# Geosciences examines seismic while drilling

## FULL WAVEFORM SEISMIC

Seismic measurement while drilling (SMWD) provides in-time seismic information relevant to the placement of a well. Like conventional wireline seismic, SMWD uses a surface source and a downhole receiver. The downhole SMWD tool performs real-time calculations of the check-shot times and transmits those measurements to the surface. In addition, full-waveform seismic data are recorded and stored in a downhole memory for later retrieval when tripping the bit.

*Full Waveform Seismic Measurements While Drilling from the Caspian Sea* (SPE/IADC 79844) by **J B U Haldorsen**, **Schlumberger**; **M Krasovec**, **Massachusetts Institute of Technology**: S **A Raikes**, **T Harrold**, **D N Day**, **BP**; **J D Clippard**, **Shell E&P Technology Appication & Research**.

## PREDICTING GEOPRESSURES

This paper will summarize some results from a joint industry project organized through the Drilling Engineering Association to develop an improved methodology for pre-drill pore pressure and fracture gradient prediction for wells in deepwater.

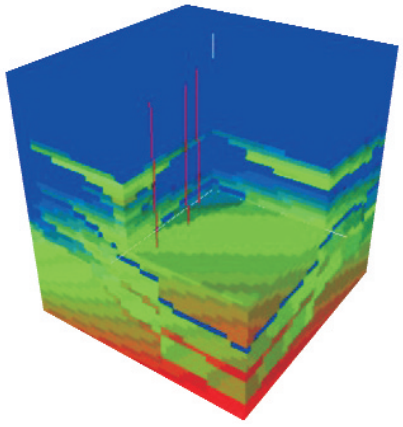
Phase 1 of the project was documented in a 300 page best practice manual and a five-day training course as well as a sizable database that includes analysis results and input data for the wells used in the project. Phase 2 is focused on further utilizing the database built in Phase 1 along with additional geologic and seismic data to construct geopressure models for several deepwater basins in the Gulf of Mexico.

*Summary of Results from a Joint Industry Study to Develop an Improved Methodology for Prediction of Geopressures for Drilling in Deepwater* (SPE/IADC 79845) by **J W Bridges**, **Knowledge Systems**.

## IMAGING WHILE DRILLING

Wellbore instability is still a leading cause of non-productive time while drilling in the Gulf of Mexico. Efforts to understand and quantify instability are often limited due to lack of direct measurements in the borehole. In this paper, root causes of wellbore instability are demonstrated through integrating direct observations (borehole image data and wellbore wall cavings morphology) with rock mechanics modeling of shear failure.

Recent experience of drilling high angle wells both on the shelf and in deepwater



**A joint industry project was organized through the Drilling Engineering Association (DEA) to develop an improved methodology for pre-drill pore pressure and fracture gradient prediction for wells in deepwater.**

has shown that more than one mechanism of instability can be active in a single wellbore. Examples are presented where Azimuthal Density Neutron (ADN) images have been tied to different cavings types within the framework of a shear failure model. This integration of observations with modeling has proved key to diagnosing both the location and the mechanism of different modes of instability.

*Imaging Unstable Wellbores While Drilling: Examples from the Gulf of Mexico* (SPE/IADC 79846) by **S T Edwards**, **B A Matsutsuyu**, **S M Wilson, BP**.

## REDUCING LOST CIRCULATION

Lost circulation is one of the major risks associated with drilling in a deepwater or subsalt environment. The downtime spent regaining circulation and the well control issues associated with it increase already high operating costs and raise critical safety concerns. This paper illustrates how formation resistivity and annular pressure measurements, combined with time-lapse logging data, have been used to determine a more accurate fracture pressure gradient, which enabled real-time drilling decisions to improve drilling efficiency.

*The Application of Real-Time Resistivity and Annular Pressure in Reducing Lost Circulation Events* (SPE/IADC 79847) by **E C Onyia**, **M A Romanchock**, **ConocoPhillips**; **A Y Akamine**, **Schlumberger**.

## PORE PRESSURE CHALLENGES

In the winter of 2001-2002 BP drilled the Havsule exploration well in 1,500m of water offshore Mid-Norway. The efficient and safe drilling of the well was a major challenge due to a series of unknown factors such as pore pressure. It was necessary to plan and drill the well with a wide range of outcomes in mind and to be prepared to adjust plans during drilling operations. This paper describes well planning and drilling to account for the uncertainties involved.

*Plan for Surprises: Pore Pressure Challenges During the Drilling of a Deepwater Exploration Well in Mid-Winter in Norway* (SPE/IADC 79848 - Alternate) by **E F Doyle**, **Knowledge Systems**; **J R Berry**, **BP**.

## POROELASTIC EFFECTS

Fracture charging becomes a dominant phenomenon drilling high pressure, high temperature wells in naturally fractured formations. Extra volume of mud absorbed by this phenomenon is perceived by the operators at the surface as loss of mud in a lost circulation zone and mud weight is reduced to prevent it. Slight reduction in mud weight returns a significant volume of mud at the surface due to closure of inflated fractures (ballooning). This mud return might be perceived as a kick and the mud weight is increased again to control the well.

*Poroelastic Effects on Borehole Balooning in Naturally Fractured Formations* (SPE/IADC 79849 - Alternate) by **O A Helstrup**, **M K Rahman**, **S S Rahman**, **University of New South Wales**.