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Application of Thermal response test to distributed fiber-optic temperature sensor (DTS) for CO_2 storage at Hontomín Technological Development Plant

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Thermal response tests will be performed at Hontomin as part of site characterization and CO_2 injection monitoring. These types of tests have been developed to determine the presence of CO_2 in the reservoir. It consists of heating an electrical cable and monitoring the temperature response by optical fiber DTS (Distributed Thermal Sensing) parallel to the heater along the well casing. Here we perform numerical simulations to analyze the effect of perturbing factors on Jacob's analytical interpretation, such as thermal convection or the presence of the casing. We find that the method is rather robust in the sense that it is possible to detect the movement of the CO_2 in the reservoir, estimate the CO_2 saturation and also the leakage through the cement. However, it is unclear whether small residual saturations of CO_2 can be identified. These require very long tests. The interpretation is improved by the use of diagnostic plots.