SIPES Luncheon Meeting
Case Study:
Highest Possible Resolution (HPR) Stratigraphic Imaging of a Deep Reef Platform

Dr. Norman S. Neidell, *N. S. Neidell and Associates (Speaker)*
Mr. James M. Charuk, *Starboard Energy*
Mr. David C. Montoya, *President, Monoco Petroleum Inc.*

To illustrate the use and benefits of Highest Possible Resolution (HPR) Stratigraphic Imaging, we present a case study using a small 3D survey over an onshore reef platform which lies at a depth greater than 15,000 feet. The views offered by the imaging from time slices and vertical sections offer remarkable direct insights into the development of the reefs on the platform, their hydrocarbon potential, the cyclic development of the carbonate lithology, shales and anhydrites, and the correlation with the well control. Seismic images (time slices) in this case look remarkably like modern aerial photographs over reef complexes. The study is significant in that it readily identifies and explains a high-volume producing gas well and a well that was deemed non-commercial.

Holographic principles applied to seismic imaging produce results having significantly broader band-widths and higher resolution than conventional signal-processing methods. Low-energy boundaries which are sharp and have great lateral continuity allow imaging to extraordinarily high frequencies. Boundaries from high-energy environments showing vertical grading and Fresnel scale lateral variations would have much lower resolution by their nature. Such imaging is termed HPR imaging and actually can estimate depositional energy.

HPR imaging typically produces results having anywhere from 8 to 32 times standard pre-stack imaging outputs in terms of samples. Resolution increases by factors of three or four are typical, although greater factors can be attained as one might expect in low-energy depositional environments.

Inversion displays of velocity are produced using an Extended Visual Dynamic Range Color format and present five times the information of typical color displays and 25 times more than black-and-white data presentations. These displays aid significantly in recognizing lithology, geopressure, porosity, and possible hydrocarbons, particularly in high-velocity or consolidated lithologic conditions.

Great Barrier Reef Source: ABC News

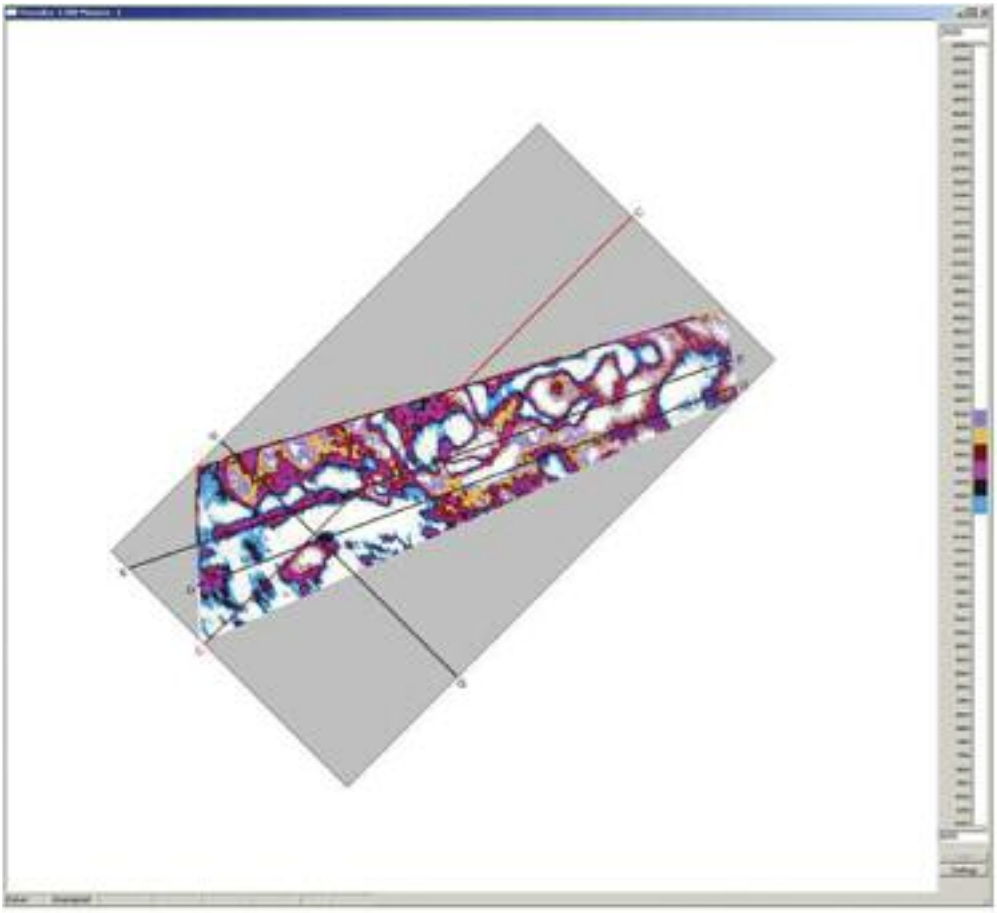
The seismic displays are readily interpreted on workstations using standard geological principles and ideas. Lithology identification, fluids, and other features can be noted with clarity and resolution with a fair degree of confidence based on the known correlations. These displays are contrasted with conventional views, which, as noted, offer far less insight and information.

Particularly noteworthy is, that by increasing seismic resolution by a factor of three or four, results better approximate the relevant geological scale, and from 17 to 23 cycles of reef development can be recognized. Dramatic displays are seen where the velocity range related to the particular age carbonates are isolated. The resulting "aerial" views via the time slices show tidal channels, atolls, and other features. Another dramatic series of displays can be developed indicating where gas is most likely **SIPES Luncheon** *continued on page 39*

SIPES Luncheon Meeting continued from page 37

to be found. This is accomplished by coloring in black the velocity most likely to indicate porosity with gas presence.

The high-resolution displays of the reef platform, by its nature as a high-velocity carbonate environment at fairly significant depth, demonstrate that the method is robust and can perform well in a circumstance that most would agree offers some challenges. HPR Imaging has proved itself yet again to be a most useful interpretive tool under another set of geologic conditions. ■



Time slice – possible gases

Biographical Sketch

NORMAN S. NEIDELL (neidell@worldnet.att.net) received a B.S. from New York University, a Post Graduate Diploma in applied geophysics from Imperial College, and a Ph.D. in geodesy and geophysics from Cambridge University. He acquired basic experience with Gulf Oil and Seiscom-Delta and then undertook independent ventures and consulting in 1971. His special interests include seismic stratigraphy, reservoir definition, and imaging technology which has resulting in international recognition for his work. He has extensive experience consulting and lecturing in all aspects involving seismic data and imaging. He has authored numerous technical papers and patents and made presentations before many learned groups both in the United States and abroad.

Dr. Neidell co-founded GeoQuest International (now part of Petroleum Information), GeoQuest Systems (now a Schlumberger company), and Zenith Exploration Co. serving as its President and Chief Executive Officer. He co-founded Gandalf Explorers Intl. Ltd., which by merger became MMS Petroleum, PLC, a public company in Ireland and the U.K. until its acquisition in December 1998 by Ramco Energy. His current interests include applications for the new ultra-high resolution method of seismic imaging which he has developed. To exploit this technology, he founded Wavefield Image, Inc. In 1997, Wavefield Image merged into Zydeco Energy and Dr. Neidell joined Zydeco as Vice President of Innovations. In 1999, he re-initiated his consulting practice, which is currently ongoing.

Dr. Neidell is a Past President and Honorary Member of the Geophysical Society of Houston (GSH), a Distinguished Lecturer for the SEG and an Honorary Life Member, a Past Associate Editor of Geophysics and a member of several AAPG and SEG committees. He lectures in continuing education programs for the AAPG, SEG and SPE as well as for several universities. He is a Registered Professional Geophysicist (California), Professional Geoscientist (Texas), and a Certified Geologist (Arkansas and SIPES).