Making Sense of all that AVO Stuff

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Abstract

Over the last few years, a multitude of new and different AVO (Amplitude Variations with Offset) and pre-stack inversion techniques have been developed, all of which put a slightly different spin on the way we extract information about the fluids and rock types within our reservoir. For the working interpreter, keeping track of all of these different methods and how they relate to each other has become an almost impossible task. This talk will review the full range of AVO methods and discuss how they are fundamentally related.

In this talk, I will show that AVO techniques can be subdivided into one of two sub-groups:

1. seismic reflectivity methods, or
2. impedance methods.

Seismic reflectivity methods include: angle-limited stacks, intercept versus gradient analysis and the fluid factor. Impedance methods include: P and S-impedance inversion, lambda-mu-rho (LMR), and Elastic Impedance.

Although all AVO methods are related through the same linearized approximation to the Zoeppritz equations for elastic wave propagation and reflection, the way in which each method is derived will shed light on its particular strengths and weaknesses. I will show that although seismic reflectivity methods are straightforward to derive and to interpret, they do not give us the reservoir properties that a geologist would like to see. On the other hand, impedance methods are more difficult to derive but give us more geologically-based physical parameters about the reservoir. In the final analysis, there is no single "best" AVO method for solving all of our exploration objectives. We must pick the method that works best in a particular area.

In this talk, the information presented will be relatively non-mathematical and instead stress the fundamental geology and geophysics behind each method. Also, each method will be illustrated using a shallow gas sand example from Alberta as well as examples from other basins throughout the world.

Brian Russell has been an exploration geophysicist for over thirty years. He started his career with Chevron Standard in Calgary in 1976 as an exploration geophysicist, and also worked for Chevron in their Houston office. He then worked for both Teknica Resource Development and Veritas Seismic in Calgary before co-founding Hampson-Russell Software Ltd. with Dan Hampson in 1987. In 2002 Hampson-Russell became a wholly-owned subsidiary of VeritasDGC Inc, subsequently CGGVeritas, where he is now Vice President. Dr. Russell is also an Adjunct Professor in the Department of Geoscience at the University of Calgary.

Brian's research interests include amplitude variations with offset (AVO), seismic inversion and seismic attribute analysis. His papers have appeared in Geophysics, The Leading Edge, Exploration Geophysics and the Journal of Petroleum Geology and he is the author of the SEG Course Notes publication entitled: Introduction to Seismic Inversion Techniques. In addition, he presents training courses on inversion, AVO and seismic attributes to petroleum geophysicists throughout the world.

Brian has been very active in both CSEG and SEG. He was President of CSEG in 1991, received the CSEG Meritorious Service Award in 1995, the CSEG medal in 1999 and CSEG Honorary Membership in 2001. With SEG, he served as chairman of The Leading Edge editorial board in 1995, technical co-chairman of the 1996 SEG annual meeting in Denver and as President in 1998. In 1996, he and Dan Hampson were awarded the SEG Enterprise Award, he received SEG Life Membership in 2005, and in 2008 received SEG Honorary Membership. Brian is currently Chairman of the CSEG Foundation Board and on the Board of the SEG Foundation.

Brian holds a B.Sc. in geophysics from the University of Saskatchewan, a M.Sc. in geophysics from Durham University, U.K., a Ph.D. in geophysics from the University of Calgary and is registered as a Professional Geophysicist (P.Geoph.) in the Province of Alberta.

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JUNE LUNCHEON

DATE:	June 15, 2009
TIME:	11:30 A.M. Lunch
LOCATION:	Telus Convention Centre, Calgary
TICKETS:	Contact CSEG office
TELEPHONE:	403-262-0015 or Fax: 403-262-7383

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