Reservoir Geomechanics

Homework No. 4 – Estimating Bounds on the Maximum Horizontal Stress
Due 8:00 UTC March 16th, 2020
If you want to see the current time in UTC, please google: current time in UTC

In this homework assignment, you will be estimating the lower bound of the minimum horizontal stress, the upper bound of the maximum horizontal stress, and the range of possible magnitudes of the maximum horizontal stress given a magnitude of the minimum horizontal stress. These estimates will be based on knowledge of the vertical stress, the pore pressure, and the coefficient of sliding friction. The relationship for faults in frictional equilibrium modified from (Zoback, 2007) is,

$$\frac{S_1 - P_p}{S_3 - P_p} \leq (\sqrt{(\mu^2 + 1)} + \mu)^2$$

in which S_1 is the maximum principal stress, S_3 is the minimum principal stress, P_p is the pore pressure, and μ is the coefficient of sliding friction.

Use the following unit in your calculation: 'psi' for minimum horizontal stress and maximum horizontal stress.

I. Answer the questions on the page below

The answers will be posted a day after it is due. Numerical entry-type responses have a range of acceptable values and are graded electronically, so please adhere to the value of constants given here. We will specify the units that we want the answer in, so please do not write units in the answer, just write the number.

Zoback, M. (2007). Reservoir Geomechaincs. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511586477

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 4400 psi, what is the lower bound of the minimum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 4400 psi, what is the upper bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a minimum horizontal stress of 8000 psi, which of the following stress states is possible?
Reverse faulting only
Normal faulting only
Strike-slip faulting only

Normal and/or strike-slip faulting
Any faulting regime is possible

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a minimum horizontal stress of 12000 psi, which of the following stress states is possible?
Reverse faulting only
Normal faulting only
Strike-slip faulting only
Normal and/or strike-slip faulting
Any faulting regime is possible

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 4400 psi, a minimum horizontal stress of 8000 psi, what is the lower bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 4400 psi, a minimum horizontal stress of 8000 psi, what is the upper bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 4400 psi, a minimum horizontal stress of 12000 psi, what is the lower bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 4400 psi, a minimum horizontal stress of 12000 psi, what is the upper bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 5200 psi, a minimum horizontal stress of 8000 psi, what is the lower bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 5200 psi, a minimum horizontal stress of 8000 psi, what is the upper bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 5200 psi, a minimum horizontal stress of 12000 psi, what is the lower bound of the maximum horizontal stress?

Assuming a coefficient of sliding friction of 0.6, an overburden stress of 11000 psi, a pore pressure of 5200 psi, a minimum horizontal stress of 12000 psi, what is the upper bound of the maximum horizontal stress?