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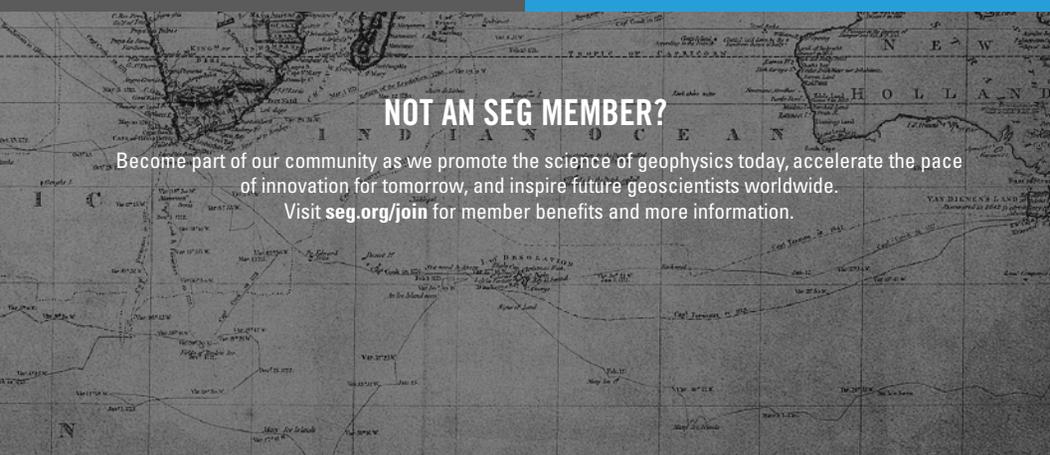
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2016 NORTH AMERICA
HONORARY LECTURER

Sigsbee Escarpment →
Controlled by salt edge

Mad Dog

Atlantis

VE 1.5
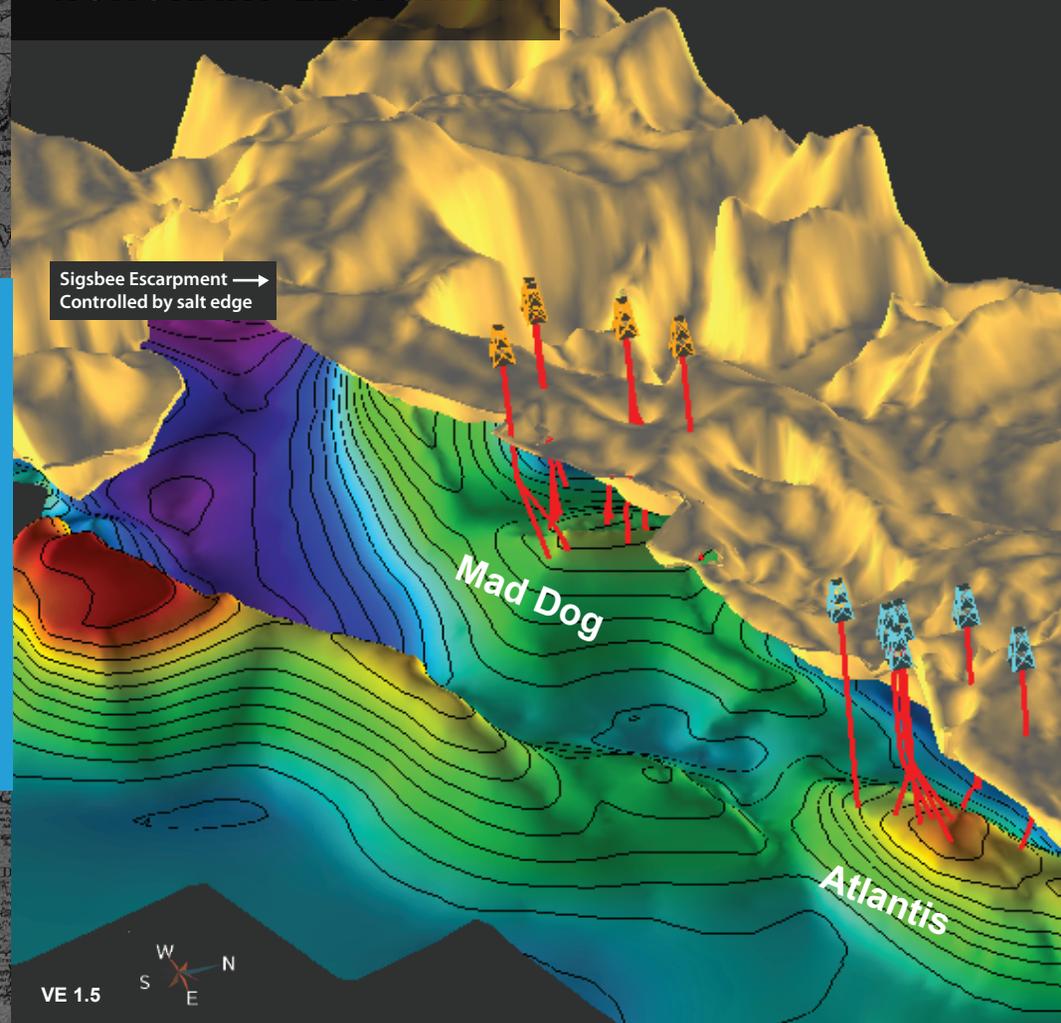
Subsalt Imaging:
Snapshots in Time,
Reflections, and Next Steps

## Presented by Scott Michell
BP America

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ABSTRACT

Many individuals, companies, consortia, and joint ventures have contributed to the current industry capabilities in subsalt imaging. The lecture will focus on the thought processes, business needs, and technologies that led to BP sponsoring two significant field trials of wide-azimuth acquisition technologies in 2005–2006 and how BP and the industry have responded since that time. Seismic acquisition is a necessary but not sufficient condition to achieving the subsalt image. Time processing, imaging algorithms, and the velocity model also are required to achieve a high-quality image and, as such, I will discuss some key enablers in the journey toward the industry's current capabilities.

In the early 1990s, there were legitimate concerns about how and if we would be able to solve the subsalt imaging challenge. Evolution of acquisition design, signal processing, imaging algorithms, and velocity determination were and are required to deliver significant improvements. Developments in velocity-model building, depth imaging, and demultiple helped but not enough to develop deep water subsalt Gulf of Mexico (GoM) discoveries and to progress large investments in leases to drillable exploration prospects.

Significant effort over a sustained period of time on the impact that acquisition has on the image yielded two alternative designs, Wide-azimuth Towed Streamer (WATS) and Wide-azimuth Ocean-bottom Node (OBN) recording, to address the imaging challenges. Finite-difference modeling set the basic parameters that needed to be achieved in the field. Learnings from previous acquisition systems design efforts (Amoco SGR's, Valhall permanent OBC, and other design efforts) and incorporating new technologies facilitated the application of the first WATS and commercial deep water OBN surveys in 2005–2006 at the Mad Dog and Atlantis fields in the GoM. Both surveys were a success, but there were some surprises, and gaps in the image remained. New acquisition techniques led to additional processing innovations, improved application of existing technologies, and significant demands on computational resources.

Wide-azimuth Towed Streamer and OBN acquisitions have had broad take-up since their introduction. The technologies have evolved allowing for more efficient, wider azimuth, and longer offset acquisition. The application of these designs and their impact, along with 3D VSPs, to fill in imaging gaps will be the subject of the lecture, including some recent 4D results. Significant progress has been made, but many challenges remain.
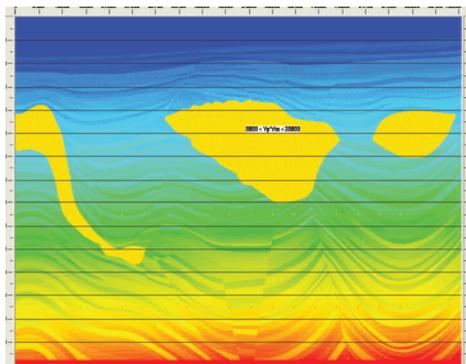
Above: 2D ELASTIC MODEL FOR WAVEFIELD INVESTIGATIONS OF SUBSALT, OBJECTIVES, DEEP WATER GULF OF MEXICO
D. Stoughton, BHP Petroleum, J. Stefani, Chevron Petroleum Technology Co. and S. Michell, BP; 2001 SEG*

BIOGRAPHY

Scott Michell joined Conoco in Ponca City, Oklahoma in 1991 as a seismic processor. The link between seismic acquisition and the final image became apparent, particularly as the industry moved from predominantly 2D to 3D data and from time imaging to depth imaging. He worked closely with the R&D teams and the processing teams to deliver high-end land and marine images with a variety of challenges including permafrost and other complex near- surface issues, multiples, anisotropy, and the challenge of moving from time imaging to depth imaging.

Upon joining BP Exploration in 1997 Michell took up the challenge of understanding acquisition footprint on TZ data and subsalt imaging. He was involved in designing and implementing a unique joint venture of five oil companies called SMAART, which was formed in 1998. As the BP technical representative, Michell worked with the SMAART Joint Venture to investigate and apply strategies for removing multiples from beneath salt and later to investigate the impact of acquisition on subsalt imaging. The SMAART JV was awarded the SEG Distinguished Achievement Award in 2008. After his involvement with the SMAART JV ended Michell went back to the depth-imaging problem examining strategies to build complex salt models and incorporating multiple data sets. He was part of the BP team that developed, designed, and implemented both the WATS technology and the OBN applications in the Deep Water GoM campaign. After the OBN and WATS surveys, Michell managed a team of leading scientists in BP's Advanced Seismic Imaging Flagship group. He has also been the seismic delivery manager for North America Gas, Alaska and for the Gulf of Mexico region which has just completed an extensive 4D OBN campaign and two very large 3D VSPs. He is now Complex Imaging Manager in Upstream Technology for BP.

To see Scott Michell's full itinerary or to view previous Honorary and Distinguished Lecturer presentations, visit:
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