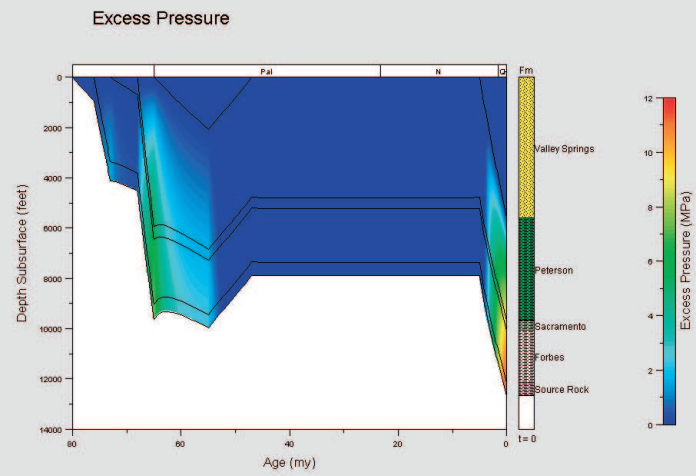
Pressure

Calculates pore fluid pressure to predict the timing and/or depth of abnormal pressure regions as well as subsequent fracturing.

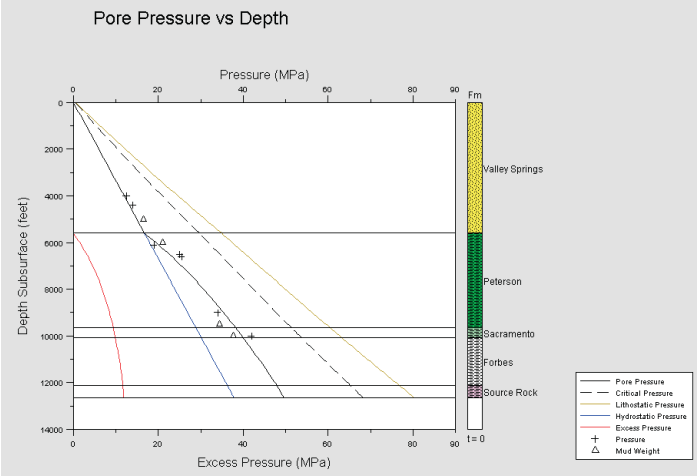
Traditional Pressure Module:
The Fluid Flow Compaction Module calculates pore fluid pressure and can be used to predict the timing of fracturing and fluid migration. It is based on the transient diffusion equation, which results when Darcy's Law is combined with the continuity equation for the conservation of total fluid mass. The hydraulic head is computed as a function of depth and time, and from this the pore pressures are calculated. Porosity comes from the burial history calculation. Permeability is modelled using either the Kozeny-Carman method, a power function, or a user-derived porosity-permeability relationship curve. The viscosity of the fluid is obtained from an empirical formula fitted to viscosity versus temperature data. Fracturing occurs when the pore pressure exceeds a specified portion of the lithostatic pressure. The effect of fracturing on fluid flow is modelled by an increased permeability, which allows the excess fluid to escape. A source/sink term, Delta Fluid, can be used to model fluid generation within a formation.

Output:
The calculated output values are permeability, pore fluid and excess pressure in the rock. These can be plotted as a function of time or depth. When plotting pressure versus depth, hydrostatic and lithostatic pressures are plotted along with a critical pressure line which represents the fracturing threshhold. Additionally, measured values of permeability, porosity, and mud weight can be plotted with calculated pore pressure data on depth graphs for calibration. Pressure can be displayed in pressure units (KPa, MPa, bars, PSI) or mud weight equivalents.

The user should be aware of the limitations of this module. It is one-dimensional, so it can only model vertical and not lateral fluid movement. The available technologies for modelling permeabilities are still quite crude, with the margin of error typically being two orders of magnitude. Calculated pressure appears to be very sensitive to even this range of variation, so it is very difficult to achieve any level of accuracy without good measured data for calibration.



Continuous Color Burial History with Excess Pressure



X vs. Depth plot showing Pore Pressure Excess Pressure, Measured Pressure, and Mudweight Values

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