

Geoscience Australia's Southwest Frontiers Geophysical Survey: NEW DATA AND OPPORTUNITIES FOR PETROLEUM EXPLORATION

Barry Bradshaw, Alexey Goncharov and Fred Krob

A geophysical survey of the southwestern Australian continental margin is the latest project to be funded by the Australian Government's \$25 million 'New Oil' initiative.

Geophysical data collected during the Southwest Frontiers survey will be used to assess the petroleum potential of offshore basins on the southwest margin that are not currently held under permit. These include the frontier Mentelle Basin, the Bremer Sub-basin (part of the western Bight Basin) and the previously explored Vlaming Sub-basin (part of the Perth Basin).

Acquiring seismic data in this area is very challenging, with shallow carbonate hard-grounds in the Vlaming Sub-basin, deep water conditions (200–4000 m) in the Mentelle Basin and Bremer Sub-basin, and a system of submarine canyons throughout the Bremer Sub-basin.

Geoscience Australia contracted Veritas DGC to undertake the survey using its MV *Pacific Sword*, a dual-source, dual-streamer seismic vessel equipped with advanced integrated geophysical and navigation data acquisition systems.

Undertaken in October and November 2004, the survey acquired 2700 kilometres of industry-standard, 106-fold seismic reflection data recorded to 12 seconds two-way time using a 6–8 kilometre digital streamer and 4900 cubic inch air gun array. Seismic data collected includes 11 lines (1300 km) in the Bremer Sub-basin, seven lines (1100 km) in the Mentelle Basin, and three lines (300 km) in the Vlaming Sub-basin (figure 1).

This is the first seismic reflection data to be acquired in the Mentelle Basin and Bremer Sub-basin in almost 30 years, and the first in over a decade from the Vlaming Sub-basin. The new data provides a regional coverage of the Bremer Sub-basin and Mentelle Basin, and will help determine if suitable geological conditions exist in these frontier basins to have generated and trapped hydrocarbons.

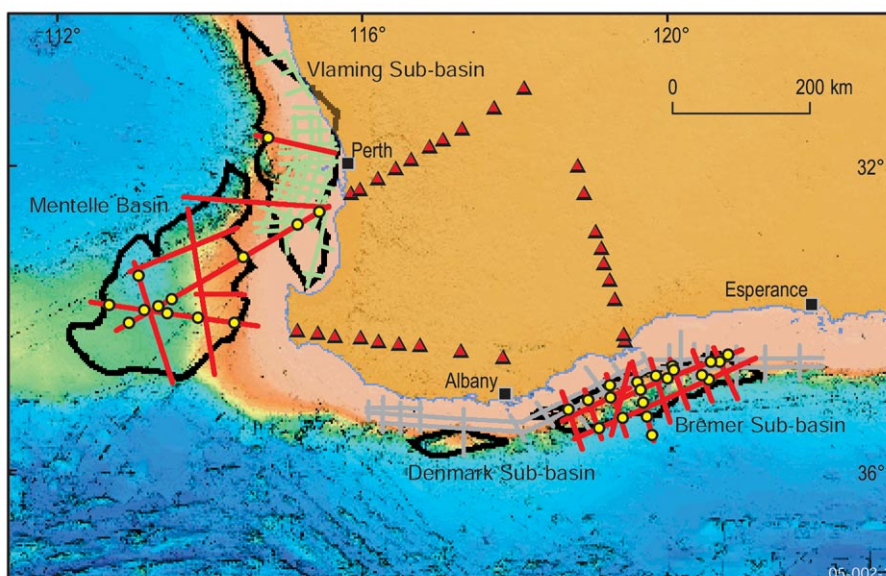
The survey will also provide the first deep seismic reflection data (> 6 seconds two-way time) in the Vlaming Sub-basin. This data will be integrated with a 2000-kilometre grid of recently reprocessed data to improve our understanding of the geology and petroleum prospectivity of the sub-basin.



Launching a sonobuoy from the deck of the *Pacific Sword*.



Detail of a sonobuoy before launch



- Reprocessed seismic (Vlaming)
- Southwest Frontiers Survey
- Sonobuoy location
- Reprocessed seismic (Bremer)
- ▲ Refraction land recorder

◀ **Figure 1.** Map showing the location of the Southwest Frontiers offshore seismic survey and the associated land refraction recording stations. Also shown are the line locations of older seismic surveys that have recently been reprocessed.



View astern from the deck of the *Pacific Sword* during seismic collection



MV *Pacific Sword*, the seismic acquisition vessel contracted from Veritas by Geoscience Australia for the Southwest Frontiers survey

The seismic acquisition involved deployment of sonobuoys at sea and recording stations on land. The land stations were placed along the onshore continuation of three key survey lines (figure 1) to record refractions from the seismic vessel's energy source—a 4900 cubic inch air gun array.

The objectives of this refraction work are to:

- estimate seismic velocities to better constrain conversion of reflection time to true depth
- estimate sediment thickness
- constrain gravity modelling
- investigate the nature of basement and crust in this part of Australia.

Twenty-nine sonobuoys (19 in the Bremer Sub-basin) recorded data to maximum offsets of 23 kilometres. The onshore refraction survey deployed 19 stations in line with two survey lines in the Mentelle–Vlaming area, and nine stations collinear with one line in the Bremer Sub-basin. The new refraction seismic data will add substantially to existing onshore and offshore refraction datasets for this region.

All seismic reflection data (including field tapes) acquired during the Southwest Frontiers Survey with basic on-board processing (Radon de-multiple, DMO, Stack, Migration) will be available at cost-of-transfer rates from April 2005.

Three lines acquired in the Vlaming Sub-basin will be available from April 2005 for use by explorers interested in the 2004 acreage release permit W04-17 in this area. Seismic data acquired from the Bremer Sub-basin will be processed further (SRME, XRMult, Pre Stack time and/or depth migration, full stacks, near, middle and far offset stacks), and will also be available at cost-of-transfer rates in April 2005.

Reprocessed seismic datasets from previous industry surveys in the Vlaming and Bremer sub-basins are currently accessible through the Geoscience Australia Data Repository.

For more information, contact Barry Bradshaw at Geoscience Australia: phone +61 2 6249 9035, fax +61 2 6249 9980 or e-mail barry.bradshaw@ga.gov.au