Geophysical Research Abstracts
Vol. 15, EGU2013-8834, 2013
EGU General Assembly 2013

Geomechanical stress inversion for reservoir fracture characterization

Mostfa Lejri (1,2), Jean Pierre Joonnekindt (1), Frantz Maerten (1), and Laurent Maerten (1)
(1) Schlumberger – MpTC, Parc Euromédecine, 340 rue Louis Pasteur, 34790 Grabels, France, (2) Géosciences Montpellier, Université Montpellier 2, Place E. Bataillon, 34095 Montpellier cedex 5, France

In this contribution we present preliminary results of the new generation of stress inversion technique using geomechanics (Maerten F, 2010) and based on a 3D boundary element method (BEM) (Thomas, 1993; Maerten, 2010) combined with a Monte Carlo simulation.

As opposed to majority of the stress inversion techniques (Carey and Brunier, 1974; Angelier, 1975; Gephart and Forsyth, 1984; Reches, 1987), which are based on the Wallace-Bott hypothesis (Wallace, 1951; Bott, 1959) and where it is assumed no stress perturbation within the rock mass, this new method does not rely on such assumptions. On the contrary, using geomechanics allows stress inversion to be better constrained by taking into account observed mechanical perturbations (e.g., the variation in fractures orientation) and the possibility to use new types of data such as GPS, InSAR, slip and stresses with magnitude (Maerten F, 2010).

We briefly describe the method, its benefits and limitations using an outcrop example, where we illustrate how joint development can be affected by local heterogeneous stress field as joints seem to be coherent with the perturbed stress field caused by slip along strike-slip faults. Heterogeneous paleostress field is therefore recovered and natural fractures are accurately reproduced.

We also demonstrate how this new inversion technique can be used for both natural fractures and present day stress modelling that lead to a better characterization of natural fractures in reservoirs. Our goal is to better constrain reservoir natural fractures, which can be affected by the paleostress field as well as the distribution of the present day heterogeneous stress field. While open natural fractures are known to be capable of significantly promoting the flow of hydrocarbons, the present day stress distribution can lead to critical leakage during drilling and production when pressure is changed, increasing risks of fracture occurrence and opening, depending on the actual stress orientation and magnitude near the borehole.

Through this example, we show that stress inversion techniques using geomechanics leads to a better natural fracture characterization compared to conventional stress inversion methods that are based on the Wallace-Bott hypothesis.