Model-based geostatistics: geospatial statistical methods for public health applications

Lab class. Geostatistical prediction

In this class we again use the data on lead concentration in moss samples contained in the file `lead2000.csv`, which you can download from the course web-site:
`http://www.lancs.ac.uk/diggle/Malawi2015`

1. Use the function `krige.conv` to perform spatial prediction by fixing the values of the model parameters for log-transformed lead concentrations at the maximum likelihood estimates – you will need to use the function `krige.control` to do this. To define the prediction locations, use a regular grid to cover the area of interest. This can be obtained using a variation of the following code

   ```
   coords <-lead$coords
   poly <- bbox(as.matrix(coords))
   h<- # CHOOSE A SUITABLE VALUE FOR THE GRID-SPACING
   grid.pred <- expand.grid(seq(poly[1,1],poly[1,2],h),
                            seq(poly[2,1],poly[2,2],h))
   ```

   Plot the resulting predictions as a map. You can use the standard `image` function for this, but for a nicer implementation install and load the `fields` package, and use the `image.plot` function, or use some of the methods you met in the "Map-making in R" section of the course.

   Note in particular, that there is no mathematical objection to your making predictions at locations outside Galicia (including in the ocean), but your final map should be confined to Galicia.

2. Obtain a map of the predictive probability that lead concentration exceeds 3.0 micrograms per gram dry weight.

3. Repeat exercises 4 and 5 but using the `krige.bayes` function.

   Comment on the similarities and differences between the two sets of results.