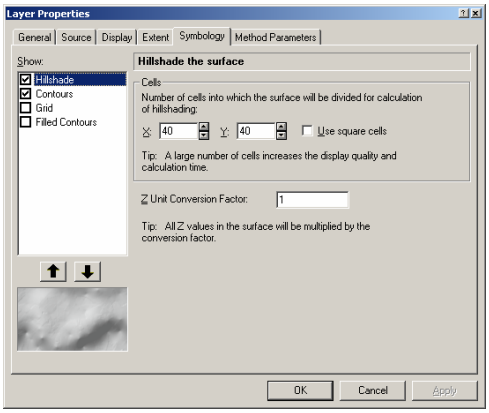

Figure 13 *Visual appearance*

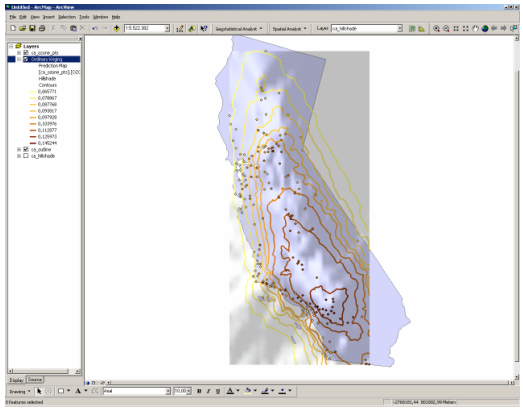

Figure 14 *Map with ozone concentration*

It is well-known that metropolitan area are the number one source of carbon dioxide and ozone. So I removed the 192 spots from the map and replaced them by the medium-sized to big cities of California (green circles). I was interested in cities with more than 100'000 citizens and emphasized them by black squares (a little bit larger than the circles).

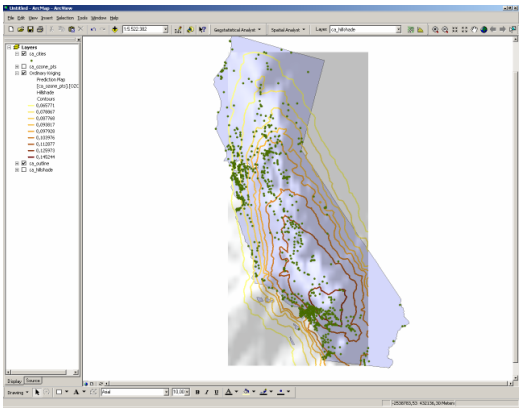

Figure 15 *Added cities*

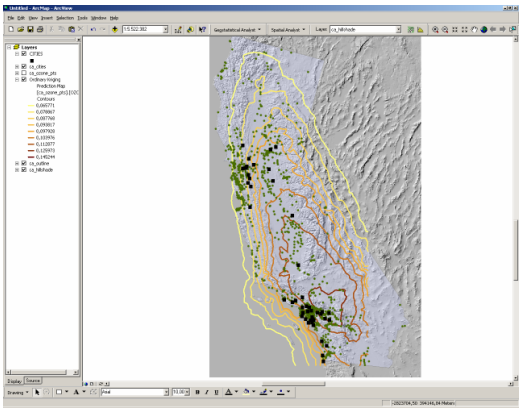

Figure 16 *Emphasized big cities, enabled heightmap again*

It becomes quite clear that the cities are mainly responsible for the high ozone concentrations. However, though their symbols do not exactly match the regions of very high values due to the steady wind coming from the Pacific Ocean.