

# EAGE DAILYNEWS

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# Implementing a Scalable Pore Pressure Prediction Solution

Accurate PPP analysis promotes multidisciplinary collaboration and enables new workflows.

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Accurate pore pressure prediction (PPP) analysis can have an impact on a wide range of E&P operations, from saving lives by ensuring safe drilling programs to saving money by optimizing operational constraints or risk ranking prospects during exploration.

PPP can be applied in many basins around the world where overpressure formations are encountered, for example:

- Basin centered gas in Australian basins or U.S. onshore;
- Deepwater areas in the Caspian Sea, Gulf of Mexico (GoM), offshore Brazil, Southeast Asia basins or West Africa;
- HP/HT reservoirs in the Gulf of Thailand, Haltenbanken, or elsewhere in the North Sea;
- Subsalt plays in Angola, east coast of Canada, GoM, North Caspian or the Red Sea; and
- Tertiary deltas in Brunei, Egypt, GoM, Indonesia, Nigeria or Trinidad.

PPP analysis can be performed at different GoM using a variety of data types.

At the well scale, wireline data, integrated with mud-weight data, along with drilling parameters, are used to estimate a log-based 1-D pore pressure response.

At the seismic scale, seismic velocities are used to estimate a pore pressure distribution that inherits characteristics from the seismic data. It is less accurate vertically than a 1-D well scale prediction, but provides 3-D spatially varying description of pore pressure.

To be meaningful, the geoscientist needs to ensure that these seismic velocities are geologically plausible, corrected for anisotropy effects using fit-for-purpose methods such as high-resolution residual and tomography update, and constrained velocity inversion.

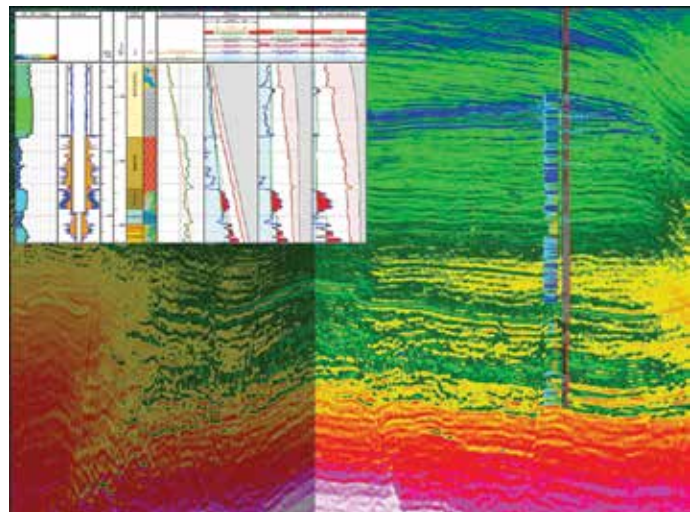
The spread of PPP tools across different domains enhances interdisciplinary collaboration and enables the integration and exchange of data for more accurate predictions while reducing operational cycle times.

Accurate predictions of pore pressures require understanding the underlying lithology, structural style and geological history of the basin. The software platform must contain rich technologies to meet these demands and support the exchange of data across disciplines utilizing the expertise of all the asset team members: engineers, geologists, petrophysicists and geophysicists.

### New software technology facilitates new practices

With the release of Paradigm 15.5, Paradigm offers scalable solutions for pore pressure prediction that promote multidisciplinary collaboration.

At the well level, Paradigm's petrophysical flagship software Geolog presents a full workflow for 1-D analysis. At the seismic scale, Paradigm offers a suite of tools for in-depth velocity optimization and PPP volume estimate using the Paradigm QSI-PPP package.



High resolution pore pressure volume with geolog pore pressure well display. (Image courtesy of Paradigm)

Geologically constrained PPP analysis is achieved with Paradigm SKUA-GOCAD.

By placing these tools at the fingertips of the complete asset team, pore pressure predictions can easily be incorporated into exploration and development workflows, providing key information for:

- Trap seal analysis: identifying protected versus possible seal breached traps;
- Reservoir quality determination: assessing if overpressure is a mechanism for porosity preservation;
- Hydrocarbon migration: overpressure influences the timing of maturation of petroleum source rocks;
- Understanding the relationship between pressure history in the source rocks and the carrier system; and
- Risking estimated resource volumes.

Interdisciplinary teams can collaborate to understand the effects of pressure lateral transfer by co-visualizing the spatial distribution of lithology and high permeability zones with pressure data, as well as structurally driven pressure compartmentalization by integrating the structural model into pore pressure prediction workflows.

In addition, drilling engineers benefit from a model-driven pore pressure prediction project that can be used for predictions for new well locations. It can also be updated with real-time drilling data to reduce NPT related to pore pressure problems that cost E&P companies millions of dollars each year.

This interdisciplinary collaboration that results in a reliable pore pressure prediction volume enables assets to be developed more efficiently and reliably. By allowing the geoscientist to identify more drillable prospects, assess subsurface uncertainties, improve drilling safety and reduce operational costs, pore pressure prediction plays a fundamental role in controlling E&P risk. ■