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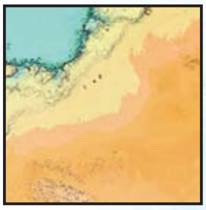
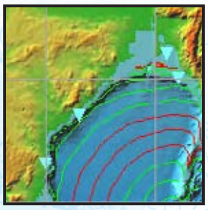
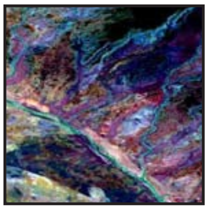
  

Welcome to the NEW ON-LINE *AusGeo News*

In this issue we are able to bring you some of the new detailed geoscience relating to the Boxing Day tsunami, in which over 200 000 people died amid widespread destruction in Indonesia, Sri Lanka, India and Thailand, and on the east coast of Africa.

As a result of this tragic event, the Australian Government is now actively planning for a higher level of involvement in disaster preparedness, both within Australia and in the surrounding region. Geoscience Australia is involved in discussions with Emergency Management Australia and the Bureau of Meteorology to establish a tsunami warning system for the region. We are also playing a major role in the development of a tsunami scenario to help the Catastrophic Disasters Working Group of the Australian Emergency Management Committee to exercise Australia's emergency management capability.

Other feature articles in this issue report on the progress of Geoscience Australia's 'Big New Oil' program, which provides pre-competitive information to support industry's search for new offshore oil provinces. The program began in 2003 with the Australian Government's Budget decision to fund a vital new phase of data acquisition and preservation of the data archive. Already one hundred thousand deteriorating seismic data tapes storing hundreds of thousands of kilometres of geoscience information from many offshore basins have been remastered onto new stable media. This represents about a third of the archive, with the process on track to be completed over the next three years.

The first of the major new seismic acquisition programs—the South West Frontiers Survey—has been completed, and the data collected will be available to explorers at the cost of transfer from April 2005. This includes processed seismic lines covering the proposed exploration acreage in the Bremer Sub-basin. Please note that the article on the offshore acreage release is embargoed till the ministerial announcement of the 2005 release areas in April at the APPEA Conference in Perth.

Other items of interest include an investigation into the application of groundwater geochemistry to assist mineral exploration under cover, as well as the latest editions of our annual assessment of Australia's identified mineral resources and the Australian and international geomagnetic reference field models.

Another important recent release is the first of the revised 100 000 scale topographic data and maps which are being updated in collaboration with state emergency management and mapping agencies as part of a pilot project in several locations across Australia.

I hope you enjoy this issue of *AusGeo News*. The new format will allow greater flexibility in content and production, and also allows us to report more promptly on items of current interest. As always, we are keen to receive your feedback and would like to have your comments about the new format.

Comment

NEIL WILLIAMS
CEO Geoscience Australia

THE BOXING DAY 2004 TSUNAMI —A REPEAT OF 1833?

Phil Cummins and Mark Leonard

An article in the September 2004 issue of *AusGeo News* discussed how massive earthquakes in the Sumatra subduction zone have the potential to cause tsunamis large enough to affect the entire Indian Ocean basin.

This potential was demonstrated three months later when a magnitude 9 earthquake off northern Sumatra triggered the Boxing Day tsunami. Over 200 000 died amid widespread destruction in Indonesia, Sri Lanka, India, and Thailand and on the east coast of Africa.

Despite this major event, the danger of tsunamis in the Indian Ocean has not passed. A regional tsunami warning system could help to prevent further tragic loss of life.

Figure 1. Great earthquakes in the Sumatran subduction zone. Note that other large earthquakes occurred in the Andaman and Nicobar Islands in 1881 and 1941.

The magnitude 9.0 Sumatra–Andaman Islands earthquake of 26 December 2004, which caused the most destructive tsunami in recent history, was the largest earthquake since the magnitude 9.2 Alaskan earthquake of 1964, and was among the five largest earthquakes in the past century. Such massive earthquakes only occur in subduction zones where two of the rigid tectonic plates that comprise the earth's surface are converging, and one plate, usually composed of heavier oceanic material, dives beneath another, usually composed of lighter continental material. The Boxing Day earthquake occurred in the Sunda subduction zone, where the Indo-Australian plate is sliding beneath Sumatra.

The locations of this and other major earthquakes along the Sumatra subduction zone are shown in figure 1. The great 1833 earthquake ruptured a segment of the subduction zone about 1000 kilometres southeast of the rupture area of the 2004 shock. Like the 2004 tsunami, the one following the 1833 earthquake devastated the adjacent coastal area of Sumatra. However—as shown in figure 2—most of the energy of the 1833 tsunami was directed into the open Indian Ocean. While the tsunami may have had an impact on Sri Lanka, the Maldives and other islands in the Indian Ocean, its origin further southeast along the zone prevented it from causing much damage in the Bay of Bengal, and there would have been little effect on Thailand. The wave height on the Australian coast may have been somewhat larger than during the 2004 tsunami, but Australia would still have been spared the main plume of energy radiated into the Indian Ocean.

Like the 1833 event, the effects of the 2004 tsunami in Sumatra were catastrophic. Tsunami run-up exceeded 30 metres in some places in Sumatra, where people had little time to escape and whole villages were razed. The 1833 event would not have produced the waves, 5–10 metres high, that hit Thailand and Sri Lanka last year about one to two hours after the earthquake.

As is typical in a subduction zone earthquake, on Boxing Day the seafloor rose near the plate boundary and subsided 100–200 kilometres landward of the boundary (see figure 1 of the September 2004 article). This resulted in a wave travelling to the east whose leading edge was receding, causing the sea to withdraw, while to the west the leading edge inundated the coast.

Thus, people in Thailand were given some warning by the sudden withdrawal of the sea, and in some cases lives were saved when this warning was recognised and acted on. In many cases, however, people did not understand the phenomenon and the subsequent sudden inundation killed many. In Sri Lanka, the first effect of the wave was inundation, giving people little or no warning. This would also have been the case in most areas hit by the 1833 tsunami.

Could victims of the 2004 tsunami in Sri Lanka and Thailand have been warned in time? The September 2004 *AusGeo News* article pointed out that tide gauges on Christmas Island and the Cocos Islands could provide effective warning of tsunamis caused by Sumatran earthquakes such as the one of 1833. The 1833 earthquake occurred off southern Sumatra, much closer to the Cocos Islands than was the 2004 earthquake.

While a tsunami like that of 1833 would arrive at the Cocos Island within about 20 minutes of the earthquake occurring, this was unfortunately not the case with the Boxing Day tsunami, whose source zone was closer to Thailand and Sri Lanka than to the Cocos Islands. A plot of the 2004 tsunami travel times (figure 3) shows that the tsunami had already passed Thailand and Sri Lanka by the time it reached the Cocos Islands. Clearly, a tsunami warning system will require more instrumentation in this region if it is to deliver effective warnings to those countries.

The extent of rupture along the arc and potential for future events

Earthquake ruptures relieve stress on the subduction zone plate boundary, so a zone segment that ruptures during a major earthquake might not be expected to rupture again for some time. In assessing the risk of future earthquakes and tsunamis in the region, the crucial question is: how much of the subduction zone ruptured during the 2004 earthquake?

As shown in figure 1, this earthquake did not rupture the segments of the subduction zone that ruptured during the 1833 and 1861 earthquakes. These segments can be expected to have been accumulating strain energy for 172 and 144 years, respectively, and so they have to be considered at risk for future earthquakes.

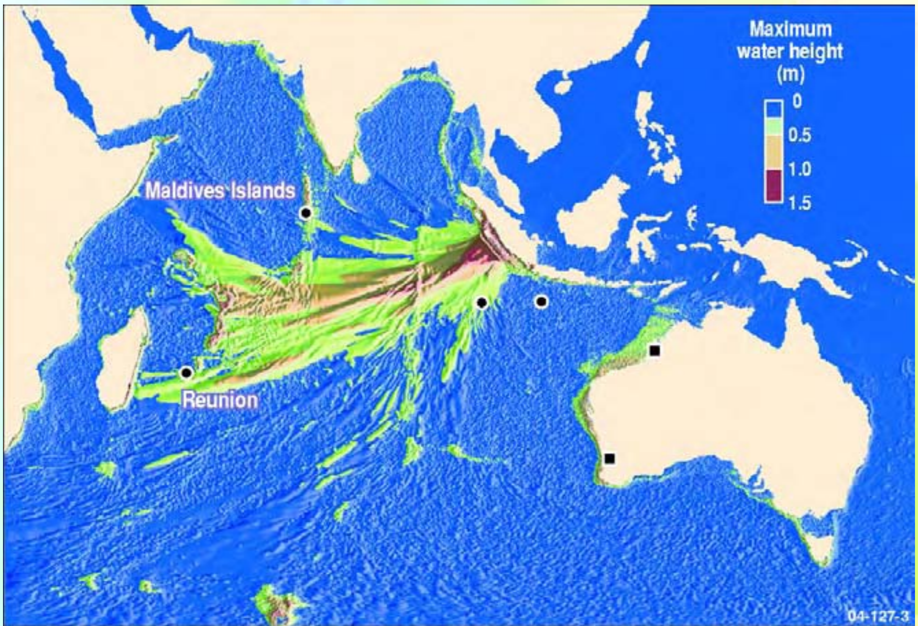
The 2004 earthquake did, on the other hand, rupture a substantial length of the subduction zone north of the rupture areas of the 1833 and 1861 shocks. While aftershocks appear to be active over a 1300-kilometre section of the zone stretching from the Andaman Islands in the north to the earthquake epicentre below the northern tip of Sumatra, the seismic waveform data appears to indicate that only a 450-kilometre length of the subduction zone off northern Sumatra ruptured (figure 4).

Has the stress on the plate boundary north of Sumatra been released or is it still accumulating, to be released in a future earthquake, perhaps generating another large tsunami? This is especially important for assessing the potential for further tsunami impact in Thailand, Sri Lanka and the Bay of Bengal.

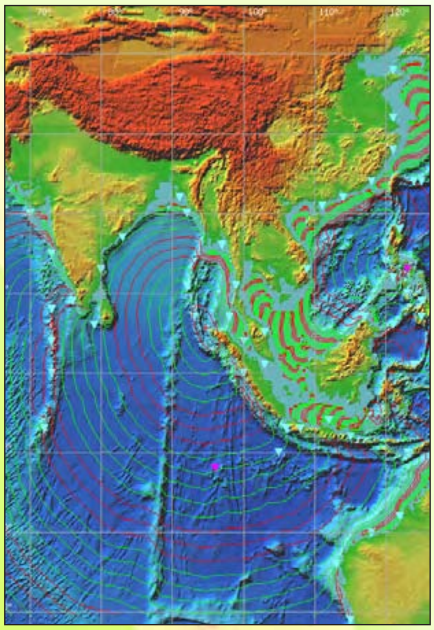
Seismic waves will be generated efficiently only if the entire fault slips as a unit at essentially the same time (that is, within few minutes). Rupture over a longer time interval will not be as efficient, but tsunami waves may still be generated as long as the rupture occurs within 10–20 minutes. The arrival time of the tsunami in the Bay of Bengal—in particular at the tide gauge at Vishakapatnam, where it arrived two hours and 36 minutes after the earthquake occurred—suggests that the northern tip of the rupture that generated the tsunami is in the northern Nicobar Islands (i.e. between the northern boundary of the rupture area inferred from seismic waves and that inferred from aftershocks).

Finally, there are reports of widespread uplift and subsidence in the Andaman Islands, consistent with fault movement.

All these observations are consistent with a rupture offshore from Sumatra with rapid, coherent slip that generated seismic waves. As the rupture propagated northwards, the fault slip may have been less sudden, and therefore progressively less efficient at generating first seismic and finally tsunami waves. The suggestion is that stress was relieved on the plate boundary along the entire extent of the aftershock zone, but whether the stress was totally or only partially relieved has yet to be determined.



▲ **Figure 2.** Calculated maximum amplitude of the tsunami caused by 1833 Sumatra earthquake. Most tsunami energy was directed into the open Indian Ocean, away from the Bay of Bengal. (Numerical modelling performed by David Burbidge of Geoscience Australia.)



▲ **Figure 3.** Travel-time contours for the Boxing Day tsunami. The source zone is roughly constrained by the tsunami arrival times at the Vishakapatnam and Cocos Islands tide gauges. (the latter is indicated by the magenta inverted triangle southwest of Indonesia). Contours are at 15-minute intervals, and alternate colour every hour. (Figure generated using software provided with the Integrated Tsunami Database for the Pacific, by Slava Gusiakov.)

Need for a tsunami warning system in the Indian Ocean

The tragic events of Boxing Day 2004 make starkly evident the importance of establishing a tsunami warning system for the Indian Ocean. More and better instrumentation, and a long-term program to educate people about the dangers of tsunamis, are clearly needed.

The short one to two hour lead time (figure 3) between an earthquake in the Nicobar–Andaman Islands region and the arrival of a tsunami in Thailand or Sri Lanka places stringent requirements on the operation of the technical component of such a warning system.

There is a far shorter lead time for tsunami impact on Sumatra itself. While the shaking due to the earthquake and the first, receding wave of the tsunami are likely to provide some warning, an extensive and long-term public education program is needed if the local population is to recognise these signs and be aware of evacuation routes.

As the September 2004 *AusGeo News* article surmised, the greatest tsunami threat in the Indian Ocean appears to be posed by great subduction zone earthquakes off Sumatra. It seems likely that the 2004 earthquake has relieved stress on the plate boundary from northern Sumatra to the Andaman Islands, so that great earthquakes are less likely to occur there in the near future. However, the possibility cannot be discounted that enough stress remains to cause an earthquake that might lead to another large tsunami in the Bay of Bengal.

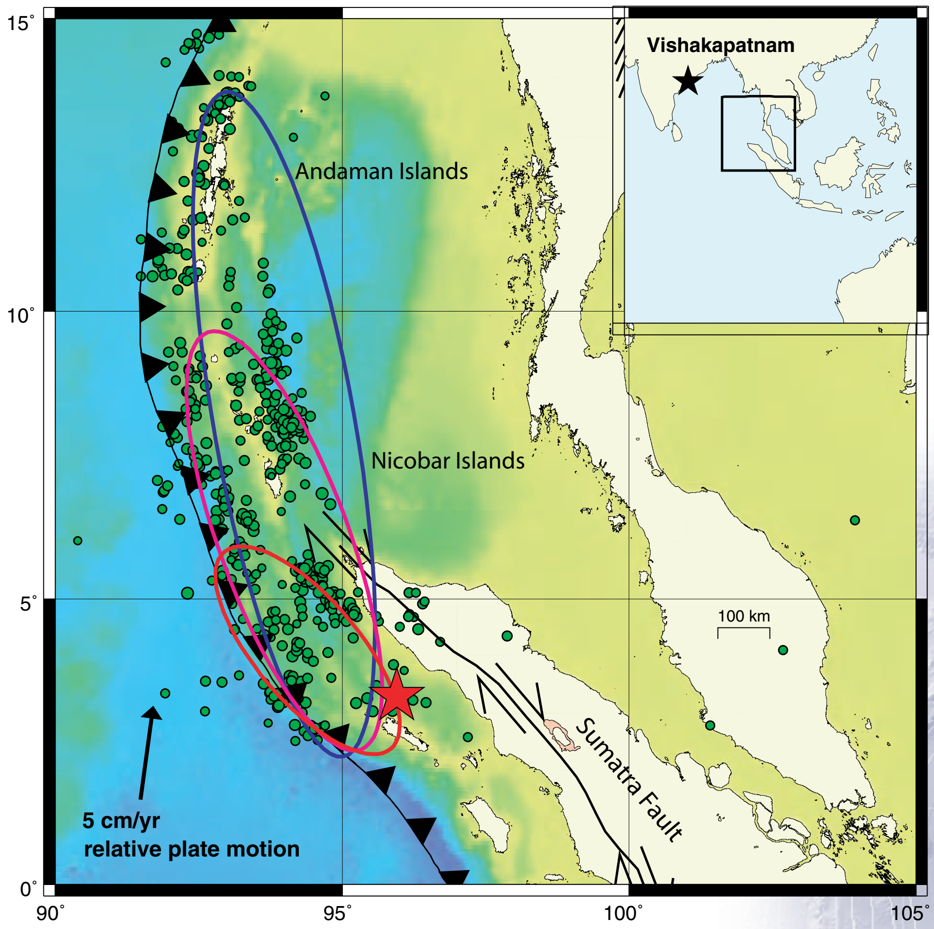


Figure 4. The 26 December 2004 Sumatra–Andaman Islands Earthquake. The red star indicates the epicentre of the main shock, and green circles those of aftershocks, estimated by the US Geological Survey. The red, magenta, and blue ellipses indicate respectively the area of seismic wave generation (from a model by Chen Ji of California Institute of Technology), tsunami generation (from travel time computations by Kenji Satake and Eric Geist), and crustal deformation (from information supplied by Roger Bilham of the Cooperative Institute for Research in Environmental Sciences). The position of the tide gauge at Vishakapatnam is indicated.

Further south, the plate boundary off central and southern Sumatra has not ruptured since the mid-1800s, so we know that these areas have accumulated considerable strain energy that could be released in a massive earthquake resulting in another ocean-wide tsunami.

Finally, the Makran subduction zone off the coast of Iran and Pakistan is another source zone for large tsunamis, as we know from the magnitude 8 earthquake and tsunami that occurred there in 1945.

The Indian Ocean countries, including Australia, cannot ignore the potential for future destructive earthquakes and tsunamis. The need for an Indian Ocean tsunami warning system is as urgent as ever.

For more information phone Phil Cummins on +61 2 6249 9632 or e-mail phil.cummins@ga.gov.au

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

Barry Bradshaw, Alexey Goncharov and Fred Kroh

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.

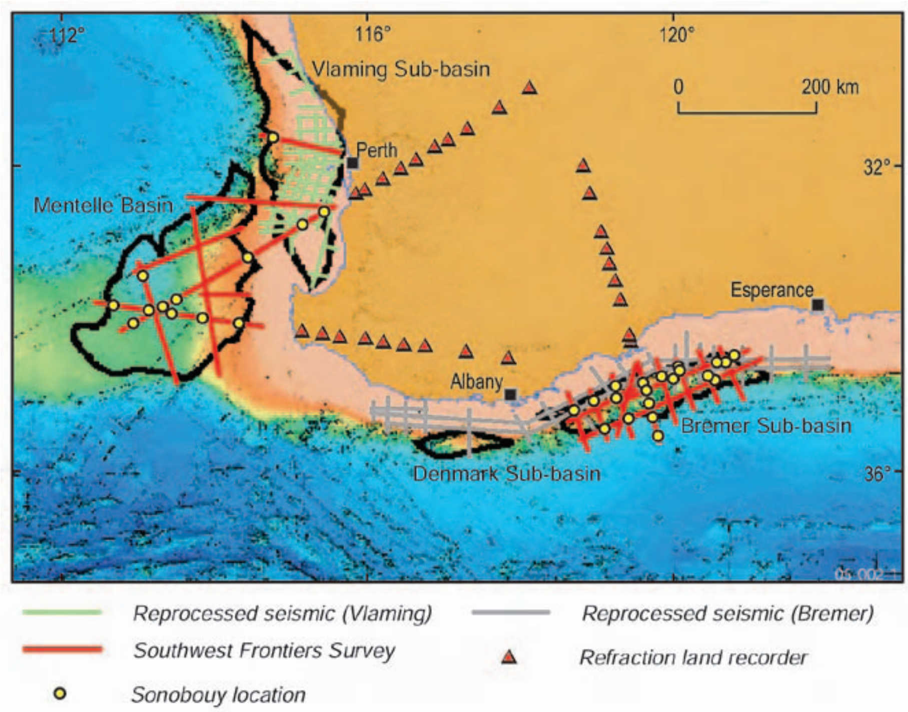
Undertaken in October and November 2004, the survey acquired 2700 kilometres of industry-standard, 106-fold seismic reflection data recorded to 12 seconds two-way time using a 6–8 kilometre digital streamer and 4900 cubic inch air gun array. Seismic data collected includes 11 lines (1300 km) in the Bremer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



◀ **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.

Seismic data acquired from the Bremer Sub-basin and three lines acquired in the Vlaming 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

Big New Oil —a progress report

Australia's gas reserves are at an all-time high and continuing to climb steeply, but oil reserves are in decline (figure 1).

The continent and its marine jurisdiction are vastly underexplored; only 8000 wells have been drilled and many offshore basins have never been tested (figure 2). The big fields in any new petroleum province are usually found first, so Australia's best chance of adding major new oil reserves is to find new petroleum provinces.

The Australian Government has made several key policy decisions with the aim of encouraging exploration investment in Australia. These include the decision in 2001 to provide access to government spatial data at the cost of transfer, enabling it to be available free online.

Geoscience Australia's online geological provinces database describes a multitude of offshore basins and sub-basins (144 at last count) and is also linked to detailed well and other data (see related website at the end of this article).

In 2003, the government announced the injection of an additional $61 million, over four years, into Geoscience Australia's petroleum program, to provide pre-competitive data in support of acreage release, and for the search for a new oil province, with new data acquisition and data preservation and archiving. This boost was followed by the introduction in the 2004 Federal Budget of tax incentives for exploration in frontier areas.

Geoscience Australia developed a portfolio of potential projects based on integrated programs of seismic acquisition, geological sampling and oil seep detection. Deepwater frontier basins are among the most promising candidates (figure 3). Some of the most prospective petroleum-bearing frontier provinces considered for new data acquisition are as follows:

- The Bremer Sub-basin, in deep water off the southwest margin between Albany and Esperance at the western end of the Great Australian Bight where reprocessed reconnaissance seismic data shows a thick and well-structured Mesozoic section.
- The Mentelle Basin is another significant Mesozoic depocentre, or area of very thick sediment deposition. The basin extends along the edge of the continental shelf from Perth to the southern tip of the continent and in deep water west to the Naturaliste Plateau.
- The Lord Howe Rise is a submerged ribbon continent in the Tasman Sea between Australia, New Zealand and New Caledonia. Before seafloor spreading in the Late Cretaceous, this continental sliver sat between Australia's first major offshore petroleum province of Bass Strait and New Zealand's petroleum-producing Taranaki Basin. There are more than a dozen depocentres on the Lord Howe Rise and some are thick enough to have generated hydrocarbons if organic-rich source rocks are present.

Following a round of industry consultation, the immediate priority areas selected for new data acquisition were the shallow-water Arafura Basin in northern Australia, and the deepwater frontier basins of the southwest margin. Validation of remote sensing as a reconnaissance technique for detecting hydrocarbon seepage in the vast offshore areas was also seen as an important part of the new program.

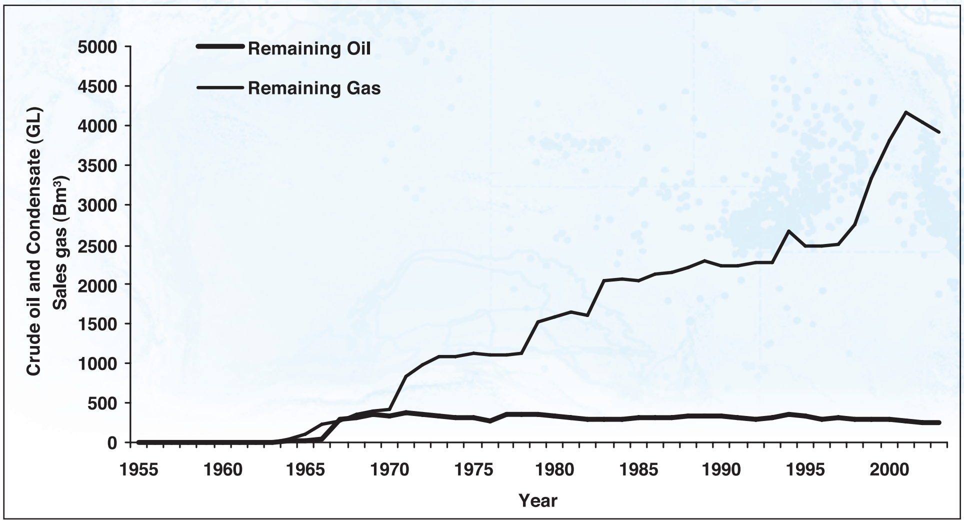


Figure 1. Graph showing Australia's gas and oil reserves through time.

In March 2004, a survey was undertaken in the natural laboratory of the Yampi Shelf on the North West Shelf, an area of known hydrocarbon seepage that is well covered by multiple datasets, including synthetic aperture radar, airborne laser fluorescence, Landsat, 'sniffer' water column geochemistry and 3D seismic. Active gas seepage was found, imaged, and tied back to its expression on seismic and bathymetric records.

In April 2005, the tools and techniques developed on the Yampi Shelf will be applied at a number of sites in the Arafura Basin, where remote sensing and seismic data indicate possible natural hydrocarbon seepage.

Geoscience Australia's program of data acquisition in the deepwater frontier basins of the southwest margin began in February 2004 with a marine sampling survey aboard the national research ship, RV Southern Surveyor. Dredging of submarine canyons recovered tonnes of rocks from the previously unknown sedimentary section of the Denmark and Bremer sub-basins. Analysis of the samples identified reservoir-quality sandstones and potential oil-prone Jurassic and Early Cretaceous source rocks.

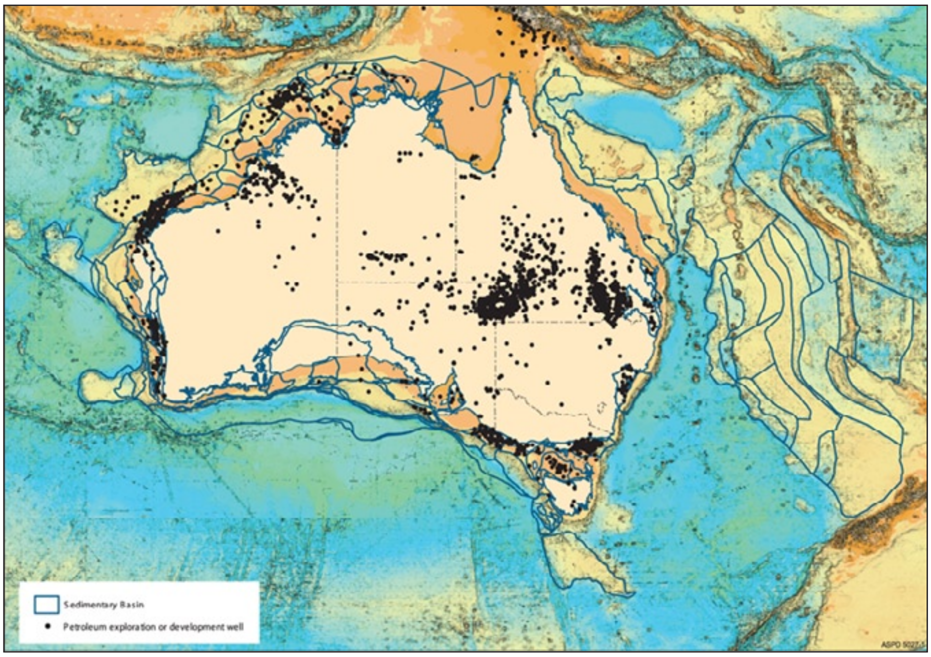


Figure 2. Map of Australia's offshore sedimentary basins draped over the bathymetry and showing the location of petroleum wells.

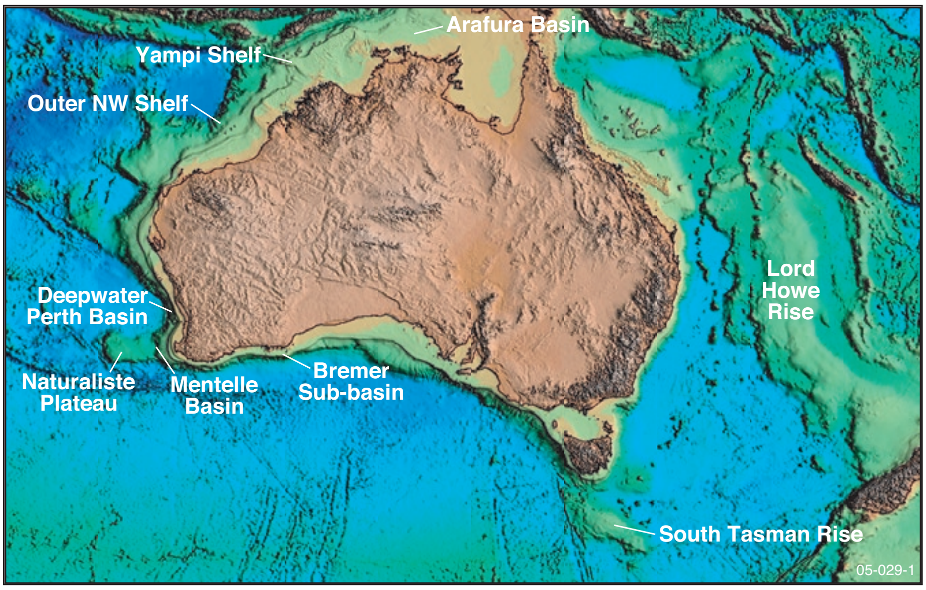


Figure 3. Map showing the location of the portfolio of potential and active Big New Oil projects

The most recent seismic coverage of the Bremer Sub-basin is a 1974 survey shot by ESSO. The age and limited extent of this data allow glimpses into the subsurface geology, but not a full understanding of the area's hydrocarbon potential.

The new seismic data, acquired in late 2004 by Veritas's MV Pacific Sword, better defines the extent, thickness and stratigraphy of the basin fill, and has identified potentially prospective structures. The Bremer is, however, only one of several potentially prospective basins along the southwest margin—the seismic survey has also collected data in the Mentelle and deepwater Perth basins (see the article on Geoscience Australia's Southwest Frontiers Geophysical Survey in this issue).

These first surveys in the Arafura Sea and the frontier basins of the southwest margin are the beginning of a four-year program to develop many new investment opportunities and present them to explorers in the annual release of offshore petroleum acreage (see the article 'Petroleum exploration opportunities in this issue). Other areas planned for data acquisition include the outer margins of the North West Shelf and the Lord Howe Rise.

The historical trend for offshore oil production shows a shift from the Gippsland Basin to the North West Shelf, and from sustained production over decades from a few giant oil fields to many smaller fields of much shorter life. Future trends may be shaped by the results of Geoscience Australia's new seismic data acquisition program.

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Online Geological Provinces:
www.ga.gov.au/oracle/provinces

REMASTERING PROJECT — *what's old is new again!*

The national repository of seismic data on the sub-surface geology of Australia's offshore marine jurisdiction is undergoing a media makeover.

Under the Petroleum Submerged Lands Act 1967 (PSLA) all companies and organisations acquiring seismic survey data within the Australian marine jurisdiction have been required to submit the raw and processed data to Geoscience Australia. Data that are part of a work program are confidential for three years from the date of acquisition. After this period the data are accessible by companies or any other interested party.

This repository of information is made available to exploration companies at cost of transfer. However, much of the data is recorded on outdated media, including 9 and 21 track tapes and 3480 cartridges, making it increasingly difficult to access and expensive to store.

Companies have been required to borrow the large number of older media associated with a seismic survey and return copies to Geoscience Australia. To preserve older data and make it accessible to explorers, Geoscience Australia was allocated $10 million in the 2003–04 Australian Government Budget to be used for the copying and concatenation of the data onto high-density media.

The overall project involves copying around 285 000 old tapes onto about 12 000 3590B tapes. This media—which holds 10 gigabytes of data per tape—has been the industry standard since 1990. More than 90% of Geoscience Australia's repository of seismic data has been collected in that time, and is stored on just over 40 000 3590B tapes.

Transcription, quality control and physical disposal are being carried out by commercial companies in Perth. The transcription contracts were awarded to Guardian Data and SpectrumData, and quality control is being undertaken by GeoCom Services Australia. After copies are approved, the original tapes are disposed of in Perth to be recycled into plastic products.

The remastering project has been running for one year. To date, about 100 000 nine-track tapes and 40 000 3480 cartridges have been transcribed (see table 1 for list of completed surveys).

The project is delivering easier access and lower costs for petroleum companies and other clients.

Data storage at Geoscience Australia's national repository of seismic data

Table 1.

Survey	Year	Basin	State
NT/P36 Marine Seismic (Arafura Sea S81)	1981	Arafura Basin / Money Shoal Basin	NT
Bridge Bass 1990 Marine Seismic	1990	Bark Sub-basin / Bass Basin / Boobyalla Sub-basin / Durroon Basin	Tas.
Donna Marine Seismic	1995	Barrow Sub-basin / Carnarvon Basin	WA
C81A Marine Seismic	1982	Barrow Sub-basin / Carnarvon Basin / Exmouth Plateau	WA
C81B Marine Seismic	1981	Barrow Sub-basin / Carnarvon Basin / Exmouth Plateau	WA
C81B Marine Seismic	1981	Barrow Sub-basin / Carnarvon Basin / Exmouth Plateau	WA
Hummock Marine Seismic	1996	Bass Basin	Tas.
Bass 1988 Marine Seismic	1988	Bass Basin	Tas.
HB 80A and Pookanah Detail Marine Seismic	1980	Bass Basin	Tas.
BS89A/B – BS90A/B and T89/2 Marine Seismic	1990	Bass Basin / Torquay Sub-basin	Tas.
Mahakam Marine Seismic	1992	Beagle Sub-basin / Carnarvon Basin	WA
Mohaku 1993 Seismic	1993	Beagle Sub-basin / Carnarvon Basin	WA
Dampier–Beagle Marine Seismic	1975	Beagle Sub-basin / Carnarvon Basin / Dampier Sub-basin	WA
Helvetius 1992 Marine Seismic	1992	Bonaparte Basin	WA

Andromeda Marine Seismic	1996	Bonaparte Basin	NT
Van Diemen Rise Seismic	1969	Bonaparte Basin	NT, WA
Caspian Marine Seismic	1991	Bonaparte Basin	WA
HV11 Skua 3D Marine Seismic	1990	Bonaparte Basin	NT
PC95 Marine Seismic	1995	Bonaparte Basin	WA
Anderdon Marine Seismic	1990	Bonaparte Basin	NT
B89 Marine Seismic	1989	Bonaparte Basin	NT, WA
Copernicus Marine Seismic	1992	Bonaparte Basin	NT
NT/P47 and NT/P48 Marine Seismic	1997	Bonaparte Basin	NT
H2683D Jabiru and Extension Marine Seismic	1984	Bonaparte Basin / Browse Basin / Vulcan Sub-basin	NT
Endeavour Marine Seismic	1995	Bonaparte Basin / Vulcan Sub-basin	WA
SPA 4SL/95–96 (Browse Basin) Marine Seismic	1996	Browse Basin	WA
Calliance Reef Marine Seismic and Seismic Refraction	1983	Browse Basin	WA
Churchill 1980 Marine Seismic	1980	Browse Basin	WA
Interpretation of the Greater Caswell Area Marine Seismic	1984	Browse Basin	WA
Sascha 1992 Seismic	1992	Browse Basin	WA
C94A Marine Seismic	1994	Canning Basin	WA
Lambert Shelf Marine Seismic	1980	Canning Basin / Carnarvon Basin	WA
Minden 3D	1995	Carnarvon Basin	WA
HH88 Marine Seismic	1988	Carnarvon Basin	WA
SPA 3D Marine Seismic (Parker 3D)	1991	Carnarvon Basin	WA
C83A Marine Seismic	1983	Carnarvon Basin	WA
C83B Marine Seismic	1983	Carnarvon Basin	WA
X95A Marine Seismic (Scarborough 2D)	1995	Carnarvon Basin	WA
C92A Marine Seismic	1992	Carnarvon Basin	WA
Boronia Marine Seismic	1983	Carnarvon Basin	WA
Eaglehawk Marine Seismic	1996	Carnarvon Basin / Dampier Sub-basin	WA
Michelle Marine Seismic	1993	Carnarvon Basin / Dampier Sub-basin	WA
Exmouth South 1996 SPA 6SL (95–96)	1996	Carnarvon Basin / Exmouth Sub-basin	WA
Cuvier 1992 Marine Seismic	1992	Carnarvon Basin / Gascoyne Sub-basin	WA
Rundle Marine Seismic	1994	Carnarvon Basin / Gascoyne Sub-basin	WA
NT/P32 1980 Marine Seismic	1980	Carpentaria Basin	NT
Carpentaria Basin 1980 Marine Seismic	1980	Carpentaria Basin	NT
Denman Basin Marine Seismic	1972	Denman Basin	SA
Offshore Twilight Cove Seismic	1970	Eucla Basin	WA
X78A Marine Seismic	1978	Exmouth Sub-basin	WA
GS81A Marine Seismic	1982	Gippsland Basin	Vic.
GP–81A Marine Seismic	1981	Gippsland Basin	Vic.
GUT–83A Marine Seismic and Magnetic	1983	Gippsland Basin	Vic.
GUT–83P Marine Seismic and Magnetic	1983	Gippsland Basin	Tas.
G89A Marine Seismic	1990	Gippsland Basin	Vic.
GH82A Marine Seismic and Magnetic	1982	Gippsland Basin	Vic.
G89A Marine Seismic: Blackback 3D Grid	1990	Gippsland Basin	Vic.
GS95A Marine Seismic (Basker Manta 3D)	1995	Gippsland Basin	Vic.
G84A Marine Seismic	1985	Gippsland Basin	Vic.
OH91B Marine Seismic	1991	Otway Basin	Vic.
OS90A	1990	Otway Basin	Vic.
Geelvink Channel Seismic	1970	Perth Basin	WA

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