Extracting Maximum Value from Seismic Interpretation

A new plug-in enables semiautomatic horizon mapping.

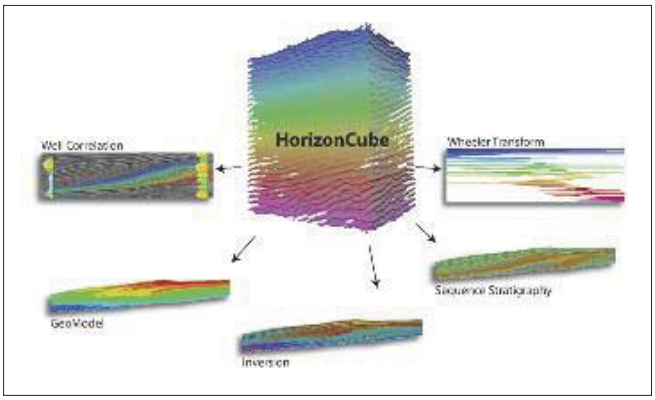
Contributed by dGB Earth Sciences

One of the key challenges in seismic interpretation today is extracting maximum value from multiple volumes of often highly complex seismic and geological data.

Too often, conventional interpretation workflows, based on a limited number of mapped horizons, lead to a general geological model where the original data measured in gigabytes ultimately is reduced to a few kilobytes of interpreted data with potentially valuable information lost – not a basis on which crucial economic and reservoir management decisions should be made.

dGB Earth Sciences is addressing this paucity of mapped horizons head-on with the latest version of its OpendTect software platform, OpendTect 4.2, which will be launched as a beta version at the 2010 Society of Exploration Geophysicists Annual Conference.

Along with new interpretation, editing, and visualization features, one of the central elements of OpendTect 4.2 is the new HorizonCube plug-in. The plug-in's semi-automated techniques increase the number of mapped horizons, with benefits regarding model building, rock property predictions, well correlation, and improved commercial success.



One of the central elements of OpendTect 4.2 is the new HorizonCube plug-in. ***(Image courtesy of dGB Earth Sciences)***

HorizonCube consists of a dense set of correlated 3-D stratigraphic surfaces that are assigned a relative geological age with a corresponding color. A second-generation 3-D chronostratigraphy auto-tracker algorithm tracks the dip/azimuth field to generate horizons that typically are separated by one sample at the starting position. This enables the dip/azimuth field to be smoothed, reduces the impact of random noise, and allows the user to control the detail that must be captured by the horizon tracker.

Originally designed for the sequence stratigraphy domain, today OpendTect 4.2 and HorizonCube have applications across the entire interpretation workflow.

HorizonCube and its densely mapped horizons will allow a more accurate and detailed low-frequency model to be built than was previously the case. The greater the number of horizons, the greater accuracy in the acoustic impedance (AI) and elastic impedance inversion results and the generation of a high-resolution model which more faithfully honors the seismic.

Other OpendTect plug-ins, such as the neural networks plug-in, also can be used to better predict rock properties from the AI volume, thereby avoiding the use of oversimplified linear models that are unable to describe most rock property relations. The result is a model that is the cornerstone of the seismic interpretation process with better seismic predictions and more accurate input into reservoir management decision-making.

Well correlation also can be improved. While HorizonCube is not yet part of the well-correlation tool's panel in OpendTect 4.2, its densely tracked horizon mapping is likely to enhance well correlation in the near future by enabling the interpreter to view in detail how events are correlated between the wells and how rock properties vary laterally.

HorizonCube includes improved seismic stratigraphy features. Users can interactively reconstruct the depositional history in geological time using the HorizonCube slider, flatten seismic data in the Wheeler domain, and make full system tracts interpretations with automatic stratigraphic surfaces identification and base-level reconstruction.

HorizonCube is just one element of OpendTect 4.2. The new version also comes with cross-plotting features:

- The ability to predict rock properties by cross-plotting color-coded well logs and attributes;
- A color density plot workflow that predicts the relationships between the seismic volumes and well properties; and
- The creation of PDFs in the cross-plot domain that can be applied to create rock property probability volumes.

New visualization, editing, and data integration features include an enhanced 2-D viewer with added tree, horizon, and fault tracking capabilities that allow for smooth 3-D auto-tracking in fault blocks and 3-D horizon tracking that can be bound to fault compartments as well as directional lighting capabilities that highlight geological objects with an artificial angled light.

OpendTect 4.2 also will support Wacom's tablet PCs and interactive pen display, allowing for the drawing of horizons, faults, and objects in a user-friendly and graphics-focused environment that comes with the ability to post OpendTect 4.2 data in Google Earth and translate GUI text using Google Translate – an important tool in OpendTect's applicability across the world.

Today, OpendTect stands as a practical and innovative open-source solution that can help shine a light on the most complex structural geologies. To find out more, visit dGB Earth Sciences booth 546. ■