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An automated workflow to study parameter sensitivities in a geothermal reservoir

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During the last two decades, a considerable effort has been made by the Oil and Gas industry to develop automated workflows to describe the uncertainty in the subsurface. The Ensemble Reservoir Tool, developed by the state-owned Norwegian company Equinor, has been a key tool to characterize and history-match real hydrocarbon reservoirs. The modelling goal has been to create repeatable, updatable and consistent reservoir models that capture the important uncertain parameters.
Our objective is to demonstrate how these same tools used for uncertainty characterization can be adapted to automate a sensitivity analysis of a geothermal reservoir. As an example, we consider a synthetic aquifer located at about 2000-meter depth. A simplified facies-belt model of three sands with their static properties (porosity, permeability and thermal conductivity) has been set up. The forward thermal simulations are carried out with Eclipse's thermal functionality. We address the sensitivity of the energy production in a production well after 50 years of production, as a function of well placement, injection-production rates and heterogeneous thermal properties. Due to the versatility of this workflow, it can be readily used on producing geothermal reservoirs to help history match complex production histories and forecast future production.

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