Boundless Electrical Resistivity Tomography
- ERT on arbitrary geometries (2D/3D, open/closed, flat/topography, trees, lysimeters)
- free and platform-independent
- use of efficient numerical libraries
- controlled by config file and command line
- scripting and batch mode, web inversion service

Advances of BERT 2
- based on the general-purpose library GIMLi
- different electrodes types: nodes, faces & free
- unstructured/structured or mixed meshes
- data filtering using min/max keywords
- improved speed and accuracy
- more flexible treatment of different model parts

The GIMLi region technique
- subdivision of model into different regions
- types: constrained, single, fixed, background
- individual settings: regularisation type/strength/direction, transformation, upper/lower resistivity bound, starting value
- coupling or decoupling of regions

Regions - types, ranges and coupling
Resistivity survey across Feldengel lake
- Wenner $\alpha + \beta$ using 46 electrodes in&outside
- known lake bottom topography
- Model PLC building:
  - 2D topography model using electrodes (●)
  - local refinement at electrodes & box around
  - connection of shore points and region marker
  → lake as independent region to be controlled
  
PLC - Input for mesh generator

Geological block inversion
Large-scale dipole-dipole experiment in Eger rift
- done by University of Leipzig
- 500 m–1 km transmitter dipoles (red)
- 200–600 m receiver dipoles (yellow)
- only about 20 reliable data available
- a-priori definition of geology blocks

Accounting for borehole fluid conductivity
Crosshole experiment for river restoration
J. Doetsch (ETH Zurich)
- crosshole ERT data using 4 boreholes
- conducting fluid in holes
- treated independently

Incorporating a-priori information
Bedrock-sediment classification (T. Schicht, K-UTec Sondershausen)
- Wenner-Schlumberger surface data
- additional resistivity probe reveals layering
- Problem: thin conducting layer is too deep & thick
- Solution: incorporation as a-priori information (structure + material)

Conclusions
- increased flexibility due to region approach
- incorporation of both structural and material a-priori knowledge is able to improve results heavily
- problem-dependent temporal behaviour
- release available soon on resistivity.net
- techniques ready for any method

References
Doetsch, Casca, Greenhalgh, Linde, Green & Günther (2010): The borehole-fluid effect in electrical resistivity imaging, in print, Geophysics
Günther & Rücker (2009): BERT 1.0 - tutorial
Günther & Rücker (2010): Migration guide from BERT 1 to 2