

## **Numerical study on hydraulic fracturing in the planned Dikili Enhanced geothermal System Project, Turkey**

J. Liao<sup>\*/\*\*</sup>, M. Z. Hou<sup>\*/\*\*</sup>, P. Were<sup>\*\*</sup>, Y. Gou<sup>\*\*</sup>

\*Institut für Erdöl- und Erdgastechnik, TU Clausthal

\*\*Energie-Forschungszentrum Niedersachsen, Goslar

### **Abstract**

Owing to the large capacity, the environment-friendly property and the lack of dependency on the weather, the geothermal energy, which has enormous potential as a renewable energy attracts more and more attention. Currently, many countries have conducted or planned enhanced geothermal system (EGS) projects over the world. The Dikili EGS project, which is the first one in Turkey, is implemented at the license area of SDS Energy Inc. in Dikili of the Izmir province with a high temperature gradient of 7°C/100m. The temperatures of Kozak granodiorite in the depth of 2000 m, which will be stimulated during EGS application, are expected exceeding 200°C. Based on the completed geological, paleostress, geophysical as well as the geochemical studies, two potential areas, named as Bozcayir Tepe (hill) and Eskinburnu Tepe (Hill) were selected to create artificial geothermal reservoir. In this study, the hydraulic fracturing of this EGS project has been preliminarily studied based on the classical Mohr-column model by using the numerical codes FLAC3D in the two corresponding areas, respectively. The stimulated reservoir, where the shear and tensile deformation occurred in hydraulic fracturing, was considered as fracture network to produce heat. Meanwhile, the leak off during hydraulic fracturing was calculated derived from the mass balance equation relating to the pressure increment. In the Bozcayir Tepe (hill) area, the simulation results showed that the stimulated reservoir volume and area could reach 200 million m<sup>3</sup> and 1.93 km<sup>2</sup>, respectively, with an injection volume of 122,931 m<sup>3</sup> using pure water. In the Eskinburnu Tepe (Hill) area, the stimulated reservoir volume and area could reach 204.13 million m<sup>3</sup> and 2.10 km<sup>2</sup>, respectively, with an injected water volume of 131,532 m<sup>3</sup>. In the end of hydraulic fracturing, the leak off was very huge up to 68% in both areas.