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Heavy metals in European soils:

a geostatistical analysis of the FOREGS Geochemical database

FOREGS Geochemical database

Forum of European Geological Surveys FOREGS database is a point database of geochemical variables taken in soil and water media. The project started in 1997 and it has been carried out by governmental institutions of 26 European countries. The final product of this collaboration was the “Geochemical Atlas of Europe" (http://www.gsf.fi/publ/foregsatlas/). The database includes about three thousand samples for solid media: topsoil, floodplain sediment, stream sediment and humus (ranging from 385 samples of sub soil to 852 samples of the stream sediment).

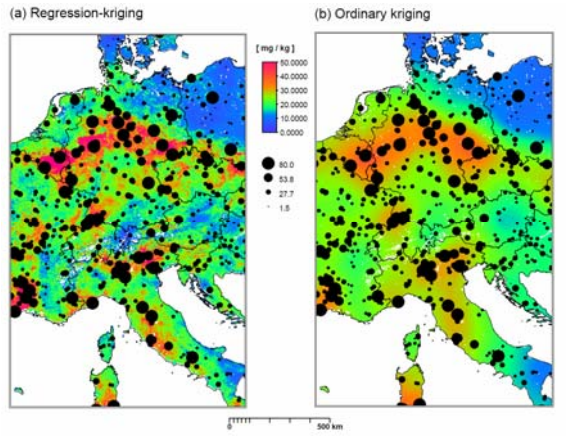


Fig: Comparison of Pb interpolations produced using ordinary and regression-kriging.

Geostatistical mapping

This poster presents results of mapping concentrations of eight critical heavy metals (arsenic, cadmium, chromium, copper, mercury, nickel, lead and zinc) in European soils by using 1588 samples taken from the FOREGS Geochemical database. We used an automated geostatistical mapping framework based on regression-kriging. The original concentrations were transformed to logits; auxiliary raster maps (DEM-parameters, MODIS NDVI time series, night light image, geological and land cover maps, cumulative earthquake magnitude map) were converted to 36 principal components.

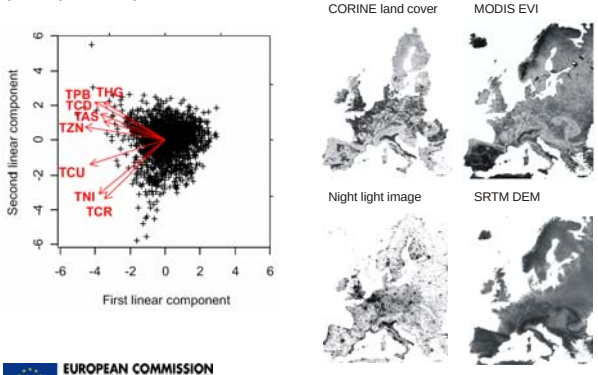


Fig: Some auxiliary predictors used to improve interpolation of heavy metals.

Where are the most polluted soils in Europe?

The result of this study showed that high concentrations of Cd, Cu, Hg, Pb and Zn can be linked with human activities, i.e. industrialization and intensive agriculture. The PCA of the overall soil pollution by heavy metals in Europe revealed that the administrative units (NUTS level3) with highest overall concentrations are: (1) Liege (Arrondissement) (BE), Attiki (GR), Darlington (UK), Coventry (UK), Sunderland (UK), Kozani (GR), Grevena (GR), Hartlepool & Stockton (UK), Huy (BE), Aachen (DE) (As, Cd, Hg and Pb) and (2) central Greece and Liguria region in Italy (Cr, Cu and Ni).

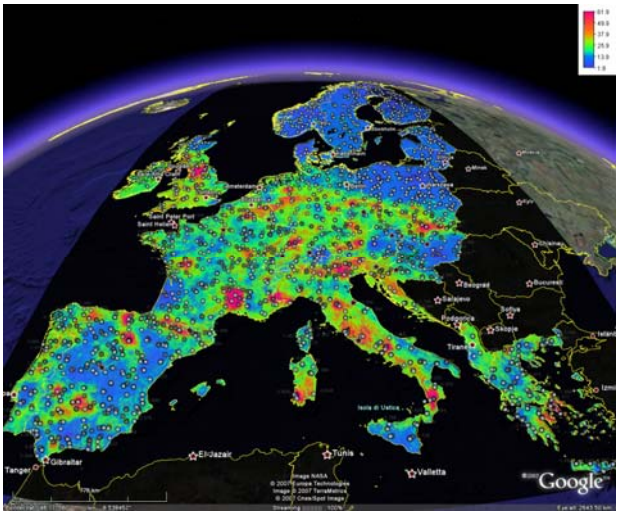
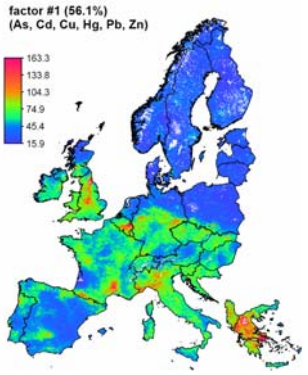


Fig: Pb content in mg / kg interpolated using regression-kriging.

Conclusions

The study revealed that the FOREGS Geochemical database is suitable for geostatistical analyses: the predictors explained from 21% (Cr) up to 36% (Pb) of variability; the residuals showed clear auto-correlation structure. The system was fully automated, which opens possibilities for automated updating of these maps.



FOR MORE INFORMATION SEE:

Rodriguez Lado, L., Hengl, T., Reuter, H.I., 2007? Heavy metals in European soils: a geostatistical analysis of the FOREGS Geochemical database. Chemosphere, in review.

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