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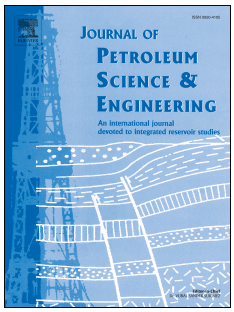

Localized stress field modelling around fractures using three-dimensional discrete element method

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Localized stress field modelling around fractures using three-dimensional discrete element method

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1. Abstract

Understanding of field stress condition in fractured rock mass is required to investigate stability of underground excavations. To analyze stress perturbation in fractured rock mass, a regional model is generated using a DEM based code, 3DEC.Three major steep faults were considered in the model. The regional model then was used to estimate stresses on the boundaries of smaller descriptive model termed as the base model. Stresses were observed to vary in magnitude at the intersection of discontinuity sets and stress drop was observed at the discontinuity. In addition, stress tensors in the model were observed to rotate parallel to the discontinuity. A vertical borehole in base model revealed that high stresses concentrated along discontinuities may result in forming yield zones around the borehole. Furthermore, the base mode was subjected to strength and stress anisotropy analysis. Effect of stress anisotropy on stress perturbation was significant, whereas, stress values slightly changed by strength anisotropy. In both cases, due to the effect of discontinuities the induced stress field was non-linear and fluctuating. Effect of stress anisotropy on stress perturbation found to be more significant for the maximum principal stress as compare with the minimum principal stress.

2. Introduction

Borehole stability is a major issue faced in petroleum and mining industry as well as in mining industry as it can result in significant expenditures thus having a significant impact on reservoir production and mine exploration activities. Stability of boreholes have been investigated in unconsolidated formations (Hashemi et al., 2014), heavily naturally fractured rock mass (Karatela et al., 2016) and deep-seated formations (McLean and Addis, 1990).

Subsurface is in a predefined stressed state before a well is drilled. General stress state of the world's tectonic regions has been studied by World stress map project (Tingay et al., 2005). The project has