

MODELING HYDRO-MECHANICAL RESERVOIR STIMULATION FOR GEOTHERMAL SYSTEMS

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ABSTRACT

Several geothermal EGS projects are under development worldwide. As such the Coso project in the US and the Soultz project in Europe intend to produce electricity from circulating fluids in hot fracture rock. Improvement of the reservoir conditions by hydraulic stimulation and minimizing the seismic risk represents now a primary challenge to enable economic operation and future extension. In this context, the new HEX-S code has been developed to simulate the transient hydro-mechanical response of the rock matrix to massive hydraulic injections. The present paper describes the modeling results of the Soultz stimulation from 2003 and 2004 and the analysis of the situation in Coso. Maximum flow rates of >60 l/s have been used, triggering >30'000 microseismic events. The transient numerical simulation intends to obtain a match of both, the microseismic and the hydraulic behavior. Different model calculations demonstrate the capabilities of our new approach. It is noteworthy that the modeling became possible only due to the excellent data quality at the Soultz project. The results demonstrate that simulations based on solid physical ground can reveal the complex reservoir behavior during hydraulic stimulation. The use of HEX-S also provides perspectives for future developments such as design calculations that enable optimizing cost-intensive hydraulic stimulations before hand.