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4-D Seismic Interpretation Technologies and their Application to the Eugene Island 330 Field, Offshore Louisiana

By Roger N. Anderson, Lamont-Doherty Earth Observatory, Columbia University, New York. **AAPG Distinguished Lecturer**

The Global Basins Research Network has developed 4-D volume processing and attribute analysis algorithms to identify significant seismic amplitude interconnectivity and changes over time that result from active fluid migration. To accomplish this 4-D imaging, we use multiple 3-D seismic surveys done several years apart over the same blocks.

We have applied these 4-D analysis techniques to known production from the most prolific Pleistocene oil field in the world, the Eugene Island 330 Field, offshore Louisiana. Three main producing reservoirs were examined at 4,500, 5,400, and 7,200 ft. Dim outs were detected where production depleted oil and gas during the interval of investigation, and amplitude increases were observed where gas/oil ratios increased during production. The "oil/water contact" movement was detected by the 4-D technique. When combined with active pressure and temperature monitoring, repeated 3-D seismic imaging of producing fields promises to identify missed hydrocarbon zones and to provide the critical production management information of the future.

In addition, we have imaged fluid flow pathways that are actively recharging shallower reservoirs in the field from fluid sources that appear to be turbidite stacks within salt withdrawal mini-basins buried deep within geopressure. Fault zone conduits provide the migration pathways out of geopressure. If correct, large reserves remain untapped within the deep shelf of the northern Gulf of Mexico.

Biographical Sketch

Roger N. Anderson has authored a marine geology textbook, a CD-ROM, five patents, and more than 130 peer-reviewed scientific papers. He has a B.S. and an M.S. degree from the University of Oklahoma and a Ph.D. from the Scripps Institute of Oceanography, University of California, San Diego. He has been associated with the Lamont-Doherty Earth Observatory and Columbia University since 1974. ■