DESTRESS

Demonstration of soft stimulation treatments of geothermal reservoirs

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Eylem Kaya is an academic in the Department of Engineering Science, at the University of Auckland. She has worked on the reservoir models for fields in Turkey, New Zealand, Papua New Guinea, The Philippines, USA and Indonesia. Her research interests include numerical reservoir simulation, reinjection into geothermal systems, reactive transport modelling, gas-rich geothermal systems, and well tests.

Effects of Reinjection of Greenhouse Gases on the Sustainability and Stimulation of Geothermal Reservoirs

In response to global warming, it is important to explore alternative disposal technologies for greenhouse gas emissions in the geothermal power sector. One alternative which has received interest is the injection of CO_2 into deep geothermal formations. Our research provides critical insight into designing an optimum CO_2 and water injection strategy for conventional geothermal systems. To evaluate the feasibility and commercial viability of this concept, it is essential to investigate the migration and behaviour of injected gases in a geothermal reservoir, identify the trapping mechanisms and forecast gas breakthrough. This assessment can be conducted via numerical modelling of subsurface conditions, including thermal, hydrological, and chemical processes, to evaluate the system realistically.

We conducted a series of numerical investigations and used several scenarios to assess the possible impacts of CO_2 reinjection on energy recovery. The trapping mechanisms were also investigated by including the adsorption behaviour of CO_2-H_2S-water mixtures, as well as the chemical reactions between the fluid and the reservoir rocks. We incorporated reactive transport models to evaluate the impact of chemical stimulation on the reservoir rock under subsurface conditions. Our results show that in certain situations, the CO_2 reinjection can improve steam rates. Still, the injection strategies must be formulated specifically to prevent premature breakthrough of CO_2 into production, which will increase the CO_2 removal load. It was also found that co-injection of CO_2 promotes the dissolution of minerals and is expected to improve porosity and permeability over time in the vicinity of the injection well.

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