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Detection of groundwater salinisation by geoelectric measurements

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Intrusion of saline water into potable water resources is a major concern in feasibility studies for the sequestration of CO_2 in deep saline aquifers and for heat extraction from geothermal brine. Non-invasive geophysical monitoring techniques may provide the capability to predict groundwater deterioration at an early stage. Numerical simulations can play an important role in understanding the behaviour of saline water migration caused by complex multiphase flow processes and pressure buildup within the geological storage formation. In this study, coupled thermal-hydraulic-chemical models of two different saline water migration scenarios are investigated employing the TOUGH2/ECO2N and PFLOTRAN simulators. An experimental realisation of the simulated saltwater intrusion scenarios is implemented by using a laboratory scale sandbox model. Electrical Resistivity Tomography measurements are carried out in order to delineate the temporal and spatial intrusion of saline water into freshwater saturated porous media. With the objective to optimise sensitivity and resolution of the array, different multi-electrode configurations are tested. This study aims at improving the calibration of field scale subsurface monitoring techniques by a comparative interpretation of modelled and experimental data.