Quantitative methods for indoor radon data analysis and modeling. Swiss experience
Team and experience (with FOPH, Bern)

- Prof. M. Kanevski: Mikhail.Kanevski@unil.ch
- Prof. M. Maignan
- Geostat Office group (Russian Academy of Sciences)
- A. Pozdnoukhov (IGAR)
- R. Tapia (IGAR)
- V. Timonin (IGAR)
- D. Tuia (IGAR)


- Case studies:
  - Switzerland, Austria, Italy, Germany.
More Information

www.geokernels.org
www.unil.ch/igar

Mikhail.Kanevski@unil.ch
Alexei.Pozdnoukhov@unil.ch

Machine learning algorithms for spatial data analysis and modelling.
Theory and Case Studies.

Coming in 2008

Bologna, October 31, 2007
Visualisation of Rn Data - PostPlot
Example: Local scale
Radon Data Base

RN Data Base Structure

- Type of Houses: 1,...,7
- Altitude
- Other information

Inhabited houses
- Levels: -4,...,11
- Room types: 1,...,12

Not Inhabited houses

More than 60000 data, heterogeneously distributed in space
Indoor Radon Data: stylized facts

- Data are very clustered (naïve statistics does not work).
- Data are highly variable at different scales (local, regional, global). Very difficult/impossible to find spatial structures using traditional variography.
- Existance of extreme values and outliers. Modelling distributions using statistics of extreme values.
- Low local predictability of concentrations.
- Better predictability for regional classification.
- Relationships with Geology? Other factors?
Approaches developed and used:

- Statistical descriptions (including EVT)
- Deterministic Interpolations
- Geostatistical Predictions/Mapping
- Geostatistical Simulations for Risk Mapping
- Machine Learning Algorithms: artificial neural networks of different architectures
- Statistical Learning Theory (Support Vector Machines, Support Vector Regression) for classification and mapping
- GIS tools
1. Geostatistical Congress 2000: 
INDOOR RADON RISK ASSESSMENT WITH GEOSTATISTICS AND ARTIFICIAL NEURAL NETWORKS 
V. Demyanov, M. Kanevski, M. Maignan, E. Savelieva, V. Timonin, S. Chernov, G. Piller

2. MS Theses (A.- Chaouch) 2003.

Indoor radon distribution in Switzerland: lognormality and Extreme Value Theory
D. Tuia and M. Kanevski

4. MS theses (P-E Huguenot) 2008

5. PhD theses (R. Tapia) 2008
Data visualisation
Measures of monitoring network complexity
Histograms of raw and declustered data
Structural Analysis. Variography

- **Exploratory variography** – estimating and interpretation of anisotropic spatial correlations using data (sometimes transformed data can be used instead of raw data);
- **Modelling** of spatial structures – development of theoretical variograms. The latter consists usually in a fitting of experimental variograms calculated basing on data with some theoretical models described by analytical formulas.
Experimental variography
Histograms of raw data and Nscore transformed
Variography of Nscore transformed data
Simulations: risk mapping