

by *Rebecca Latimer*
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Uses, Abuses and Examples of Seismic-Derived Acoustic Impedance Data: What Does the Interpreter Need to Know?

Throughout the years there has been a concerted effort to integrate the geoscience disciplines to become more adept at understanding the petroleum potential of an area. In the 1980s, geophysicists interpreted 2D seismic data by overlaying log data on paper seismic sections and using generalized depth-to-time curves to determine which events represented markers on the logs. Geologists interpreted cross-sections by drawing straight lines between wells to represent their correlations. Because technology advances have changed the process, many people today have become “interpreters” of 2D or 3D data on workstations where the log data, seismic data and many derivations of the seismic data (attributes, coherence, P impedance, inversions, elastic impedance, lambda rho, etc.) are available to fine-tune the analysis process. The question, however, still remains: Are we integrating the data yet?

Inversion of seismic data into acoustic impedance provides a natural tie to the log impedance data and forces the geoscientist, in analyzing seismic data, to extract appropriate wavelets, determine the phase and amplitude of the data, determine whether or not the phase is stable throughout the volume and very intimately tie the well log impedance data to the seismic data. Utilizing inverted data at the beginning of the interpretation process requires that the geoscientist understand the rock properties in the target area before embarking on an “attribute” interpretation. Even when the P impedance data do not clearly distinguish between fluids or lithologies, value is added by using these data as the first interpretation tool. The simplicity in knowing that the change of values represents a change in rock properties without the complexity of wavelet variability is a distinct advantage to the interpreter. This initial process is critical to undertaking any interpretation of seismic data. Seismic data,

being an interface property, contain tuning, side lobe effects, and phase and frequency variability, making it difficult to directly determine the geology. Inverted data, layer properties, are a more intuitive geologic tool that allows interpreters to utilize their natural ability to “see” the geology in the seismic data.

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Today, advanced impedance tools use angle-stack data and shear log components that can aid in distinguishing between lithologies and hydrocarbon properties. These data combine the benefits of angle data, AVO, and rock properties, which—when analyzed together with an understanding of the depositional environments, stratigraphic concepts, and the myriad of seismic attributes—can greatly increase the interpretative ability of the geoscientist.

This presentation will demonstrate the necessity for inversion and explain why it is beneficial in an interpretation workflow. It will examine both the strengths and drawbacks of using inverted data as compared with the seismic data and the original rock data. It will also show

- how scale differences between various data types can affect the results,
- how the interpreter analyzes the rock properties and utilizes these with inverted data, and
- how to spot pitfalls in the overuse of impedance data. ■

Biographical Sketch

REBECCA BUXTON LATIMER is team leader for Chevron’s Energy Technology deepwater stratigraphy team in Houston, Texas. She received an MS in geology/geophysics from Boston College in 1980 and has been in the oil industry for 26 years.

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Ms Latimer started her career with Amoco in New Orleans in 1980. In 1986, she moved to Houston with Amoco and worked as an interpreter and sequence stratigrapher in a series of basin-modeling groups. In 1989 she moved to Stavanger, Norway, where she worked as a sequence stratigrapher for Enterprise Oil. After leaving Amoco in 1992, she worked for five



years as an inversion/geostatistics specialist and Chief Geoscientist with Jason Geosystems in Houston.

Ms Latimer joined Texaco's Upstream Technology Group in 2000, doing work in seismic inversion and geostatistics. After the merger of Chevron and Texaco, she became a team leader in ChevronTexaco's Energy Technology Company, supporting the business units, worldwide. She is also an editor for the SEG's *Leading Edge* magazine.

Volunteer of the Month



BONNIE MILNE-ANDREWS stepped to the role of the International Explorationists' Group technical program chairman in January 2006, taking over for Ian Poyntz, who had successfully organized the International Group's program for almost 2 years. She works for Swift Energy International in north Houston as a key member of their New Ventures/International explo-

ration team. Before joining Swift Energy, Bonnie spent 20 years as a geologist with Amoco Corporation, and later worked with Schlumberger's NExT group. She brings the HGS International group over 25 years of industry experience, having worked challenging project areas in North America, Qatar, Gabon, Bolivia, Argentina, Russia, Kazakhstan, New Zealand and Australia.

A lot of Houston geologists know Bonnie as a member of the AAPG House of Delegates (Houston chapter) and for helping the AAPG organization. She is chairman for the Career Center activities of the upcoming April AAPG 2006 Annual Convention in Houston.

All this international experience is far away from her start in the oil industry, which began when she graduated with a Master of Science degree in geology from the University of Iowa. She remains active as a member of the Geological Alumni Advisory Board at her alma mater, is married to Houston attorney Jim Andrews and is also a proud mom to George Caracostis, a freshman at Texas State University. ■

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