



[Print this article](#)

[Close](#)

## Venture seeks better seismic imaging of deep prospects

A partnership led by Repsol YPF SA has launched a project to apply unprecedented computing power to geophysics to reduce the risk in exploration of deep subsalt prospects under ultradeep water of the Gulf of Mexico.

Repsol YPF said the partnership gives it exclusive or privileged access to the know-how it needs to combine for the first time the hardware and software necessary to commercially image structures that, at more than 40,000 ft, are impossible to resolve on today's best 3D seismic data.

The company said it is pursuing the "full realization of the next generation of seismic imaging technology, including a specialized technique called reverse time migration (RTM), that will accelerate and streamline oil and gas exploration by several orders of magnitude compared to current industry standards."

Joining Repsol YPF in the Kaleidoscope Project are 3DGeo Development Inc., a private Houston imaging company formed by Stanford University associate professor and seismic imaging pioneer Biondo Biondi, and the Barcelona Supercomputing Center (BSC), owned by the government of Spain. 3DGeo will open a Barcelona office.

Repsol YPF also has joined the university's Stanford Exploration Project, an industry-funded academic consortium aimed at improving the theory and practice of constructing 3D and 4D images of the earth from echo soundings.

### Applying RTM

Industry has known of the RTM technique since the 1970s, but the computer power necessary to perform it profitably and apply it widely has not been available, said Francisco Ortigosa of Houston, Repsol YPF's chief geophysicist and Kaleidoscope project leader.

The technique involves the fast Fourier transform of 3D data sets, which requires computing power many times greater than what is in use in exploration today, Ortigosa said.

"We can realistically say that we will reach speeds fast enough to make RTM a routine processing [step] in exploration and not something for special processing. If we achieve RTM with the productivities of salt profile migration, we will be satisfied," he said.

The cost of supercomputers based on IBM Corp.'s Cell Broadband Engine (BE) processor may also decline because the gaming industry plans to produce millions of similar processors, Ortigosa added.

The partnership gives Repsol YPF exclusive access to the three key components of advanced seismic imaging.

These are: the RTM codes or algorithms through the company's relationship with the pioneers of the technology; privileged access through the Barcelona center to Cell BE-based systems; and exclusive access to the center's research experience and the MareNostrum supercomputer.

MareNostrum, developed by IBM, is the world's fifth most powerful supercomputer. Public benchmarks show that the Cell BE processors perform the computation of fast Fourier transforms 40 times faster than the leading brand processors, Repsol YPF said.

Biondi said, "3DGeo will develop a suite of production-ready high-end imaging applications that implement the most advanced algorithms developed at 3DGeo, at Stanford, and in the industry, culminating with heretofore unimplemented cutting-edge, full-wavefield imaging techniques.

"Testing of these new compute-intensive imaging algorithms will benefit from the exceptional computational capabilities available at the MareNostrum supercomputer center in Barcelona, and with BSC's vast experience in computer architecture and parallelization."

The imaging development effort will require extensive testing and trial runs of challenging 3D data sets. The development and testing will be conducted at the MareNostrum supercomputer center by 3DGeo personnel working in conjunction with Repsol YPF and BSC personnel.

### The project

Kaleidoscope "brings together the necessary components of modeling, algorithms, and the uniquely powerful computing power of the MareNostrum supercomputer to realize the promise of RTM and incorporate it into daily processing flows," Repsol YPF said.

The process integrates steps traditionally taken sequentially, Ortigosa said.

3DGeo is one of the pioneers in wave-equation migration and velocity-model building. The Barcelona center has vast experience in computer architecture and in parallelization for the Cell BE processor.

Biondi said, "We estimate that this solution will accelerate seismic imaging by several orders of magnitude compared to conventional solutions running on standard Linux clusters."

First deployment of RTM in the gulf could come as early as the end of the first quarter of 2007. The partnership is initially chartered for 5 years but is meant to develop into a long-term relationship as other technology challenges emerge, Ortigosa said. Eventually RTM could have application off West Africa and Brazil, he added.

Repsol YPF operates 45 of the 85 exploration blocks in which it holds interests in the gulf, where it has been a player since 2002. The blocks are in Green Canyon, Atwater Valley, Alaminos Canyon, and Mississippi Canyon. The company's first important gulf production is to start in 2007 at a net 7,500 b/d of oil and 7.5 MMscfd of gas from Neptune field.

*Oil & Gas Journal* November 27, 2006

volume 104, issue 44

**Author(s)** : Alan Petzet

---

To access this article, go to:

[http://www.ogj.com/articles/article\\_display.cfm?ARTICLE\\_ID=278200&p=7](http://www.ogj.com/articles/article_display.cfm?ARTICLE_ID=278200&p=7)

---

Copyright © 2008: PennWell Corporation, Tulsa, OK; All Rights Reserved.