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# Predictive Mechanical model for fracture stimulation in an enhanced geothermal system (EGS) context

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The development of an EGS is one of the goals of the GEMex project, an international collaboration of two consortia, one from Europe and one from Mexico. The research is based on exploration, characterization and assessment of two geothermal systems located in the Trans-Mexican volcanic belt, Los Humeros and Acoculco. Los Humeros has been a producing field for several years, but Acoculco is yet to be developed. Thanks to surface manifestations of hydrothermal activities, the existence of a geothermal system is evident. However, two wells reached very high temperatures, but did not find any fluids. For that reason, the Acoculco Caldera is foreseen as EGS development site, hoping to connect existing wells to a productive zone.

In this study, we develop a workflow that aims at assessing the feasibility of this EGS. The approach aims at generating a realistic predictive mechanical model for fracture stimulation from the well borehole.
The strength of the method stands in the combination of reliable data obtained from field work and experimental measurements on mechanical properties of the target rocks, used together to populate a numerical model.
The workflow starts with the identification and description of the surface discontinuities using the scanline survey method. These surveys are interpolated and extrapolated using the multiple point statistics method to generate geological discrete fracture networks.
The results of these simulations are then evaluated in a finite element method program using a flow model for fractured media.
Finally, combining the fracture flow model and the mechanical properties measured in the rock physics laboratory, the fracture propagation is calculated using the non-local damage approach, combined with the cohesive-zone model.

The method offers a physically sound prediction of the reservoir flow characteristics as well as an accurate mechanical model of the fracture propagation and the pressure distribution for well borehole stimulation. Because the workflow is based on easily accessible data and thanks to its simplicity, this approach could be applied in most EGS case studies.