



Combining geoelectrics and seismics using a structural constrained inversion approach with an application at the CO₂ pilot storage Ketzin (Germany)

Peter Bergmann (1), Monika Ivandic (2), Carsten Rücker (3), Dana Kiessling (4), Cornelia Schmidt-Hattenberger (1), Stefan Lüth (1), Christopher Juhlin (2), and Ben Norden (1)

(1) GFZ German Research Centre for Geosciences, Potsdam, Germany, (2) Uppsala University, Uppsala, Sweden, (3) TU Berlin, Berlin, Germany, (4) Schweinfurt, Germany

Geophysical monitoring at the CO₂ pilot storage Ketzin comprises time-lapse seismic and geoelectric (ERT) measurements. Both types of measurements are known to image geological structures differently, in particular for a variable saturation of CO₂. We present a combination of both methods by means of a structural constrained inversion approach. Structural constraints are implemented in the geoelectric inversion by a local regularization. This allows model parameters to behave discontinuously across prominent geological boundaries. A tetrahedral finite-element parametrization is used to closely follow geometric a priori structures interpreted from seismic reflection data. Thus, seismics and geoelectrics are arranged in a sequential workflow which is based on a structural similarity.

Practical application is performed on the Ketzin datasets which comprise repeated 3D seismic surveys, as well as repeated surface-downhole geoelectric surveys, providing different illumination/coverage and time-lapse signals. However, application of a local regularization for the caprock-reservoir boundary yields a more consistent image and reduces some of the ill-posedness in the ERT inversion. We compare the result with that of an unconstrained inversion and discuss its potential for CO₂ migration imaging.