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Geodesy Course 2008. Exercise 4.

4.1 Statistical analysis of gravity data

Estimation of a gravity anomaly (empirical) covariance function and variogram

The following data must be used, with format:
number, latitude, longitude, altitude and gravity anomaly in mgal.

```
11 56.0 10.0 0.0  4.0
12 56.1 10.0 0.0  2.0
13 56.2 10.0 0.0  0.0
14 56.3 10.0 0.0 -2.0
15 56.4 10.0 0.0 -4.0
16 56.5 10.0 0.0 -6.0
17 56.6 10.0 0.0 -8.0
18 56.7 10.0 0.0 -9.0
19 56.8 10.0 0.0 -7.0
20 56.9 10.0 0.0 -5.0
21 57.0 10.0 0.0 -3.0
22 57.1 10.0 0.0 -1.0
23 57.2 10.0 0.0  1.0
24 57.3 10.0 0.0  5.0
25 57.4 10.0 0.0  4.0
```

The covariances are estimated by forming products of all data with distances in the interval from 0 to 0.05 and then 0.05+n*0.1 to 0.05+n*0.1 for n=1, 2, 3, 4, 5, 6, 7, and counting how many points there are in each sampling interval (totally 8). (Divide the work between you, so each one takes one interval). The variogram is estimated by forming sums of products of differences.

Where is the first zero-point for the covariance function and what is the correlation distance (the distance to where the covariance first time becomes half the variance (and we have 50 % correlation).

4.2 Prediction.

Predict using collocation the gravity anomaly in a point with latitude 56.65 and longitude 10.0 from point 18 only, and then from point 17 and 18, and finally 17, 18, 19.

What is the theoretical error-estimate if only point 18 is used ?