courtesy of Daniel Bücken, geomecon

What was first: stress or strain?

Who cares, as long as we can estimate the stress for you?

It feels like an endless discussion whether stress or strain caused the formation of the Alps, but as long as we can estimate the in-situ stress situation for your project, one of the biggest obstacles in any geomechanics analysis is overcome!
Determination of stress is an art, but at the same instance a necessity for any geomechanical analysis. Stress will influence excavation stability in tunneling, mining and drilling, as well as possible injection and depletion rates in geothermal, hydrocarbon or sequestration applications. With stress being a key input to any geomechanical analysis, highest care should be taken in estimating the stress field right.

We at geomecon have developed a dedicated workflow for estimation of the in-situ stress tensor in both green and brown field scenarios.

The determined stress tensor is the input to our simulations aiming at e.g. analysing the impact of stress on mechanics and hydraulics of complex settings like faulted reservoirs, well trajectories penetrating faults, and also on fault stability for seismic risk mitigation, or conventional analyses such as wellbore stability planning.
>>> see our other service and fact sheets at datashelf.geomecon.de.

Together with our partners we complement our services with overcoring and hydraulic stress measurements as well as microseismic inversion analysis; *please contact us for further details*.

Selected references: Central European Petroleum - green field stress modelling; G.E.O.S - simulation of stress influence on fault system; SSM - stress modelling and spalling analysis for Forsmark; St1 Deep Heat - stress field modelling and wellbore stability.

>>> p.t.o. for more details

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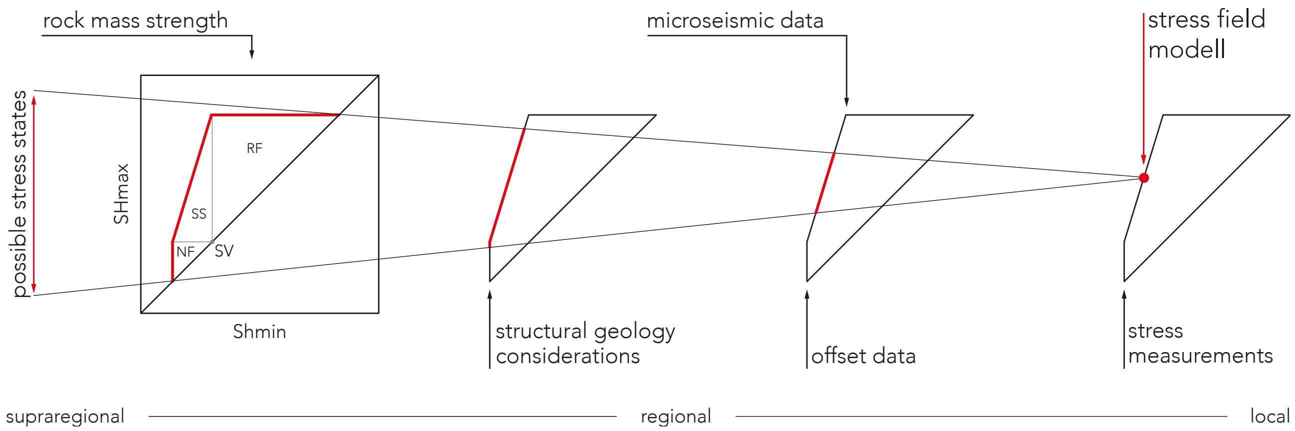


^ Basic workflow for stress tensor modelling. Starting from basic rock mechanics the possible stress states are defined and subsequently narrowed down by incorporating available data on your project area.

in-situ 1D stress field modelling

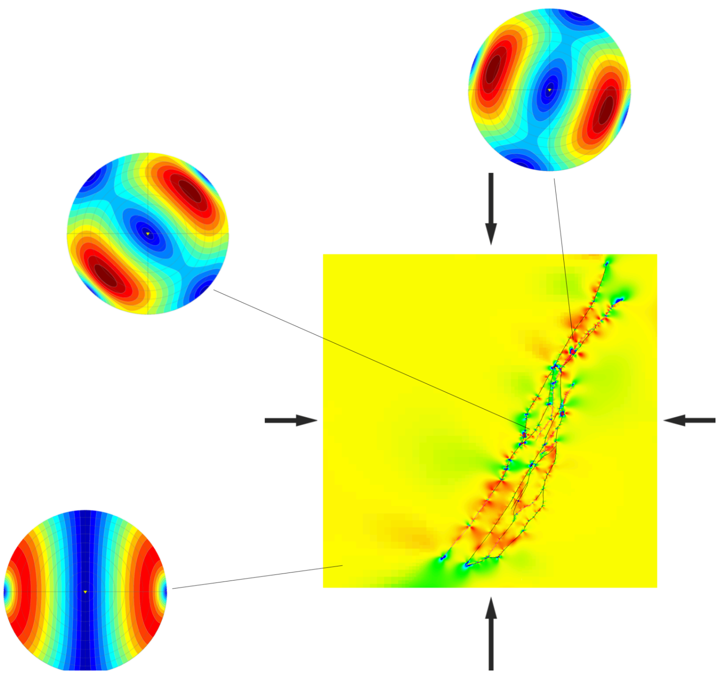
Any geomechanical analysis will only be as good as the estimate of in-situ stress. Our dedicated workflow starts with analysis of available information on the structural evolution of your play, and collects available data like stress regime indicators, offset well information, seismicity, and similar.
With subsequent construction of a strength polygon for individual depth levels of interest, possible stress states can be identified; in combination with additional data we can then indicate the sub-regional stress for the site.
The workflow aims both at green field and brown field applications.
Additional information like stress measurements will complement the analysis and improve your stress model. In hydrocarbon or geothermal applications indirect information from drilling performance (instabilities, losses, cementing) and measurements such as SRT, LOT, XLOT, FIT, HF, or MM[1] will be incorporated and improve not only reservoir understanding but also the stress field model significantly.

fault stability analysis

Complementary with stress modelling we provide ‚discontinuity stability diagrams'. These are helpful to identify less stable joint orientations or the potential of individual faults to slip.

simulation of local stress

While the 1D stress modelling yields a sub-regional estimation of stress, faults may locally alter the stresses. Our simulation approaches using our in-house code roxol™ show the spatial variation of stress orientation and magnitudes. Our 'stress simulation fact sheet' (>>> *datashelf.geomecon.de*) summarises the features of this service.



> Simulation of the stress redistribution around faults (with roxol). Red indicates regions of increased stress, green indicates regions of reduced stress. The pole plots indicate the orientation of unstable faults in the locally rotated stress regimes.

[1] SRT: step rate test, LOT: leak off test, XLOT: extended leak off test, FIT: formation integrity test, HF: hydraulic fracturing, MM: microseismic monitoring.