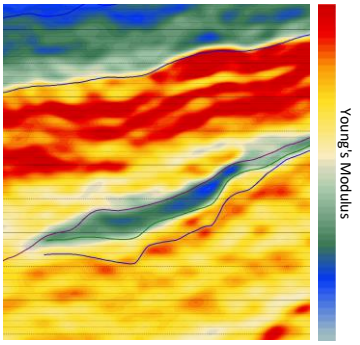
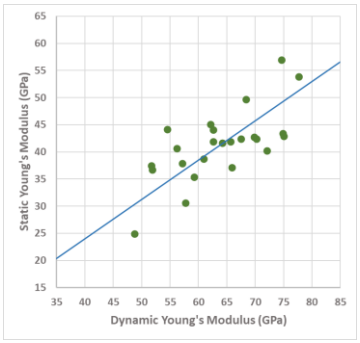
# Geomechanical Properties

Seismic data provide valuable information between wells for input into geomechanical analysis. Predictions of pore pressure and stress, calibrated to wells, give insight for operational decisions.

## Elastic Properties

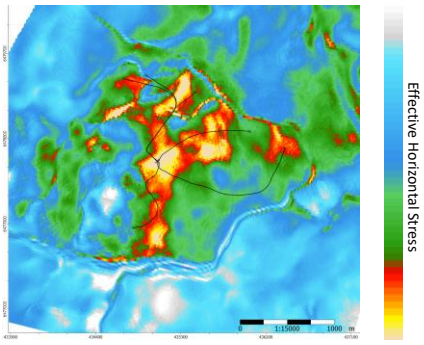
Prestack AVO inversion is able to produce estimates of Young's Modulus and Poisson's Ratio, key parameters for fracture modelling and engineering design. The dynamic values measured from seismic data can be converted to static values using relationships obtained from core data. Similar relationships can be used to calculate the equivalent horizontal values. In addition to calculating further parameters (e.g. closure stress scalar or brittleness) the static elastic properties may be used for stress calculations.

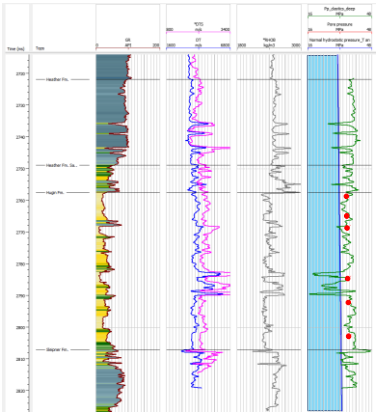


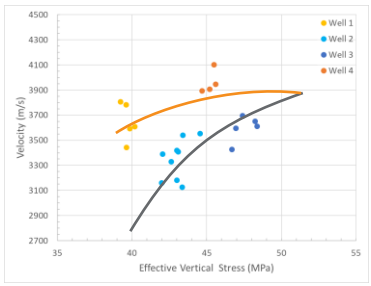




## Stress

Estimates of vertical stress (from the overburden rock) or horizontal stress (from the transfer of vertical stress to the horizontal direction) can be made from inverted volumes of density, Young's Modulus and Poisson's Ratio. Comparing these estimates with data from DFITs or mini-fracs is an important step to calibrate the measurements and make adjustments to the assumed mechanisms. The calculated total and effective stresses can be used to identify variations in behaviour across the reservoir.

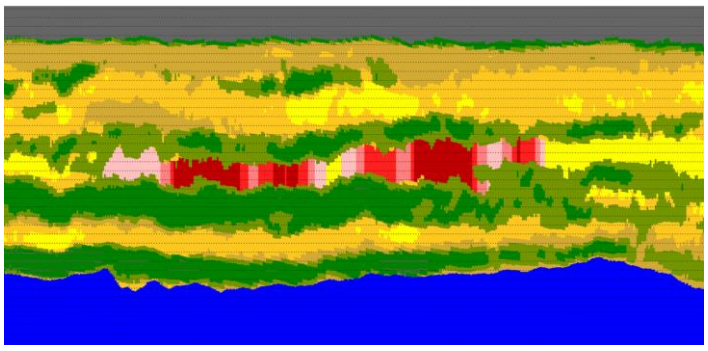





## Pore Pressure

Pore-pressure estimates from seismic data are typically based on relationships between expected and observed velocities. These relationships are modelled using pressure data and well logs, and are then applied to seismic velocities. Decomposing the estimates by various pressure mechanisms allows a more robust prediction of over- or underpressure relative to hydrostatic values. Hydrostatic pressures are calculated using rock-physics relationships to account for vertical variations due to temperature, pressure, and salinity.



## Azimuthal Variations

Stress is often anisotropic, and to account for the azimuthal variation, stress estimates can incorporate azimuthal AVO analysis. The resulting minimum horizontal stress and its orientation can show not only how the stress magnitude varies, but also how its anisotropy magnitude and orientation vary, giving insight into factors such as the predicted orientation of hydraulic fractures. This information can be layered on to geological classification using Sound QI's QI-Pro software.

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