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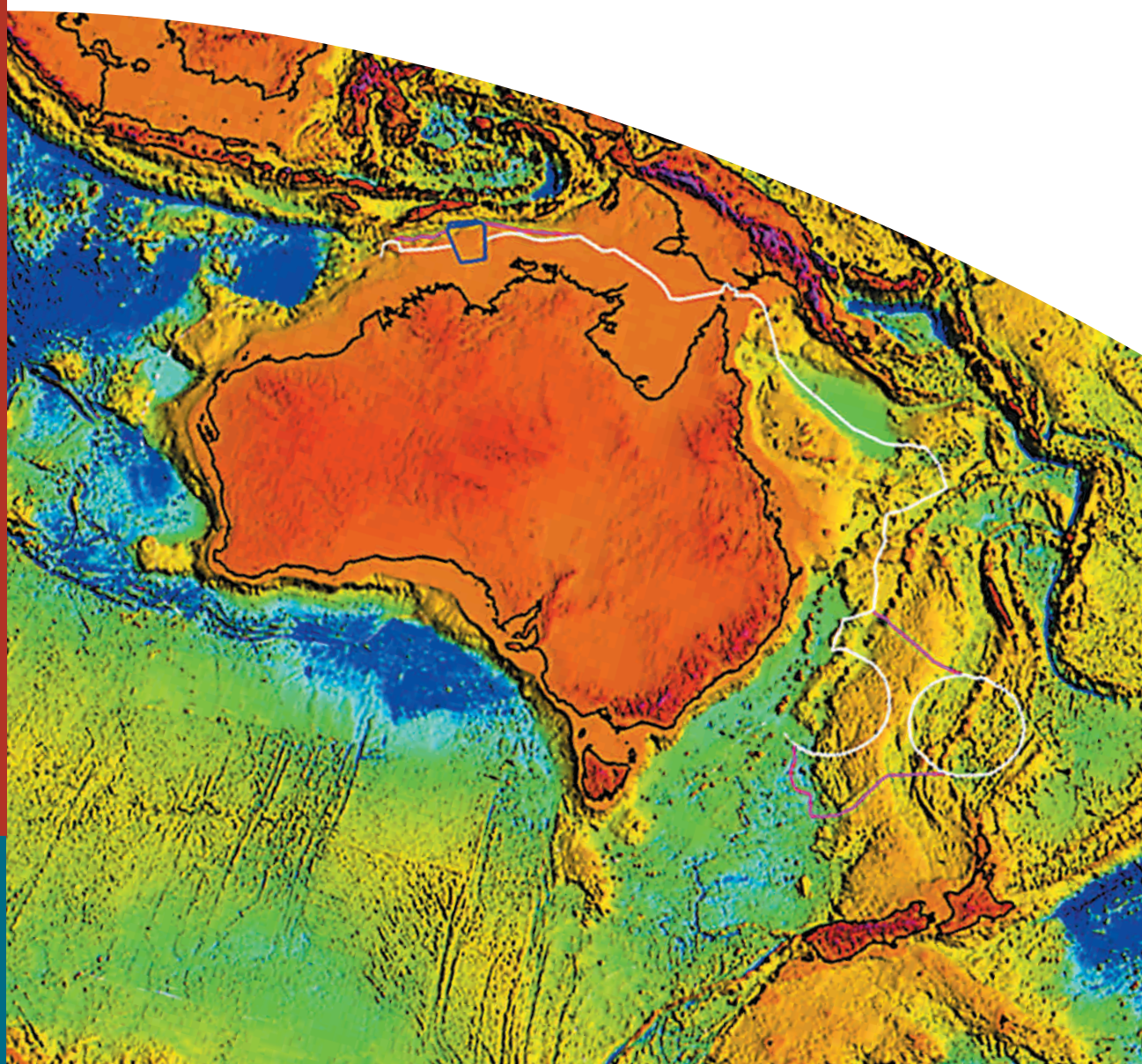
Industry, Commonwealth Government and International.

Earl, K., Holm, O. and Powell, T.G.



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Outline of Geological Studies in the Great Barrier Reef and Adjacent Regions: Industry, Commonwealth Government and International

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PREFACE

From time to time, public interest has been generated in the geology of the Great Barrier Reef and the associated regions, particularly in the context of any previous or prospective interest in petroleum exploration. In response to this interest and ongoing public comment, Geoscience Australia has compiled the history of geological investigations by Geoscience Australia, its predecessors and collaborating organisations. A comprehensive bibliography of the results of these investigations is also provided. It is hoped that this record will inform any future public debate on the matter.

Deputy CEO and Chief of Petroleum and Marine Division Geoscience Australia Dr. T.G. Powell.

PART ONE: THE GREAT BARRIER REEF REGION

ECOSYSTEM OF THE GREAT BARRIER REEF

The Great Barrier Reef (Figure 1) is the world's largest system of corals and associated life forms, covering an area of approximately 300,000 km^2, on Australia's continental shelf (Kelleher & Kenchington 1982). The Great Barrier Reef is approximately 2,300 km in length, of which 1,950 km of its length has been declared a marine park. The full marine park (the so-called Great Barrier Reef Region) is approximately 345,000 square kilometres in area. It stretches for almost 2000 km along Australia's northeastern coast, and is made up of approximately 2900 individual reefs, ranging in size from less than 1 ha to more than 100 km^2 (Kelleher & Kenchington 1982), 890 fringing reefs, 300 coral cays and more than 600 continental islands (Australian Institute of Marine Science 1997). The reef region is known for its faunal diversity. There are an estimated 1500 species of fish and over 400 species of hard corals that have been recognised (Australian Institute of Marine Science 1997). The Great Barrier Reef Marine Park (GBRMP) was declared in 1975 through an Act of Federal Parliament (Figure 1).

GEOLOGY OF THE GREAT BARRIER REEF AND SURROUNDING REGION

The Great Barrier Reef and surrounding region is of great geological significance. It represents the Late Cretaceous to Paleocene (83-53 Ma) opening of the Tasman Sea/Cato Trough during the continental break-up between Australia, New Zealand, and the Lord Howe Rise (Struckmeyer & Symonds 1997). The warm water carbonate sediments of the Great Barrier Reef, and earlier cooler water carbonate platforms, are important as they help us understand the cycles of climate and sea level change. The Great Barrier Reef itself is less than a million years old. There may be some petroleum potential in parts of the region of the Great Barrier Reef, the Coral Sea and surrounding area. However, most of the area is completely unprospective, and those areas with some potential are poorly known. The main geological features of the area are shown in Figure 1. Petroleum exploration in the Great Barrier Reef Marine Park has been banned since 1970.

REVIEW OF GEOSCIENTIFIC RESEARCH

INTRODUCTION

Geoscientific research and exploration of the Great Barrier Reef and surrounding region dates back to the first half of the 20th Century. The reef history, underlying geology and associated ecosystems have been studied extensively by state and federal government scientists and research institutes (Figure 2).

The use of seismic methods for subsurface investigation of reefs was advocated in 1936 by the Great Barrier Reef Committee (Richards & Hill 1942). Early investigations were varied, and included studies into the patterns of shelf sediment distribution (eg. Fairbridge 1950). Bathymetric maps of the Coral Sea region were first compiled in the 1960s and generally focussed on the Coral Sea Basin and Queensland Plateau areas to the north of the Marion Plateau (Pigram 1993).

The main aim of this document is to cover the activities of the Commonwealth geoscience agency since 1970: its name evolved through time from the Bureau of Mineral Resources (BMR) to the Australian Geological Survey Organisation (AGSO) in 1992 and finally Geoscience Australia in 2001.

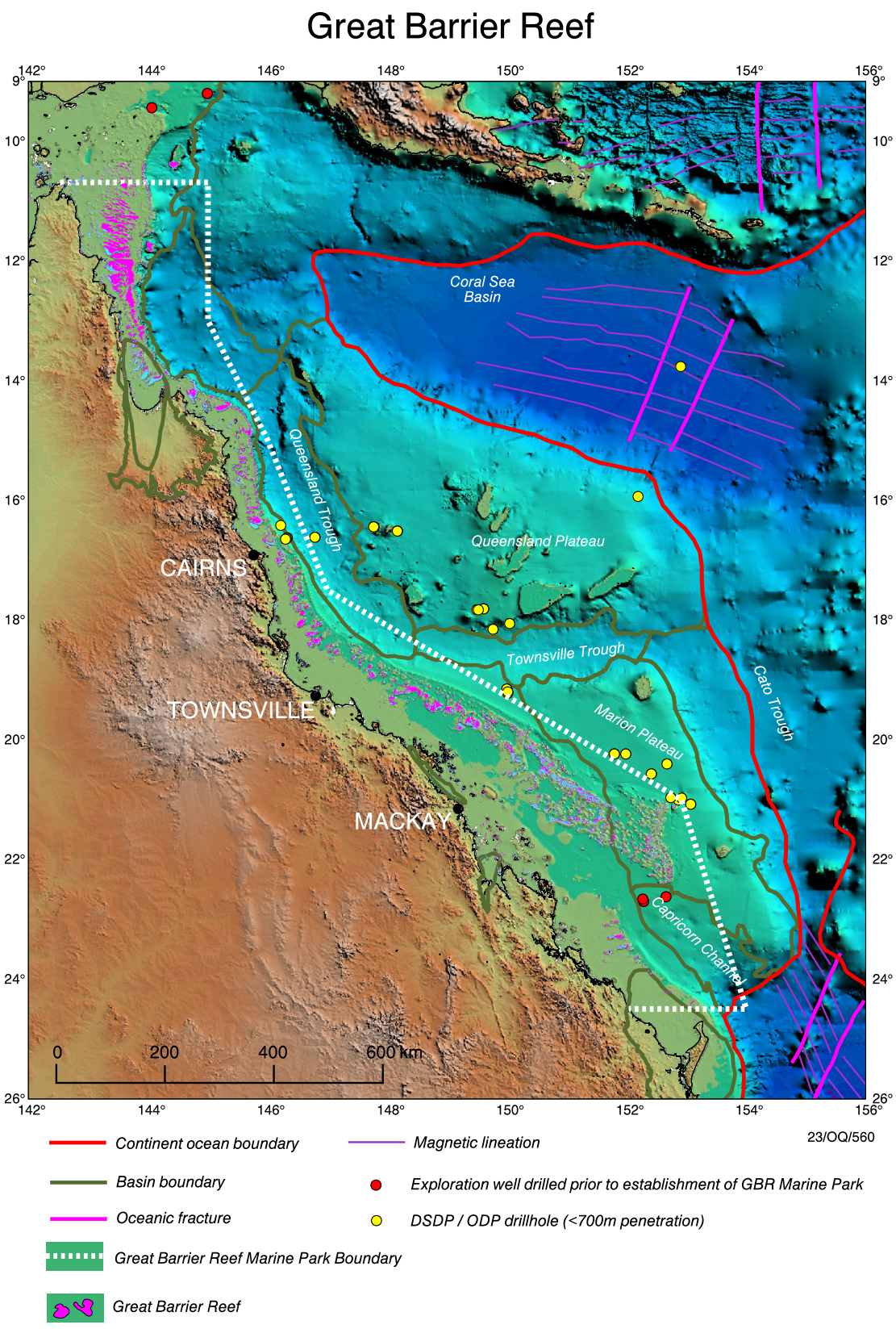

Figure 1: Digital Terrain Model of northeastern Australia showing the Great Barrier Reef, the Great Barrier Reef Marine Park Boundary and the major geological features of the Great Barrier Reef Marine Park and surrounding regions. Exploration wells and scientific drill holes in the region are also shown.

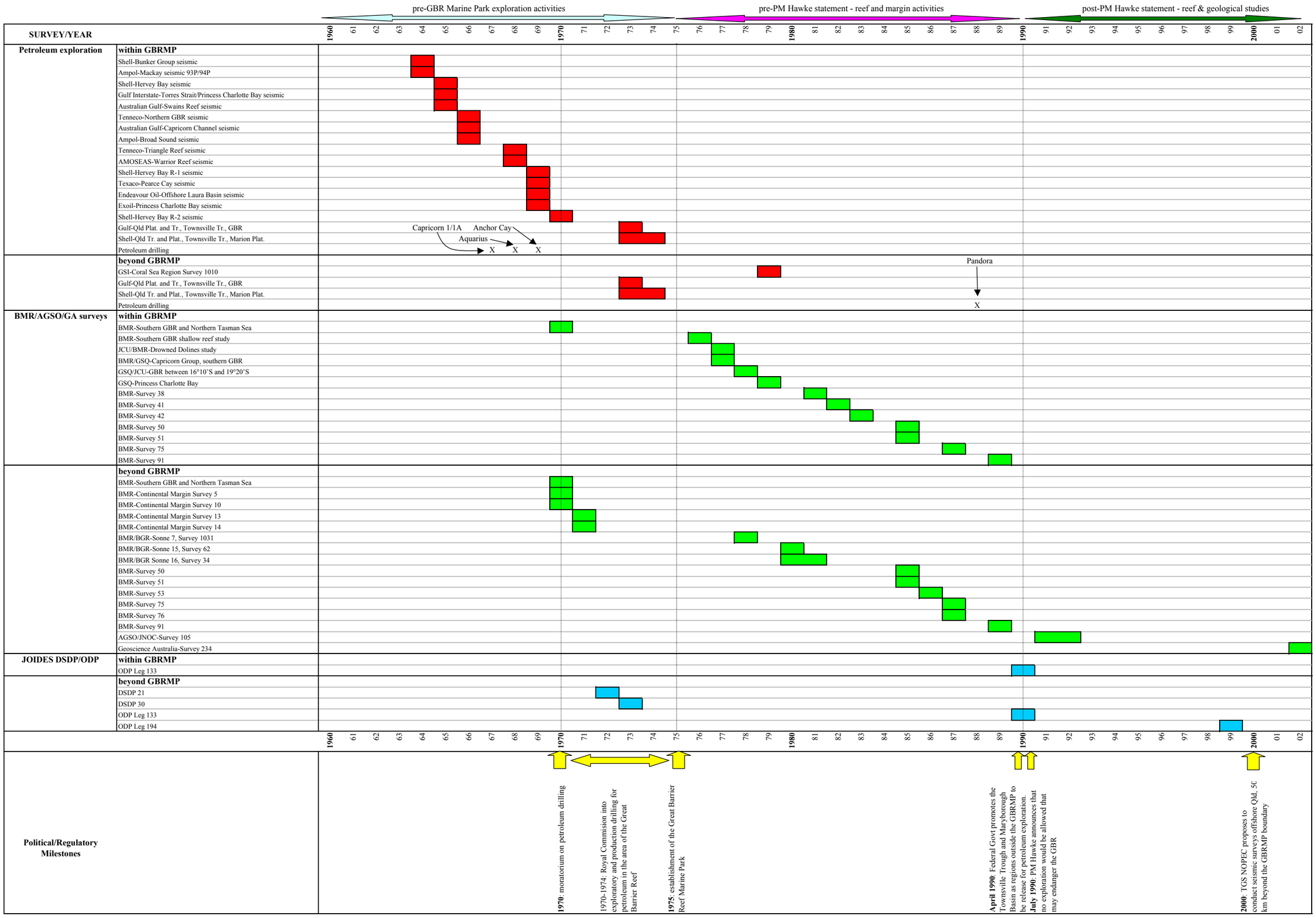

Figure 2. Timeline illustrating marine surveys in the northeast Australia region from 1960 to present.

MARINE SURVEY ACTIVITIES

Geoscientific research in the northeast Australia region during the 1960s included charting the seafloor topography, carrying out seismic profiling, and seafloor dredging. The BMR and research institutes commenced major geoscientific marine surveys within the Great Barrier Reef and in the surrounding region in the early 1970s (Figure 2, Table 1). The surveys mainly consisted of shallow, high-resolution seismic research (Table 2). The main research programs undertaken by the BMR and international research institutes in the region during the 1970s were the Continental Margins Survey (1970-1972), and the JOIDES Deep Sea Drilling Project (DSDP)(1971-1973); however there were several other minor surveys (Figure 2).

The BMR's marine surveys in the 1970s consisted of geoscientific research within what became the GBRMP and beyond its boundaries. Activities within the GBRMP included investigating modern and ancient reef history, whereas research beyond the GBRMP boundaries included similar studies, as well as investigating the nature of the continental margin, and assessing the petroleum potential.

Geoscientific surveys carried out by the BMR and research institutes in the 1980s also consisted of research within the GBRMP and beyond its boundaries, with goals similar to earlier phases of study. The research activities within the GBRMP were aimed at:

- investigating the evolution of the Great Barrier Reef and adjacent carbonate platforms, and
- establishing the structure and stratigraphy of the inter-reef areas.

Research activities beyond the GBRMP were aimed at:

- broadening the understanding of the regional geologic and tectonic framework,
- determining the structural styles, sedimentological evolution and stratigraphic relationships of the Townsville Trough, the Queensland and Marion Plateaus, the Hillsborough, Narrows and Capricorn Basins, and
- understanding the implications for the development of the northeast Australian continental margin, and
- assessing the petroleum potential of the region.

In addition, AGSO Survey 75 in 1987, and Survey 209 in 1999, conducted site surveys in support of the scientific Ocean Drilling Program (ODP) proposals to understand the history of the Great Barrier Reef and sea level change, that culminated in ODP Leg 133 in 1990, and ODP Leg 194 in 2001. These seismic studies were carried out to provide the ODP with appropriate information to select drilling sites. Further seismic work was conducted during the drilling legs to confirm the locations of drilling targets.

The Commonwealth Scientific and Industry Research Organisation (CSIRO) and universities have conducted a number of oceanographic research cruises in the northeast Australia region, using the research vessel *RV Franklin*. Details on these activities can be found on their website, at www.csiro.au.

Survey No.	Category	Year	Title
	MR	1970	Southern Barrier Reef and Northern Tasman Sea cruise
5	BS	1970	Continental Margin Survey
10	BS	1970	Continental Margin Survey
13	BS	1971	Continental Margin Survey
14	BS	1971	Continental Margin Survey
1584	ODP	1972	DSDP 21
1587	ODP	1973	DSDP 30
	GH & MR	1976	Southern Great Barrier Reef.
	MR	1977	Drowned Dolines, MV James Kirby
	MR	1977	Joint BMR-GSQ Marine Survey, MV Seahunt
		1978	GSQ-JCU
1031	BS	1978	Sonne 7
		1979	GSQ
62	MR	1980	Sonne 15
34	BS & GH	1980-81	Sonne 16
38		1981	GBR
41		1982	Mag. Pass., GBR
42		1983	Ayr
50	BS & GH	1985	BMR Rig Seismic
51	BS & GH	1985	BMR Rig Seismic
53	BS	1986	BMR Heat-flow
75	BS, ODP & RA	1987	Townsville Trough and Marion Plateau
76	BS, ODP & RA	1987	Townsville Trough and Marion Plateau
91	BS & RA	1989	BMR/AGSO Survey
1333	ODP & GH	1990	ODP leg 133
105	MR	1991-92	Joint AGSO and JNOC
209	ODP & GH	1999	ODP leg 194 Site Survey
	ODP & GH	2001	ODP leg 194 Marion Plateau

Table 1. BMR/AGSO and collaborative marine surveys in the northeast Australia region from 1970 to present. The categories are explained in the *Classification of Surveys* section.

Survey: Government and Research Institutes	Contractor	Year	Area	Source
BMR (Record 1968/44)		1968	New Guinea and Solomon Sea	Sparker
BMR (Record 1971/17)		1970	Southern Great Barrier Reef and northern Tasman Sea	Sparker
BMR (Record 1975/151) Surveys 5 and 10	Compagnie Generale de Geophysique	1970-1972	Bismarck Sea and Gulf of Papua (survey 5), northern Coral Sea, northern Tasman Sea (surveys 10 to 14)	120kJ Sparker
BMR Continental Margins Surveys 13 and 14		1971-1972	Northeastern Australia region	120kJ Sparker
BMR (Record 1978/96)		1976	Southern Great Barrier Reef	Shallow seismic – hammer or explosive sound source
GSQ and BMR		1977	Capricorn-Bunker Group of the Southern Great Barrier Reef	Uniboom (200-300J)
"Sonne" SO-7, BGR, BMR, DSI (NZ) and GSPNG		1978	Northern Coral Sea and Lord Howe Rise	Air-gun array
"Sonne" SO-15, BGR, BMR, GSQ and GSNSW (Record 1981/4)		1980	Newcastle to Forster (NSW), Yamba to Byron Bay (NSW), Brunswick Heads to North Stradbroke Island (NSW-Qld) and off Fraser Island (Qld)	Air-gun array
"Sonne" SO-16, BGR, BMR, GSPNG		1980-1981	Northern Coral Sea, around the margins of the Coral Sea Basin	Air-gun array
BMR Survey 41		1982	Central Great Barrier Reef and adjacent slope	9 kJ Sparker
BMR Survey 42		1983	Great Barrier Reef and adjacent slope between Townsville and Bowen	9 kJ Sparker
BMR *Rig Seismic* Surveys 50 and 51		1985	Northeastern Australia region	Air-gun, 9 kJ Sparker
BMR *Rig Seismic* Survey 75		1987	Queensland and Townsville Troughs, Marion Plateau	80-in.^{3} Water-gun
BMR Rig Seismic Survey 76		1987	Townsville and Cato Troughs; Marion Plateau	2 x 26 L Air-gun array
BMR/AGSO Survey 91		1989	The Maryborough and Capricorn Basins and the northern margins of the Tasman Basin	Air-gun array
AGSO/JNOC Survey 105		1991-1992	Continental shelf area offshore southern Queensland	Water-gun array and Boomer
AGSO		1998	Marion Plateau	Air-gun

Table 2. Government and research institute seismic data acquired offshore Queensland. Seismic resolution indicator: Boomer – shallow; Sparker, water-gun and GI-gun – shallow to intermediate; Air guns and Aquapulse – deep. BMR = Bureau of Mineral Resources, Commonwealth Government of Australia. AGSO = Australian Geological Survey Organisation, Commonwealth Government of Australia. GSQ = Geological Survey of Queensland. GSNSW = Geological Survey of New South Wales. GSPNG = Geological Survey of Papua New Guinea. DSI (NZ) = Department of Scientific and Industrial Research, Government of New Zealand. BGR = Bundesanstalt fur Geowissenschaften und Rohstoffe (Federal Republic of Germany).

Survey - Industry	Contractor	Year	Area	Source
Shell	Western	1964	Bunker Group	Explosives
Ampol	Western	1964	Mackay 93P/94P	Explosives
Shell	Geophysical Service International (GSI)	1965	Hervey Bay	Explosives
Gulf Interstate	Western	1965	Princess Charlotte Bay	Explosives
Australian Gulf	Western	1965	Swains Reef	Explosives
Tenneco	Independex	1966	Northern Great Barrier Reef	Explosives
Australian Gulf	United	1966	Capricorn Channel	Explosives + sparker
Ampol	United	1966	Broad Sound	Sparker
University of New South Wales and Lamont-Doherty Geological Observatory		1967	Coral Sea region	
Shell		1968	Coral Sea region. Junction of Queensland and Townsville Troughs	
Tenneco	Western	1968	Triangle Reef	Explosives
AMOSEAS	Western	1968	Warrior Reef	Explosives
Shell	BIPM	1969	Hervey Bay R-1	Air-guns
Texaco	Western	1969	Pearce Cay	Aquapulse
Endeavour Oil	United	1969	Offshore Laura Basin	Air-guns
Exoil	United	1969	Princess Charlotte Bay	Air-guns
Shell	GSI	1970	Hervey Bay R-2	Air-guns
Gulf Research and Development Co. and Australian Gulf Oil Co.		1973	Queensland Plateau and Trough; Townsville Trough; Great Barrier Reef south of Townsville	Aquapulse
Shell Development (Australia) Pty. Ltd.	GSI	1973/1974	Queensland Trough and Plateau, Townsville Trough, Marion Plateau	Air-gun
Geophysical Service International		1979	Queensland Trough and Plateau, Coral Sea	Air-gun

Table 3. Industry seismic data acquired offshore Queensland. Seismic resolution indicator: Boomer – shallow; Sparker – shallow to intermediate; Explosives, Air-guns and Aquapulse – deep.

COLLABORATIVE RESEARCH PROGRAMS

Throughout the 1970s, the BMR, in some cases as part of national and international collaborative research programs, carried out geoscientific investigations in the region (Figure 2, Table 1). Seismic, gravity and magnetic surveys were carried out during the research activities (Table 2). Drill, core, dredge and grab samples were collected for scientific purposes on some of the surveys. These research programs revolved around understanding the age and history of the Great Barrier Reef, the geology of the continental margin, including the extent of possible offshore sedimentary basins, the sedimentary structure, and regional basement tectonics. In addition, the surveys aimed to better define the bathymetry of the region.

The BMR's collaborative geoscientific research included limited involvement with the JOIDES Deep Sea Drilling Program (DSDP) from 1971 to 1973. The goals of the DSDP in Australia were to investigate the break-up of the southern continents, the development of major oceanic circulations, and climatological implications for the circum-Antarctic area.

From 1978 to 1981, the BMR collaborated with the German Geological Survey (BGR). The surveys were aimed at elucidating the nature of Australia's continental shelf and margin, as part of a world-wide passive margin research program.

In 1990, in order to investigate carbonate platform development, global responses to sea level change, and other palaeoclimatic and paleoceanographic aspects, the BMR participated in an international research project as part of the Ocean Drilling Program (ODP) Leg 133, ODP being the successor organisation of the DSDP. Amongst other results, this coring showed that the GBR is less than one million years old.

In 1991-1992, the Australian Geological Survey Organisation (AGSO)(formerly the BMR) collaborated with the Research Department of the Japanese National Oil Corporation (JNOC). The aim was to study the development of modern carbonate environments offshore southern Queensland south of the GBRMP, as an analog for hydrocarbon exploration in ancient buried reefs elsewhere in the world.

Most recently, in 1999-2001, AGSO collaborated with the ODP on Leg 194 in order to carry out drilling on the Marion Plateau in the Coral Sea region. The drilling investigated sea level variation, paleoceanography, and fluid flow.

REVIEW OF PETROLEUM EXPLORATION

In the 1960s, there were numerous seismic surveys for petroleum exploration in the northeast Australia region (Table 3). These surveys initially used explosives as the seismic source. From 1969, non-destructive seismic sources were used such as Aquapulse or Airgun systems. Several petroleum exploration wells were drilled in the region between 1967 and 1969, however no petroleum was found (Figure 1).

In 1970, a moratorium on petroleum exploration drilling on the Great Barrier Reef was declared. The subsequent "Royal Commission into exploratory and production drilling for petroleum in the area of the Great Barrier Reef" (1970-1974), was followed by the establishment of the "Great Barrier Reef Marine Park" in 1975.

After the establishment of the Great Barrier Reef Marine Park, seismic surveys for petroleum exploration ceased within the park (Table 3).

In 1979, Geophysical Services International (GSI) conducted geoscientific seismic surveys outside the Great Barrier Reef Marine Park under the Petroleum (Submerged Lands) Act (PSLA). These surveys were conducted over the eastern Queensland Trough, the Queensland Plateau and in the Coral Sea region, and were aimed at better defining the petroleum potential of the region.

In 2000, the geophysical company TGS-NOPEC lodged with the Federal Government a proposal to conduct seismic surveys in the Townsville Trough offshore Queensland, 190 km from the coast and at least 50 km outside the boundary of the Great Barrier Reef Marine Park. This proposal is currently being assessed by Environment Australia (6/2002).

CLASSIFICATION OF RESEARCH SURVEYS

Since 1970, when geoscientific research of the Great Barrier Reef region began in earnest, 29 marine surveys of relevance to this review have been conducted. Of these,

24 involved BMR or AGSO, as either a major or minor contributor. Key surveys are described in detail further on in this document. The geological and geophysical marine surveys undertaken offshore northeast Queensland can be categorised as either geoscientific research or petroleum exploration, as outlined below:

- Petroleum, which includes commercial operations carried out by industry for general resource assessment purposes and petroleum exploration (P).
- Resource assessment (RA) activities that are carried out to assess long-term resource potential and are normally based on geological framework studies for defining potential petroleum systems.
- Continental Margin Studies (CMS), which includes operations carried out by government to assess the broad geological framework of areas. These were designed to aid in the understanding of the geology of the continental margin including the controls on reef growth and basin formation in a global context.
- Deep Sea Drilling Project and Ocean Drilling Program (ODP) investigations, which include paleoceanographic studies, in order to understand earth systems including climatic and sea level changes over time.
- Geological history of the reef and its processes (GH), including studies of carbonate platforms formed in the last 25 Ma. This includes inter-reef studies investigating the geology of areas between reef complexes and around their margins.
- Modern reef studies (MR) of the reef and associated sediments since the last ice age. This also includes inter-reef studies investigating the geology of areas between reef complexes and around their margins.

These categories are used to classify the marine surveys summarised in this report and shown in Part 2.

POLITICAL AND REGULATORY MILESTONES

During the history of geoscientific and petroleum exploration surveys in the Great Barrier Reef region, there have been several important political milestones. These are summarised below, and are also displayed in Figure 2.

- 1970: Moratorium on petroleum exploration drilling on the Great Barrier Reef
- 1970-1974: Royal Commission into exploratory and production drilling for petroleum in the area of the Great Barrier Reef
- 1975: establishment of the "Great Barrier Reef Marine Park"
- April 1990: Federal Government promotes the Townsville Trough and Maryborough Basin as regions outside the GBRMP to be released for petroleum exploration in a 2-6 year time frame, and the Queensland Trough and Capricorn Basin in a 6-10 year time frame (Commonwealth of Australia 1990).
- July 1990: PM Hawke announces that no exploration would be allowed which would in any way endanger the Great Barrier Reef.
- 2000: Geophysical company TGS-NOPEC proposes to conduct seismic surveys offshore Queensland, 190 km from the east coast and 50 km outside the Great Barrier Reef Marine Park boundary.

The clear response of BMR/AGSO/Geoscience Australia to government priorities is evident in Figure 2. Petroleum related studies were discontinued by

BMR/AGSO/Geoscience Australia in the early 1990's when it became clear that no petroleum exploration leases were to be awarded in the region.

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PART TWO: SURVEYS AND DRILLING PROGRAMS

Activity 1970

BMR Marine Geology Cruise in the Southern Barrier Reef and Northern Tasman Sea 12.9.1970 to 14.12.1970 Year of Survey: 1970 Category: MR
Reference
Jongsma D. & Marshall J.F., 1971. BMR Marine Geology Cruise in the Southern Barrier Reef and Northern Tasman Sea 12.9.1970 to 14.12.1970. BMR Record 1971/17.
Location
The survey covered areas off the central and southern Queensland and northern NSW coasts. The shelf from the Capricorn Channel southwards to 32 S was covered in addition to off lying seamounts and islands. The cruise collected bottom samples and seismic data between Swain Reefs (Qld) and Port Macquarie (NSW).
Organisations/ Companies Involved
BMR, Queensland Geological Survey and New South Wales Geological Survey
Aims
To carry out geological reconnaissance of the Australian Continental Shelf and build an understanding of modern (Holocene) reef age, development and distribution.
Summary
The report consists of a cruise summary and a brief preliminary assessment of some of the data collected. Many papers on reef growth have stemmed from shallow drilling relating to this cruise, and a BMR cruise in 1976 (see below)
Activity
290 bottom samples and 3500 km of boomer profiles were obtained from the continental shelf and upper continental slope off eastern Australia
Comments
The continental shelf and upper slope of the northern study area is mantled by reef-derived organic carbonates. In the south, quartz sands dominate. Shallow seismic profiles indicate an undisturbed conformable sequence 300-400 m thick in the Capricorn Channel thinning landwards. Several follow-on papers focus on the age of the Great Barrier Reef, and the rates of growth determined by the research. Shallow drilling (less than 30 m in depth) to investigate the nature of submarine cements and coral growth occurred in later studies in the southern and central Great Barrier Reef (Marshall 1983, 1986). Holocene reefs were shown to be of variable thickness, and to have grown on an older reef surface that developed during the last interglacial.

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- Marshall J.F., 1991. Models of Holocene reef growth in the southwest Pacific. In.: Workshop on Coastal Processes in the South Pacific Island Nations, SOPAC Technical Bulletin 7; 43-44.

Continental Margins Survey

Year of Survey: 1970-1972
Survey No: 5 (1970), 10 (1970), 13 (1971), 14 (1971)
Category: CMS

Reference

Compagnie Generale de Geophysique & BMR 1975. Geophysical surveys of the continental margins of Australia, Gulf of Papua and the Bismarck Sea – operations and techniques. Record 1975/151.

Location

Bismarck Sea and Gulf of Papua (survey 5), northern Coral Sea, northern Tasman Sea (surveys 10 to 14)

Organisations/ Companies Involved

BMR and Compagnie Generale de Geophysique

Aims

The aim of the seismic, gravity and magnetic surveys was to investigate the shallow sub-bottom, the extent of possible offshore sedimentary basins, the sedimentary structure down to a few thousand feet, and the regional basement tectonics

Summary

The purpose of the report is to describe operations, techniques, the staffing and logistical organisation of the survey.

Activity

Surveys were carried out from 1970 to 1972 by Compagnie Generale de Geophysique for the BMR.

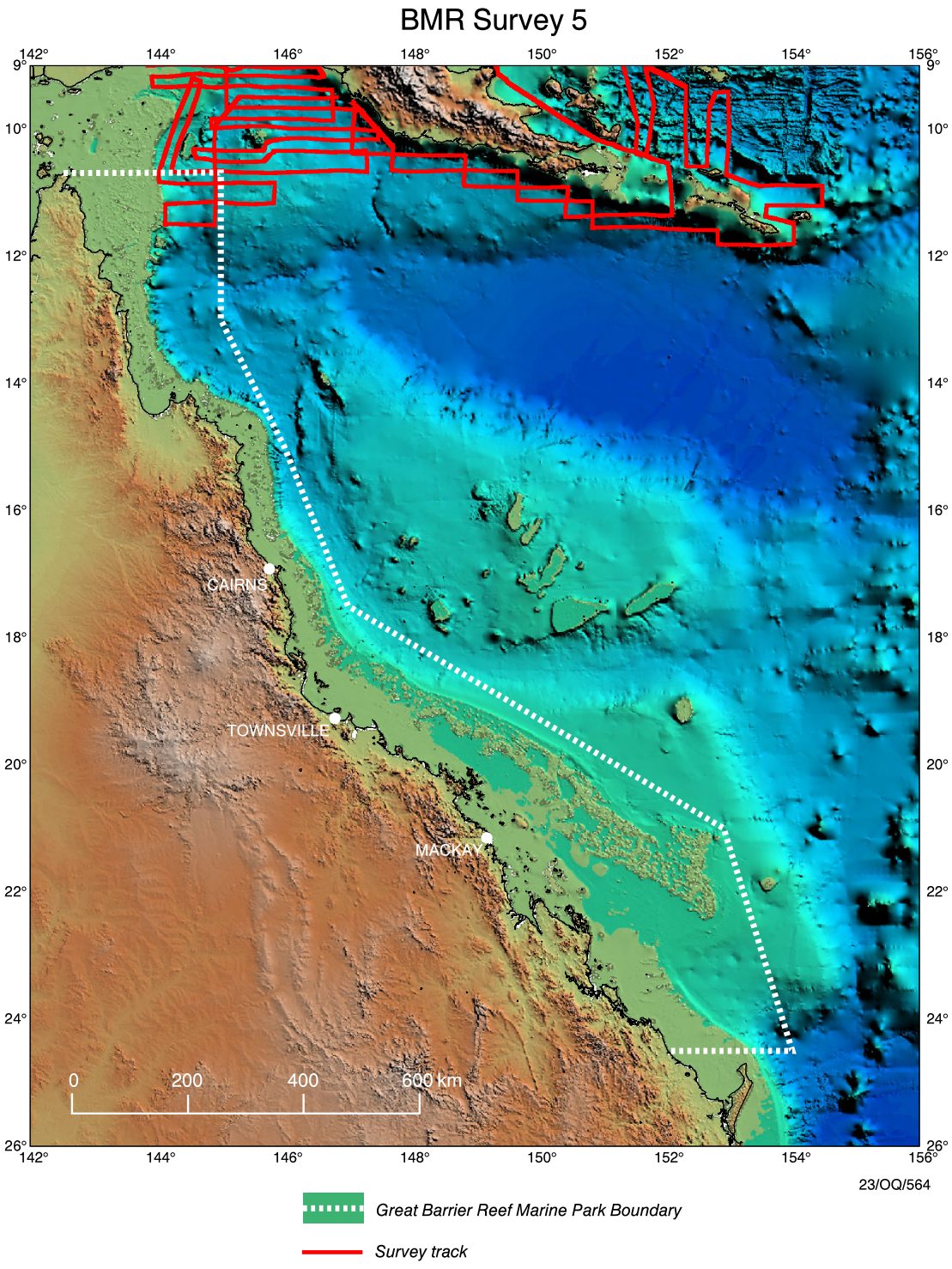
Comments

Numerous follow up reports stemmed from these surveys. Marshall (1972) delineated a wide continental shelf and gently inclined continental slope in the north and a narrow continental shelf and relatively steep continental slope in the south. Mutter (1972) delineated structural trends in the Gulf of Papua and northwestern Coral Sea region. Mutter (1973) defined the basic morphology of the Coral Sea and Marion Plateau, and the surrounding area. Information on the thickness of various sedimentary sequences, and the possible origin of topographic features increased the understanding of the geological history in the region, including the breakup of Gondwana and the significance of the Lord Howe Rise. Marshall and Davies (1974) detailed the first reported occurrence of ooids in the GBR, over an area of 340 km^2. Mutter (1974) helped define the gravity, magnetic and seismic properties of the Queensland continental margin. Pinchin and Hudspeth (1974) assessed the data collected on the BMR surveys, along with DSDP holes 209 and 210. The authors also assessed the region for petroleum potential, and recommended future petroleum exploration be concentrated on the continental slope outside the Great Barrier Reef, and within the southern end of the Townsville Trough. Jongsma (1976) discussed the morphology, geology and geophysics of emergent seamounts off the Queensland coast.

Related Papers

- Marshall J.F., 1972. Morphology of the east Australian continental margin between 21 S and 33 S. BMR Record 1972/70.
- Mutter J.C., 1972. A Recent geophysical reconnaissance of the Gulf of Papua and the northwest Coral Sea. BMR Record 1972/122.
- Mutter J.C., 1972. Marine geophysical survey of the Bismarck Sea and Gulf of Papua, 1970 – a structural analysis of the Gulf of Papua and northwest Coral Sea region. BMR Record 1972/134.
- Mutter J.C., 1973. Aspects of the structure and tectonic history of the continental margin of northern Queensland. BMR Record 1973/107.
- Willcox J.B., 1973. Preview report for the marine geophysical survey of the Gulf of Papua and the Bismarck Sea, 1970. BMR Record 1973/38.
- Marshall J.F. & Davies P.J., 1974. High-magnesium calcite ooids from the Great Barrier Reef. BMR Record 1974/24.
- Mutter J.C., 1974. Geophysical results from the Coral Sea: continental margins survey report. BMR Record 1974/116.
- Compagnie Generale de Geophysique ,1974. Field report of marine geophysical survey No.5 of the Gulf of Papua and Bismarck Sea. BMR Record 1974/45.
- Compagnie Generale de Geophysique, 1974. Geophysical surveys of the continental margins of Australia, Gulf of Papua, and Bismarck Sea – equipment description. BMR Record 1974/111.
- Compagnie Generale de Geophysique, 1974. Geophysical surveys of the continental margins of Australia, Gulf of Papua, and Bismarck Sea – data processing. BMR Record 1974/110.
- Pinchin J. & Hudspeth J.W., 1974. The Queensland Trough: some recent geophysical results, and its petroleum potential. BMR Record 1974/170.
- Compagnie Generale de Geophysique, 1975. Geophysical surveys of the continental margins of Australia, Gulf of Papua, and Bismarck Sea – systems performance. BMR Record 1975/104.
- Mutter J.C., 1975. A structural analysis of the Gulf of Papua and northwest Coral Sea Region. BMR Report 179.
- Pinchin J. & Hudspeth J.W., 1975. The Queensland Trough: its petroleum potential based on some recent geophysical results. APEA Journal.
- Tilbury L.A., 1975. Geophysical results from the Gulf of Papua and Bismarck Sea. BMR Record 1975/115.
- Compagnie Generale de Geophysique., 1975. Geophysical surveys of the continental margins of Australia, Gulf of Papua, and Bismarck Sea – data quality and distribution. BMR Record 1975/152.
- Garnett R.A.P., 1975. Geophysical surveys of the continental margins of Australia, Gulf of Papua, and Bismarck Sea – satellite fix processing methods. BMR Record 1975/60.
- Mutter J.C., 1975. A structural analysis of the Gulf of Papua and northwest Coral Sea Region. BMR Report 179
- Jongsma D., 1976. A review of the geology, and geophysics of the Queensland Plateau. BMR 1976/39.
- Jongsma D., 1976. A review of the geology and geophysics of the area around Mellish, Frederick, Kenn and Wreck Reefs, and Cato Island. BMR Record 1976/40.

- Jongsma D., 1976. A review of the geology and geophysics of the Marion Plateau BMR Record 1976/41.
- Jongsma D. 1976. A review of the geology, and geophysics of the Queensland Plateau. Bureau of Mineral Resources, Geology and Geophysics. Record 1976/39:6p.
- Pinchin J. 1976. Velocity analysis of two seismic sections across the Queensland Trough. BMR Record 1976/58.
- Wilcox J.B, 1976. Structure of the Bismark Sea. BMR 1976/59.
- Marshall J.F., 1977. Marine geology of the Capricorn channel area. BMR Bulletin 163.
- Marshall J.F., 1978. Morphology and shallow structure of the continental shelf of southern Queensland and northern New South Wales. BMR 1978/100.
- Mutter J.C. & Karner G.D., 1980. The continental margin off northeast Australia. Geology and Geophysics of Northeastern Australia, Edited by R.A. Henderson and P.J. Stephenson. Brisbane, Geological Society of Australia, Queensland Division. 1980: 47-69.


BMR Survey 5
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CAIRNS
TOWNSVILLE
MACKAY
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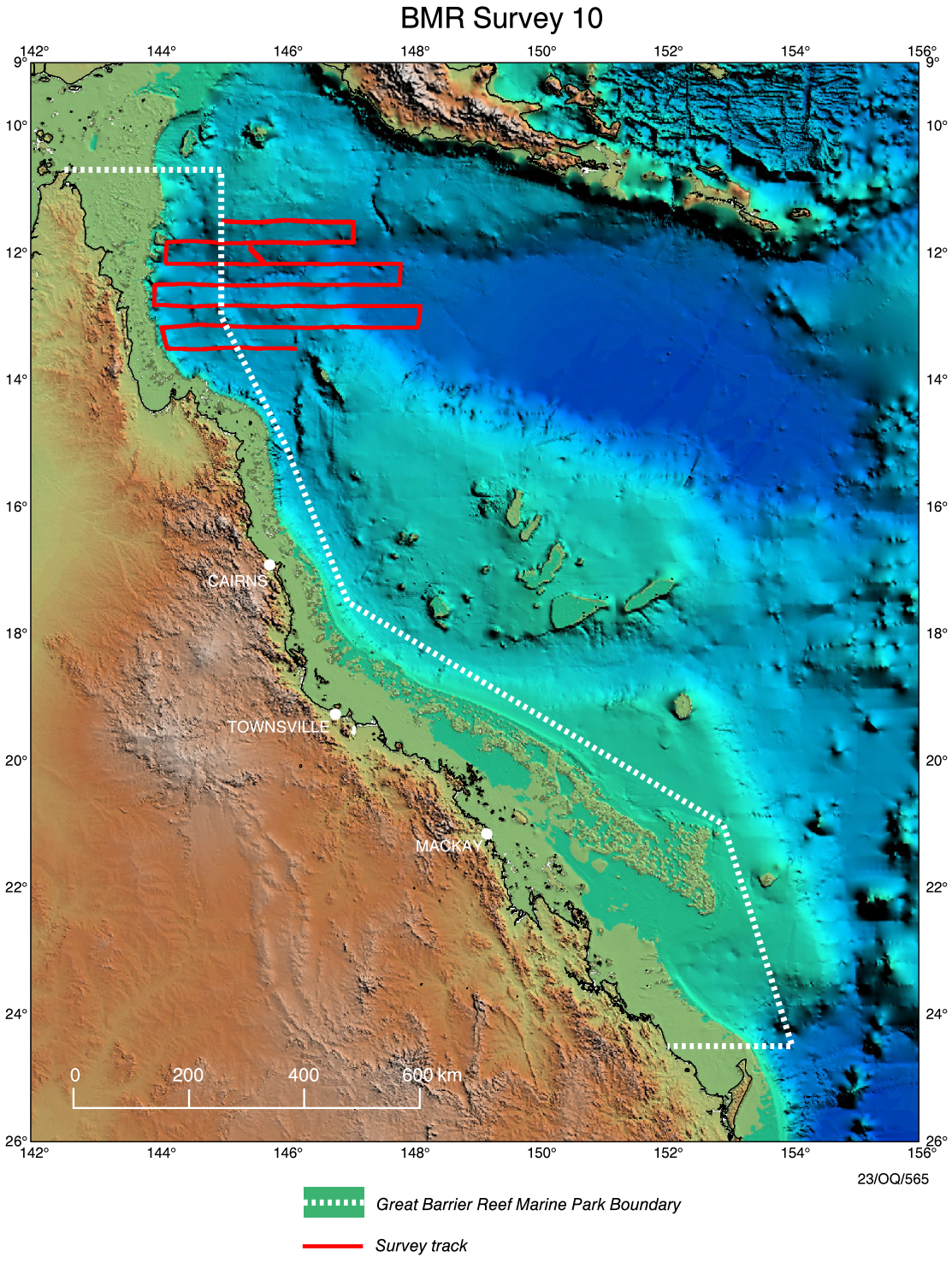
23/OQ/564
Great Barrier Reef Marine Park Boundary
Survey track


BMR Survey 10
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CAIRNS
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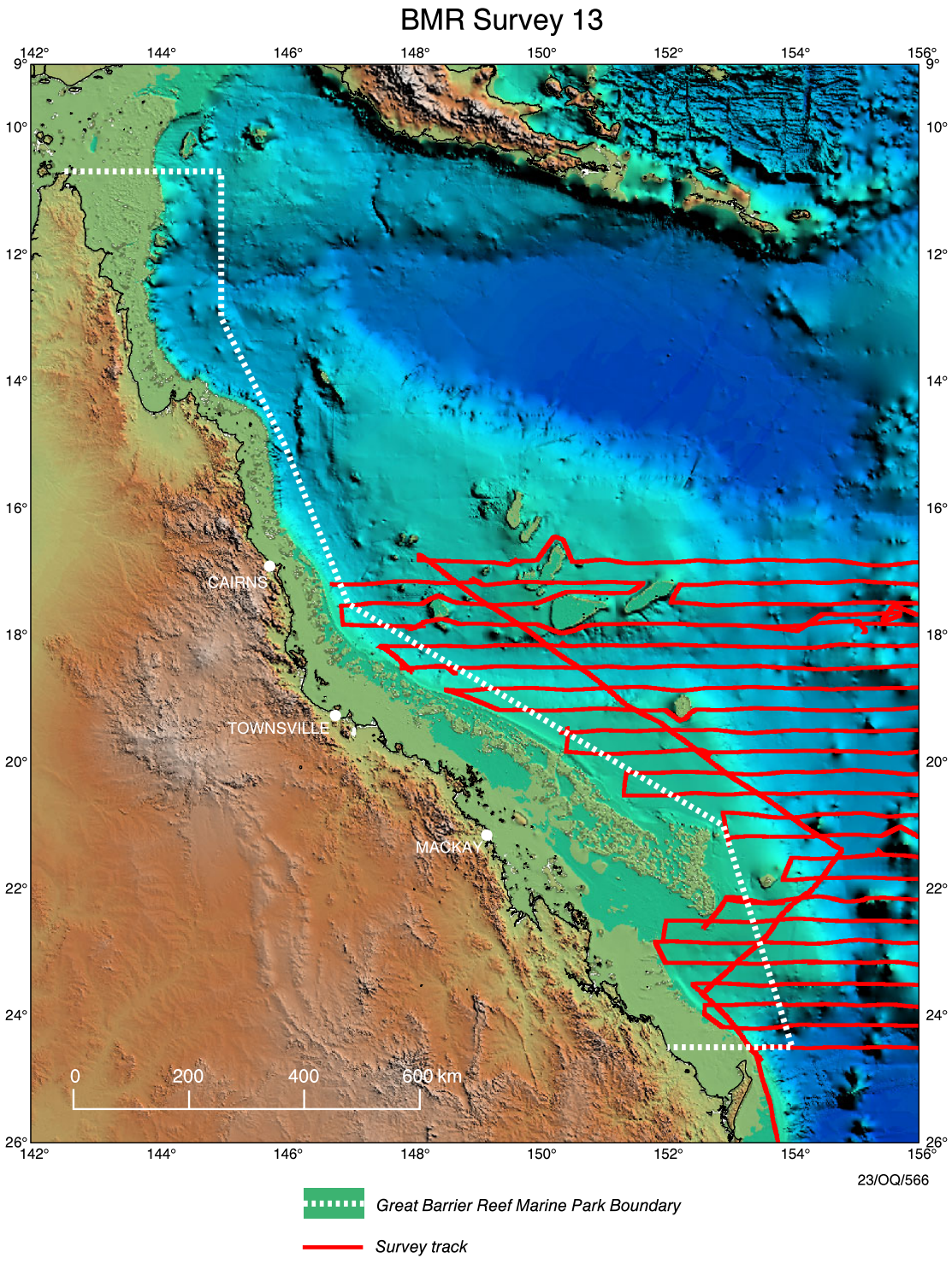
23/OQ/565
Great Barrier Reef Marine Park Boundary
Survey track


BMR Survey 13
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CAIRNS
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MACKAY
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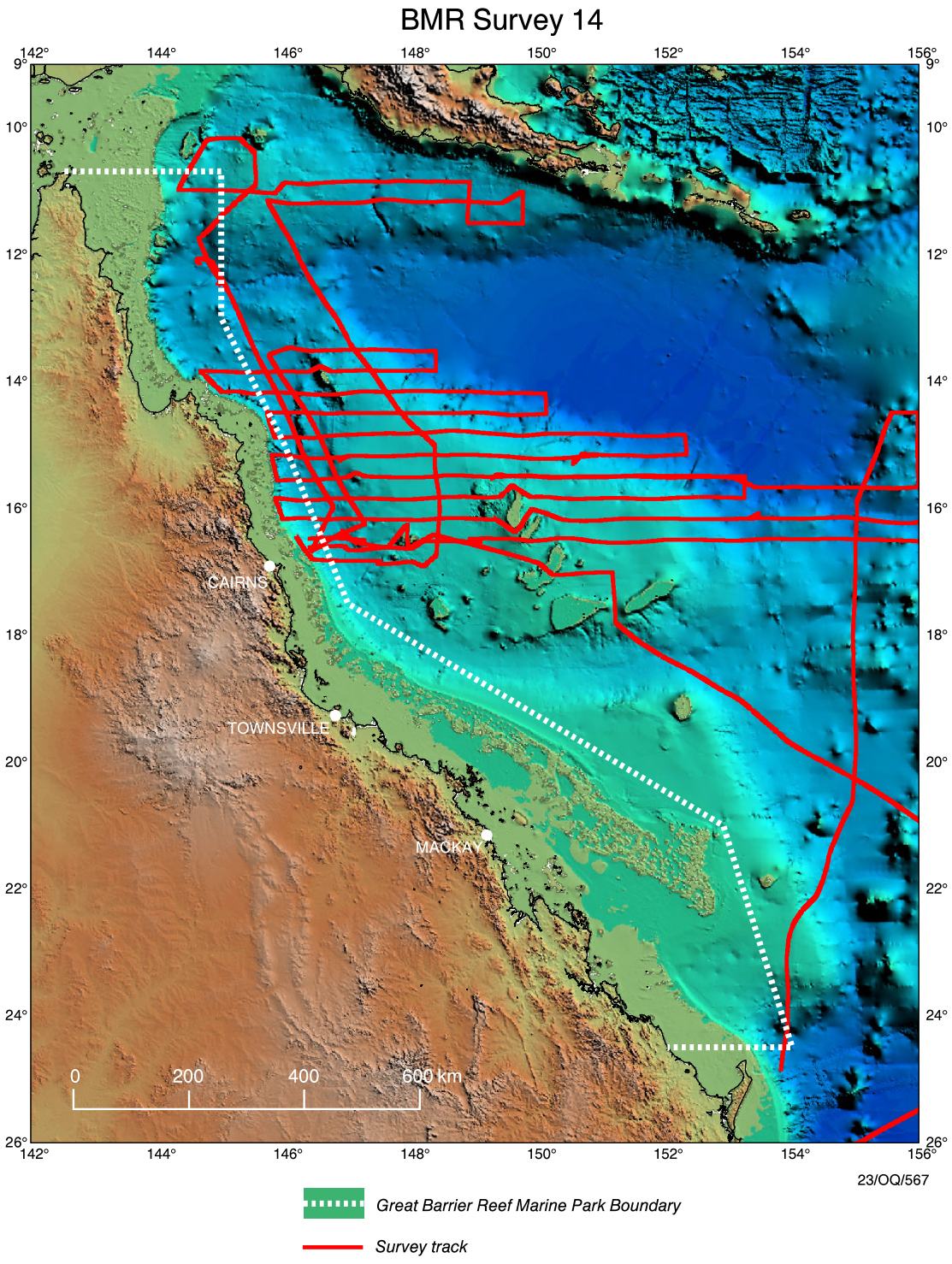
Great Barrier Reef Marine Park Boundary
Survey track


BMR Survey 14
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CAIRNS
TOWNSVILLE
MACKAY
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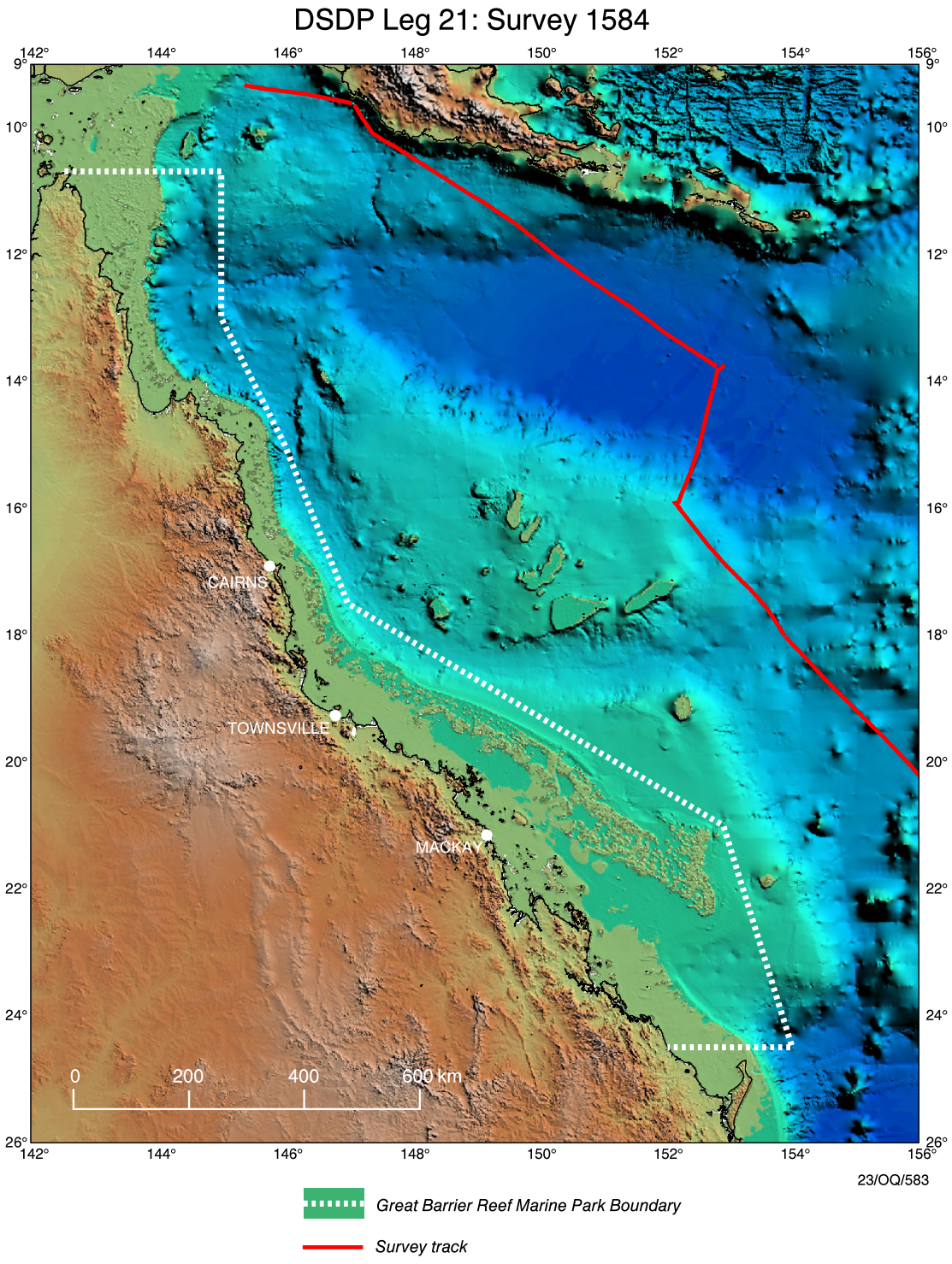
600 km
23/OQ/567
Great Barrier Reef Marine Park Boundary
Survey track

Activity 1971

JOIDES Deep Sea Drilling Program (DSDP) Year of Survey: 1971-1973 Survey No.: 1584 (1972), 1587 (1973) Category: ODP
Reference
• Burns R.E., Andrews J.E., et al., 1973. Initial Reports of the Deep Sea Drilling Project, Volume 21, Washington (U.S. Government Printing Office). • Andrews J.E., Packam G., et al., 1975. Initial Reports of the Deep Sea Drilling Project, Volume 30, Washington (U.S. Government Printing Office).
Location
Western Coral Sea
Organisations/ Companies Involved
The project has been sponsored by the US National Science Foundation since its inception. The USSR and the Federal Republic of Germany had entered into agreements with the United States whereby these countries also contributed to project costs.
Aims
The principal goals of the DSDP in Australia was to determine the chronology of the separation of the southern continents, development of major oceanic circulations, and climatological implications of the circum-Antartic area. The specific goals of Leg 21 (1584) and Leg 30 (1587) were to determine the biostratigraphy, lithology, and age of underlying crust, and the relationship between the Coral Sea and the Queensland Plateau.
Summary
Operating from August 1968, until replaced by the Ocean Drilling Program in 1975, the Deep Sea Drilling Project, using the unique drilling vessel *Glomar Challenger*, occupied drill sites in all the major oceans of the world, except the icebound Arctic, and visited several major marginal seas. Major contributions were made in the sub-fields of Global Tectonics, Sedimentology, Palaeontology, Mineralogy, Stratigraphy, and Paleo-oceanography, as well as in the peripheral fields of economic geology and drilling technology. Scientific guidance was provided mainly through the organisation JOIDES (Joint Oceanographic Institutions for Deep Earth Sampling), an international group of major oceanographic institutions operating within an agreement to foster plans for deep ocean drilling.

Activity
The DSDP has completed three holes in the Western Coral Sea; • Leg 21 Site 209: on the eastern margin of the Queensland Plateau. - The R/V *Kana Keoki* conducted a site survey in 1972, covering a section of outer plateau and the slope break. - Drilling penetrated 344 meters sampling three lithologic units. Site 210: on the Coral Sea Abyssal Plain - The R/V *Kana Keoki* conducted a site survey in 1972. - Drilling penetrated 711 meters and sampled 5 lithologic units. • Leg 30 Site 287: on the Coral Sea Abyssal Plain. - Location chosen based on previous legs seismic. - Drilling penetrated 252 m and sampled 7 lithologic units. - Leg was in 1973 using the *Glomar Challenger* vessel. This project also used the Continental Margin Geophysical Survey (1970-1972) seismic data for selecting possible drill sites.
Comments
The object of this drilling program was to reach the basement of the Coral Sea
Related Papers
• Falvey D.A. & Taylor L.W.H., 1974. Queensland Plateau and Coral Sea Basin: structural and time-stratigraphic patterns. Australian Society of Exploration Geophysicists. Bulletin 5(4):123-6. • Mutter J.C., 1975. Basin evolution and marginal plateau subsidence in the Coral Sea. Australian Society of Exploration Geophysicists. Bulletin 6(2/3): 35-7. • Veevers J.J. (Ed.). 1975. Deep Sea Drilling in Australasian Waters. Challenger Symposium, Sydney. • Jongsma D., 1976. A review of the geology, and geophysics of the Queensland Plateau. BMR 1976/39. • Mutter J.C., 1977. The Queensland Plateau. Bureau of Mineral Resources, Geology and Geophysics. Bulletin 179:55p. • Taylor L., 1977. The western Coral Sea: sedimentation and tectonics. PHD Thesis, University of Sydney. • Taylor L. & Falvey D., 1977. Queensland Plateau and Coral Sea Basin: stratigraphy, structure and tectonics. APEA Journal 1977/17(1):13-29. • Mutter J.C. & Karner G.D., 1980. The continental margin off northeast Australia. Geology and Geophysics of Northeastern Australia, Edited by R.A. Henderson and P.J. Stephenson. Brisbane, Geological Society of Australia, Queensland Division. 1980: 47-69. • Chaproniere G.C.H, Pigram J.P., Symonds P.A. & Davies P.J., 1990. The northeast Australian margin and adjacent areas- a biostratigraphic review and geohistory analysis. BMR 1990/7.


DSDP Leg 21: Survey 1584
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MACKAY
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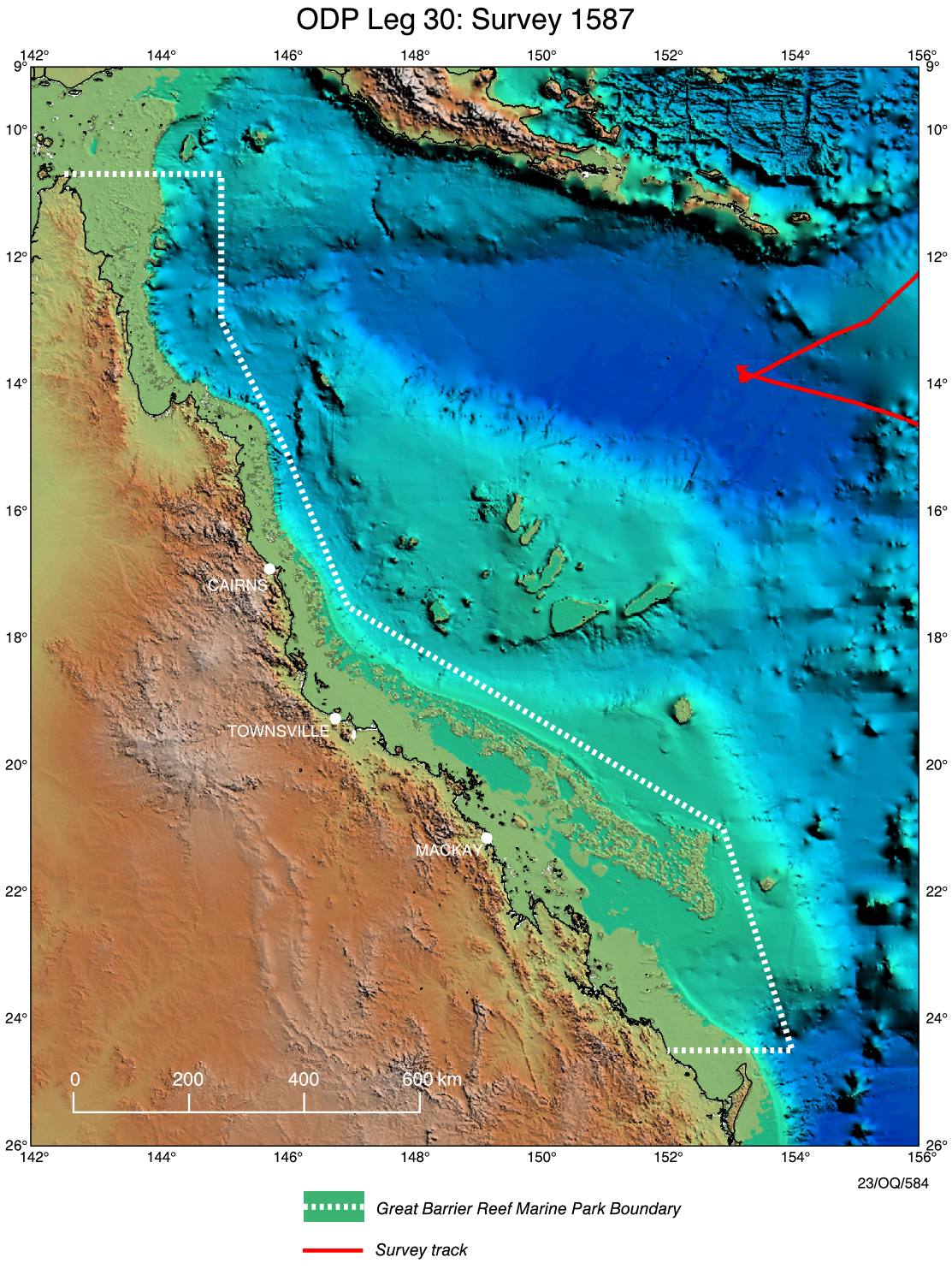
23/OQ/583
Great Barrier Reef Marine Park Boundary
Survey track


ODP Leg 30: Survey 1587
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CAIRNS
TOWNSVILLE
MACKAY
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23/OQ/584
Great Barrier Reef Marine Park Boundary
Survey track

Activity 1976

Shallow Reef Structure: Southern Great Barrier Reef Year: 1976 Category: GH & MR
Reference
Harvey N., Davies P.J. and Marshall J.F., 1978. Shallow reef structure: southern Great Barrier Reef. BMR Report 1978/96.
Location
Southern Great Barrier Reef
Organisations/ Companies Involved
BMR
Aims
To carry out shallow seismic refraction studies on six reefs of the Capricorn and Bunker Groups, in order to understand the pre-Holocene reef morphology and the Holocene reef growth.
Summary
The Record provides a brief morphological description of each reef accompanied by the detailed seismic data for the reef.
Activity
Seismic investigations were carried out on 6 reefs (Fairfax, Fitzroy, Masthead, One Tree, Sykes and Wreck)
Comments
Results from this survey, and the southern GBR 1970 survey were the basis of many subsequent papers. The extended list of papers discussing research in the southern Great Barrier Reef is displayed on page 13 in the Related Papers section of the BMR Record 1971/17 summary.
Related Papers
• Davies P.J., Marshall J.F., Foulstone D., Thom B.G., Harvey N., Short A.D. & Martin K., 1977. Reef growth, southern Great Barrier Reef – preliminary results. BMR Journal of Australian Geology and Geophysics 2; 69-72. • Davies P.J., Marshall J.F. & Graham T., 1986. The outer barrier of the Great Barrier Reef. 12th International Sedimentological Congress Field Excursion 1A. • Davies P.J., Marshall J.F. & Graham T., 1986. Capricorn and Bunker Reefs, southern Great Barrier Reef. 12th International Sedimentological Congress Field Excursion 18B.

Activity 1977

Drowned Dolines – The Blue Holes of the Pompey Reefs, Great Barrier Reef Year of Survey: 1977 Category: MR
Reference
Backshall D.G., Barnett J., Davies P.J., Duncan D.C., Harvey N., Hopley D., Isdale P.J., Jennings J.N. & Moss R., 1979. Drowned dolines – the blue holes of the Pompey Reefs, Great Barrier Reef. BMR Journal of Australian Geology and Geophysics 4; 99-109.
Location
Cockatoo and Molar Reefs, Central Great Barrier Reef (offshore Mackay)
Organisations/ Companies Involved
James Cook University and BMR
Aims
To investigate the occurrence of 'blue holes' in reefs of the Great Barrier Reef
Summary
The research, carried out by JCU researchers on the RV James Kirby, interpreted the features to provide evidence of substrate control of Holocene reef growth – that substrate was formed by karst processes.
Activity
Shallow seismic profiling and shallow drill holes, were carried out
Comments
Related Papers

Joint BMR-GSQ Marine Survey

Year of Survey: 1977
Category: MR

Reference

Searle D.E., Davies P.J., Hekel H., Kennard J., Marshall J.F. & Thom B.G., 1978. Preliminary results of a continuous seismic profiling survey in the Capricorn Group, southern Great Barrier Reef. Geological Survey of Queensland Record 1978/46.

Location

The area investigated was in the southern Great Barrier Reef, situated in the Bunker High, between the Capricorn and Maryborough Basins

Organisations/ Companies Involved

The project was a joint BMR-Geological Survey of Queensland survey

Aims

The aim was to collect information about the Late Pleistocene to Holocene geology of the Capricorn-Bunker Group

Summary

Six geological units were identified from the seismic profiles, however the depth of unconformities beneath Holocene reefs was not determined.

Activity

The 1977 survey incorporated:

- Continuous seismic shallow profiling offshore (276 km)
- Seismic refraction profiling on islands and exposed reefal flats
- Scuba diving observations and drilling in shallow water, using a hand-held air operated coring device

Comments

More work was required to understand the full meaning of the CSP profiles for the Pleistocene history of the southern Great Barrier Reef.

Related Papers

- Davies P.J., Marshall J.F., Hekel H. & Searle D.E., 1981. Shallow inter-reefal structure of the Capricorn Group, southern Great Barrier Reef, BMR Journal of Australian Geology and Geophysics 6; 101-105.

Activity 1978

Preliminary Results of Continuous Seismic Profiling in the Great Barrier Reef Province Between 16°10'S and 19°20'S Year of Survey: 1978 Category: MR & GH
Reference
Searle D.E., Harvey N. and Hopely D. 1980. Preliminary results of continuous seismic profiling in the Great Barrier Reef province between 16°10'S and 19 20'S. Geological Survey of Queensland Record 1980/23.
Location
The northern central region of the Great Barrier Reef
Organisations/ Companies Involved
James Cook University (JCU) and the Geological Survey of Queensland (GSQ).
Aims
• To provide continuous sub-surface data across the continental shelf • To define ancient drainage channels • To integrate the results of reflection (CSP) and reef-top refraction work
Summary
• Conduct shallow drilling of reef caps to obtain material for dating • Carry out reef-top refraction work to identify solution disconformities • Carry out continuous seismic reflection profiling (CSP) to investigate shallow sub-surface geology in this part of the GBR
Activity
In July 1978, JCU and GSQ conducted a research cruise during which 260 km of high resolution continuous shallow seismic reflection profile was recorded.
Comments
The shallow seismic results obtained during the survey provided additional information about the structure and evolution of the northern central region of the Great Barrier Reef province.
Related Papers

"Sonne" Southeast Asia Cruise SO-7

Year of Survey: 1978
Survey No.: 1031
Category: CMS

Reference

Hinz K., 1979. Bericht über die "Sonne"-Südost-Asien-Fahrt 1978 – Forschungs – fahrt SO-7 – 16.10.1978 bis 22.12.1978. – Unveröffentlichter Bericht der BGR, Hannover, Archiv-Nr. 82086.

Location

Northern Coral Sea (Sonne 7 A) and the Lord Howe Rise (Sonne 7 B). All work outside of the Great Barrier Reef Marine Park.

Organisations/ Companies Involved

BMR, Bundesanstalt fur Geowissenschaften und Rohstoffe (BGR) Federal Republic of Germany, Department of Scientific and Industrial Research (NZ) and the Geological Survey of Papua New Guinea.

Aims

To determine the depth and nature of the basement of the Lord Howe Rise (7a), and to search for marginal graben zones off the Queensland and Papuan Plateaus associated with the initial rifting of the Coral Sea Basin (7b)

Summary

The research delineated regional unconformities, the transition from continental crust (Queensland and Papuan Plateaus) to oceanic crust (Coral Sea Basin), approximate reef growth rates and regional tectonic characteristics, in particular the presence of narrow rift grabens beneath the outer margins of the Queensland and Papuan Plateaus.

Activity

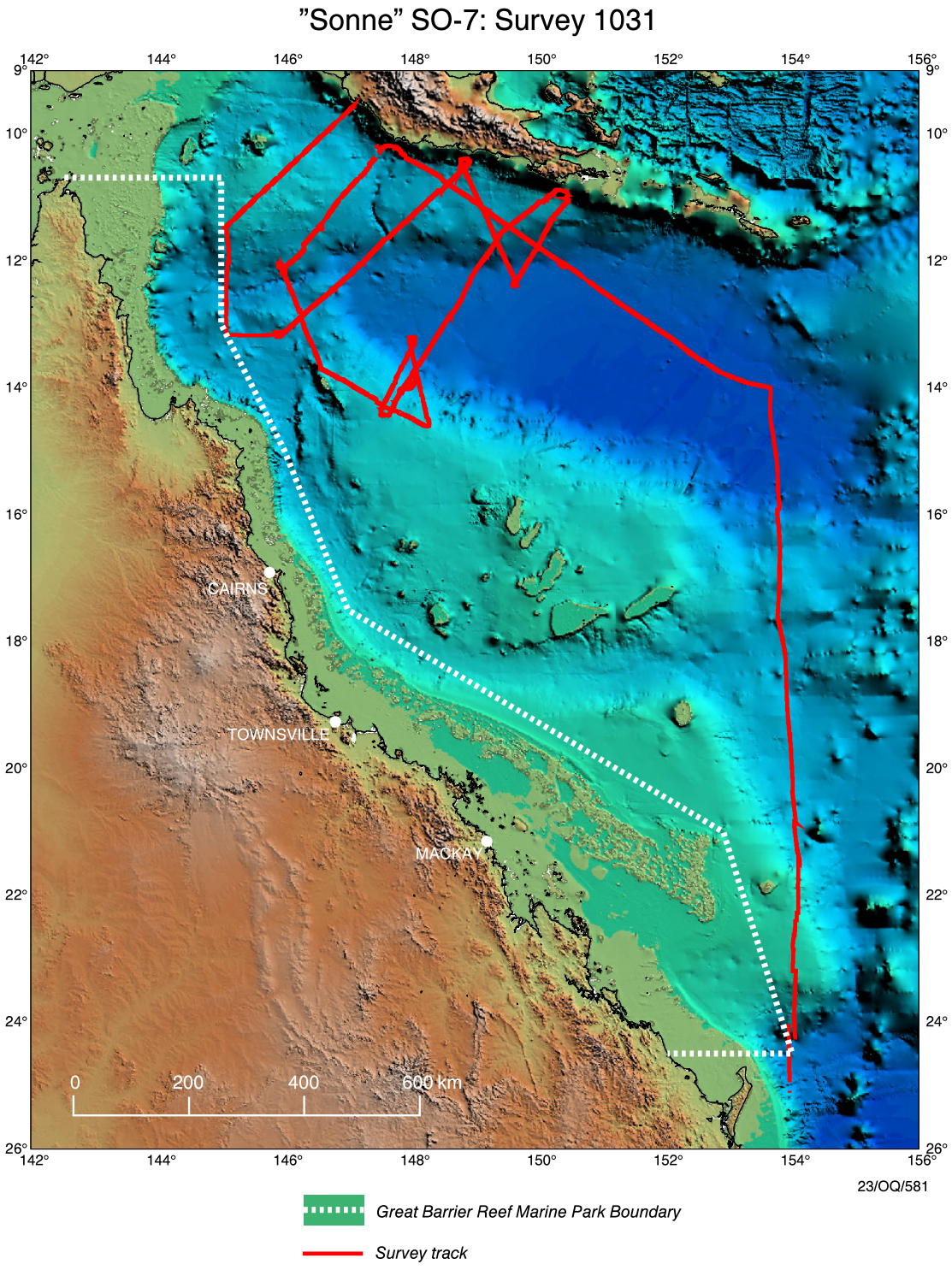
A total of 10,500 km of bathymetric, magnetic and gravity profiles, 7000 km of digital deep seismic reflection profiles and 50 sonobuoy refraction profiles were recorded in the 2 surveys, which occurred in October-December 1978.

Comments

The co-operation between the BGR and BMR was conducted within the framework of the FRG/Australia Science and Technology Agreement.

Related Papers

- Summary report of the "Sonne" southeast Asia cruise SO-7 1978. CCOP Newsletter 6; 18-21.
- Cameron P.J. et al., 1979. Papuan and Queensland Plateau margins, Coral Sea: Geophysical results of SONNE-cruise SO-7.
- Symonds P.A, Fritsch J. & Schluter H.U., 1982. Continental margin around the Western Coral Sea basin: structural elements, seismic sequences, and petroleum Geologic Aspects. Transactions of the Third Circum-Pacific Energy and Mineral Resources Conference, Honolulu, Hawaii.


”Sonne” SO-7: Survey 1031
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CAIRNS
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600 km
23/OQ/581
Great Barrier Reef Marine Park Boundary
Survey track

Activity 1980

Sonne Cruise SO-15 Year of Survey: 1980 Survey No.: 62 Category: MR
Reference
Von Stackelberg U (compiler). 1982. Heavy Mineral Exploration of the East Australian Shelf, SONNE cruise SO-15. Geologisches Jahrbuch Reihe D 1982, 56, 215 p.
Location
Four areas were investigated: Newcastle to Forster (NSW), Yamba to Byron Bay (NSW), Brunswick Heads to North Stradbroke Island (NSW-Qld) and off Fraser Island (Qld). Outside the Great Barrier Reef Marine Park.
Organisations/ Companies Involved
The Sonne cruise SO-15 was arranged under the auspices of the German-Australian Science and Technology Agreement. It involved the BMR and the FRG Institute of Geoscience and Mineral Resources (BGR). Scientists from the NSW and Qld Geological Surveys participated in the relevant parts of the cruise.
Aims
The cruise was undertaken to investigate the stratigraphy and depositional environments of superficial sediments on the east Australian continental shelf, particularly the nature and distribution of heavy minerals in the offshore sequences. Drillcore collected between Newcastle and Fraser Island were taken to try to unravel the Pleistocene history of the region and apply the results to the history of the Great Barrier Reef.
Summary
The research revealed a complex picture of sedimentation, with considerable variations in surface sediment composition. The work also found that heavy mineral abundances were low, and any plan to exploit the resources would face considerable environmental problems likely to arise from large scale dredging operations.
Activity
The cruise started in Sydney (September 1980) and finished in Brisbane (November 1980). The areas were studied using shallow seismic profiling and surface and subsurface sampling
Comments

Related Papers

- Colwell J.B., Jones H.A. & Davies P.J., 1981. Initial results of Sonne Cruise SO-15 on the east Australian continental shelf, September-November 1980. BMR Record 1981/4.
- Von Stackelberg U. (and shipboard party), 1981. SO-15 Schwermineralkampagne auf dem Ostaustralischen Schelf mit MS SONNE vom 20.9. bis 20.11.1980 (Förderungsvorhaben MF 02700) Fahrtbericht. Bundesanstalt Für Geowissenschaften Und Rohstoffe Hannover 87383 10195/81.
- Colwell JB and Roy PS 1983. Description of subsurface sediments from the east Australian continental shelf (Sonne cruise SO-15). BMR Record 1983/21.
- Chaproniere GCH 1983. Tertiary larger foraminiferids from the northwestern margin of the Queensland Plateau, Australia, in Palaeontological papers 1983. Bureau of Mineral Resources, Bulletin 217, 31-57.
- Chaproniere GCH 1991. Pleistocene to Holocene planktic foraminiferal biostratigraphy of the Coral Sea, offshore Queensland, Australia. BMR Journal of Australian Geology and Geophysics, 12, 3, 195-221.

"Sonne" Southeast Asia Cruise SO-16

Year of Survey: 1980-1981
Survey No.: 34
Category: CMS & GH

Reference

Fritsch J. & onboard crew, 1981. Bericht über den ersten und zweiten Fahrtabschnitt der "SONNE"-SODOST-ASIEN-FAHRT 1980/1981 – Forschungsfahrt SO-16 – 22.11.1980 bis 9.1.1981 – (Bericht zum Förderungsvorhaben MF 0274). Bundesanstalt For Geowissenschaften Und Rohstoffe Hannover 87968 10622/81.

Location

Northern Coral Sea, around the margins of the Coral Sea Basin. Outside of Great Barrier Reef Marine Park area.

Organisations/ Companies Involved

BMR, Bundesanstalt fur Geowissenschaften und Rohstoffe (BGR) Federal Republic of Germany, and the Geological Survey of Papua New Guinea

Aims

To research the fundamental problems concerning the development of continental margins, by investigating:

- The extent, age and nature of sediment fill, and development history of the rift grabens around the Coral Sea Basin
- The nature of possible fossil reefs beneath the slopes of the Papuan and Queensland Plateaus
- The location and nature of the ocean/continent boundary around the Coral Sea Basin
- The nature, structure and development of the Osprey Embayment (only partially completed due to areas falling within the GBR Marine Park)
- To obtain information on the lithofacies, age and palaeoenvironment of the Mesozoic and Cainozoic sediments, and to investigate the nature of the basement rocks in the region

Summary

Preliminary results of cruise SO-16a indicated that the Coral Sea Basin region is an area in which several stages of continental margin development have been preserved beneath relatively thin sediment cover.

Activity

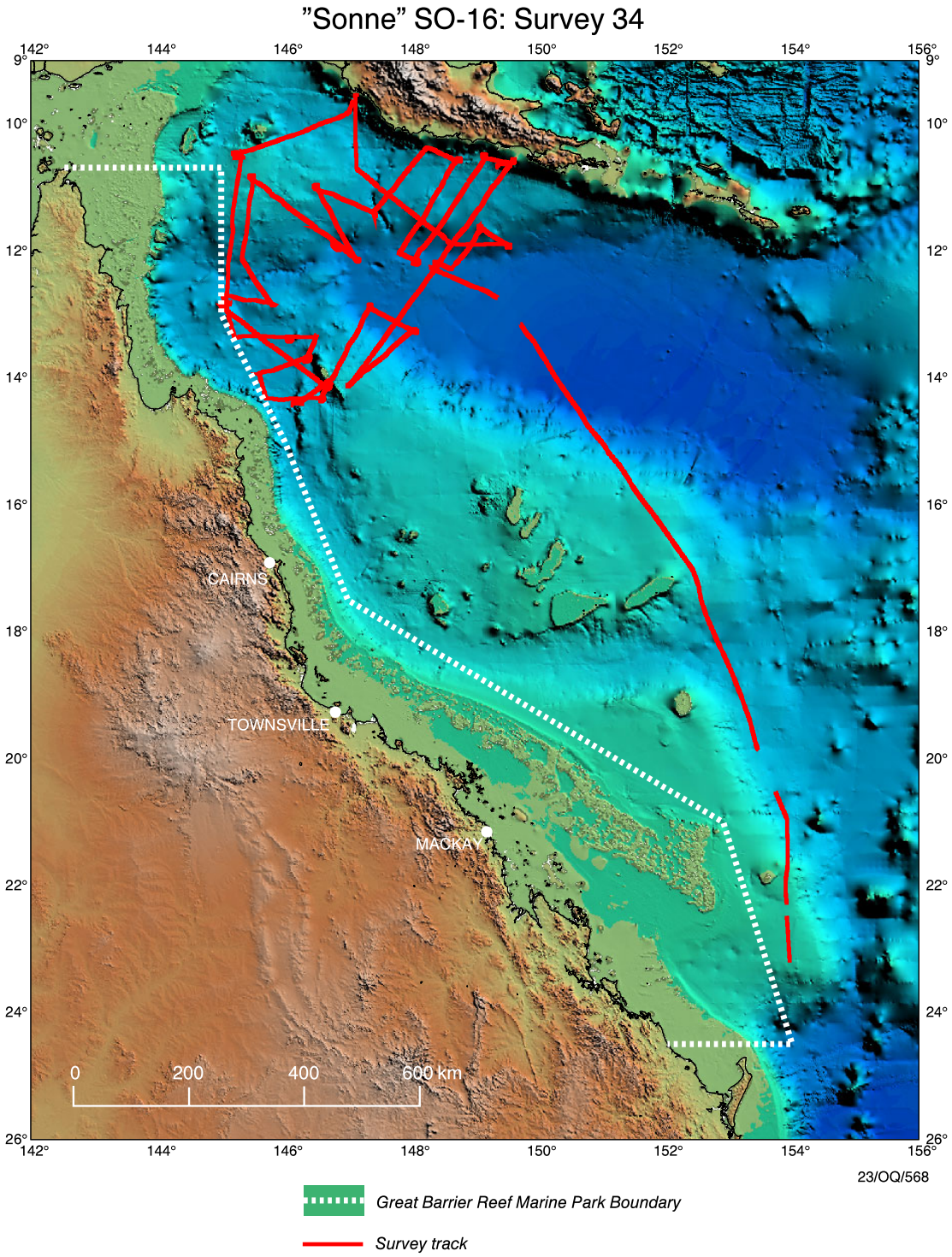
From November 1980 to January 1981, the cruise, which was divided into a geophysical cruise (SO-16a) and a geological sampling cruise SO-16b) recorded 7140 km of bathymetric and gravity data, 6950 km magnetic data, 3150 km digital multichannel deep seismic reflection profiles, 3560 km of analogue single channel seismic reflection profiles, 10 sonobuoy refraction profiles and the sampling of 16 stations by dredging and 9 by coring.

Comments

The co-operation between the BGR and BMR was conducted within the framework of the FRG/Australia Science and Technology Agreement.

Related Papers

- Symonds P.A., Fritsch J. & Schulter H.U., 1982. Continental margin around western Coral Sea Basin: structural elements, seismic sequences, and petroleum geological aspects. *In* Transactions of the Third Circum-Pacific Energy and Mineral Resources Conference, 243-252.
- Falvey D.A., Hinz K., Willcox J.B., Exon N.F., Symonds P.A. & Williamson P.E., 1986. Prospective Frontier Basins of Australia. *In* Fourth Circum-Pacific Energy and Mineral Resources Conference Transactions 424.


"Sonne" SO-16: Survey 34
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MACKAY
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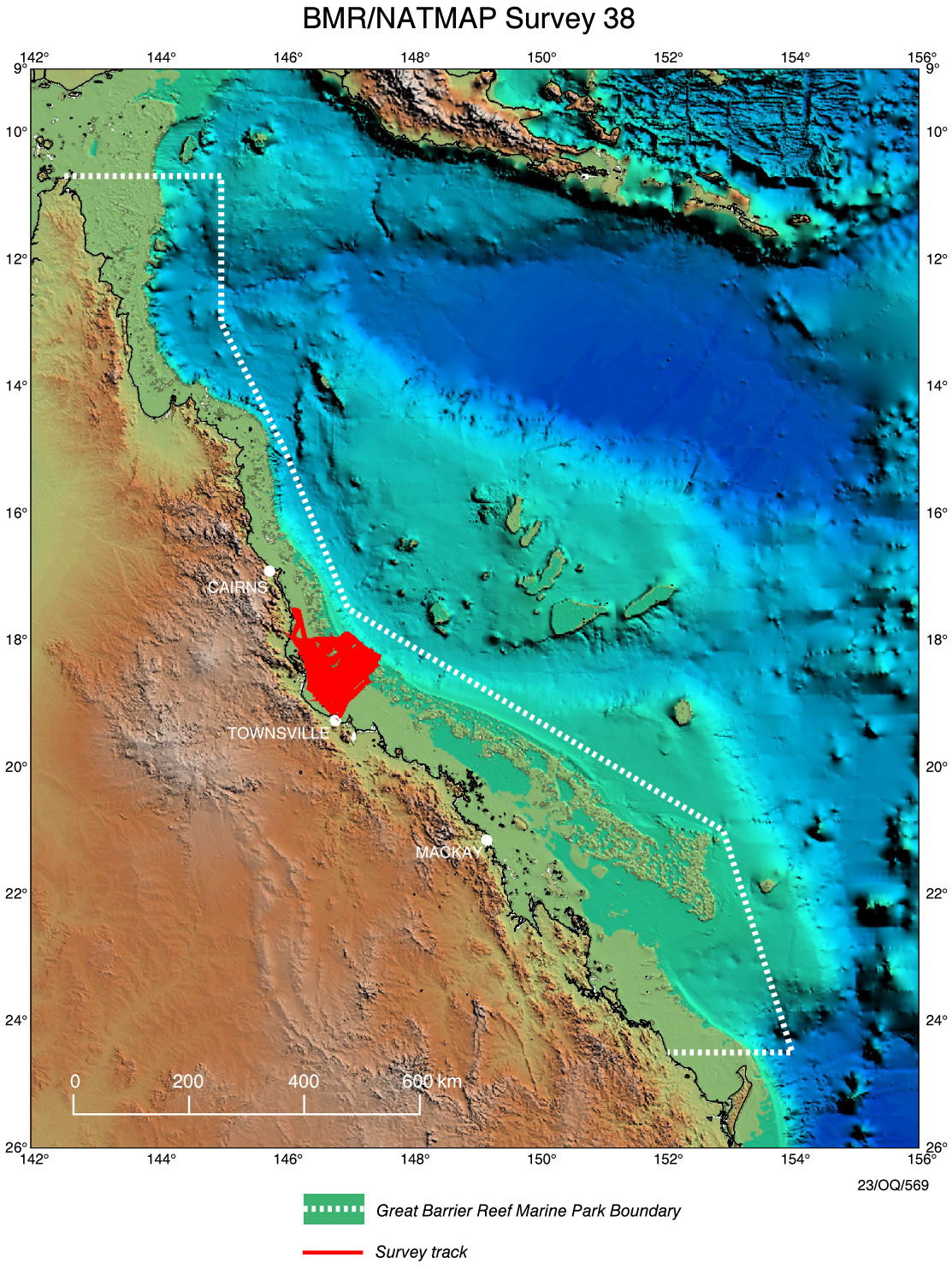
600 km
23/OQ/568
Great Barrier Reef Marine Park Boundary
Survey track

Activity 1981

38, 41 and 42 Surveys Year of Survey: 1981-1983 Survey No.: 38 (1981), 41 (1982), 42 (1983) Category: GH & MR
Reference
Falvey D.A. & McElhinny M.W. Seismic data processing research in the Bureau of Mineral Resources: A review of current programs and future needs. BMR.
Location
Townsville and Dunk Island (1981). Main reef passage between Townsville and Cairns and South of Myrmidon Reef and north of Broadhurst Reef (1982). The final survey (1983) is located southeast of the 1981 area.
Organisations/ Companies Involved
BMR & Division of National Mapping (NATMAP).
Aims
To establish the structure and stratigraphy of the inter-reef areas, and thus determine what geologic processes have controlled the evolution of the Great Barrier Reef.
Summary
The BMR seismic program in the central Great Barrier Reef Province tied together, wherever possible, Shell and BMR seismic lines on the continental slope. The sparker surveys was carried out with cooperation from the Division of National Mapping and used their Decca Hifix 6 and Motorola miniranger navigation system. The high-resolution boomer profiles were obtained using an E.G. and G. Subtow system at an energy level of 250-500 joules.
Activity
These three surveys were carried out using the vessel *Fabrina*. During August and September 1981 about 1000 km of single-channel shallow seismic data was digitally recorded. During July to September 1982 a total of 4228 km of magnetic and 24 channel digital shallow seismic data, and 6290 km of bathymetric data were collected. Approximately 4000 km of multichannel seismic data was recorded in the 1983 survey.
Comments
These surveys were used to study the formation and evolution of the Great Barrier Reef.

Related Papers

- Central Great Barrier Reef Inter-reefal study report for the third quarter. BMR.
- Symonds PA. Relation between continental shelf and margin development – central and northern Great Barrier Reef. In: Baker, J T, Et Al., (Eds), Proceedings of the Inaugural Great Barrier Reef Conference, Townsville, August 29-September 2, 1983, Hosted by James Cook University and Australian Institute of Marine Science. Townsville, James Cook University Press. 1983; 151-7.
- Symonds P.A., Davies P.J. & Parisi A., 1983. Structure and stratigraphy of the central Great Barrier Reef. BMR Journal of Australian Geology and Geophysics 8; 277-291.
- Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1987. Horizontal plate motion: a key to allocyclic factor in the evolution of the Great Barrier Reef. Science 238; 1697-1700.
- Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1988. Facies models in exploration – the carbonate platforms of north-east Australia. APEA Journal 28(1); 123-143.


BMR/NATMAP Survey 38
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MACKAY
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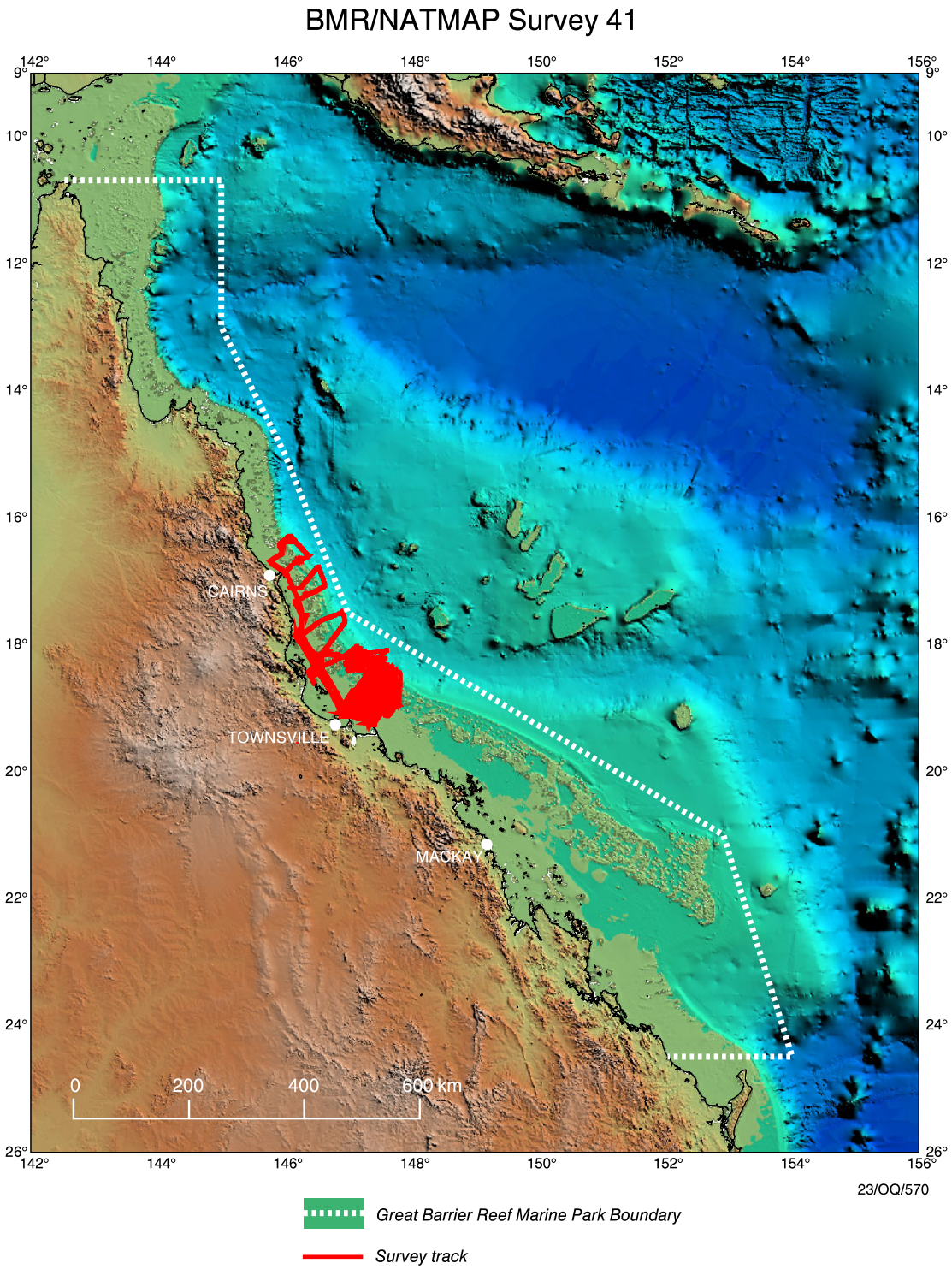
23/OQ/569
Great Barrier Reef Marine Park Boundary
Survey track


BMR/NATMAP Survey 41
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CAIRNS
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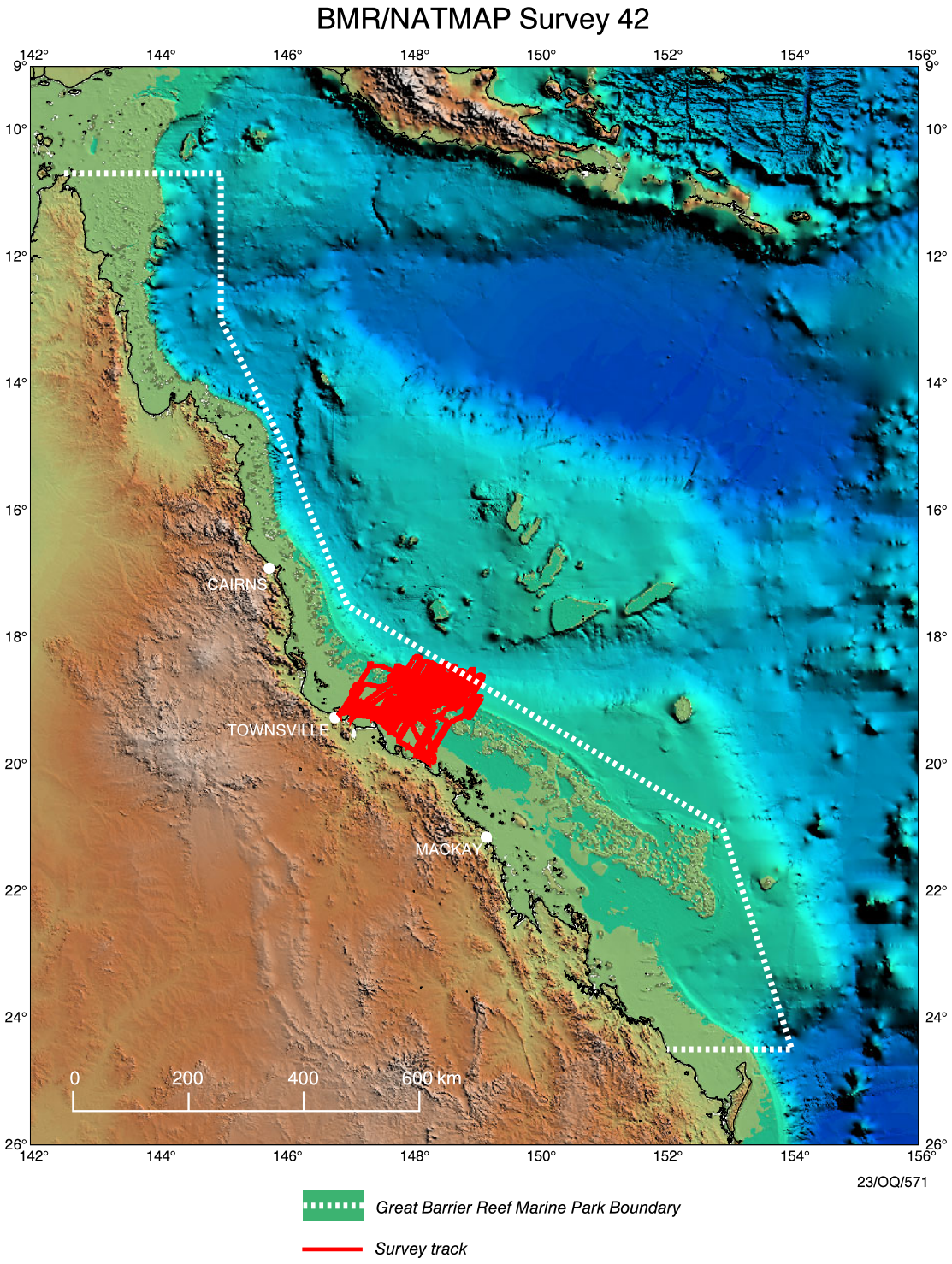
Great Barrier Reef Marine Park Boundary
Survey track


BMR/NATMAP Survey 42
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CAIRNS
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MACKAY
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600 km
23/OQ/571
Great Barrier Reef Marine Park Boundary
Survey track

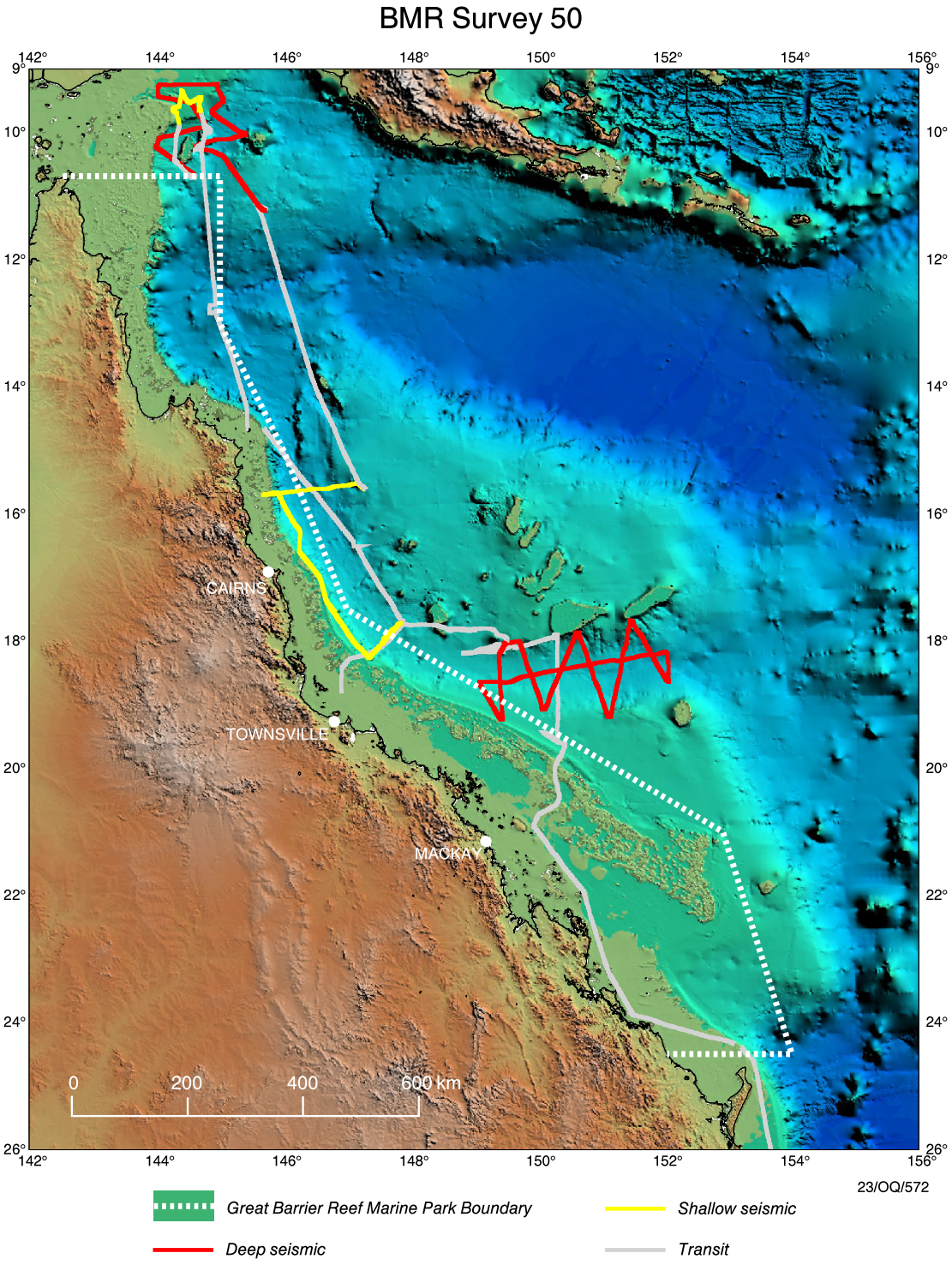
Activity 1985

BMR Rig Seismic 50 & 51 Surveys Year of Survey: 1985 Survey No.: 50, 51 Category: CMS & GH
Reference
There were no specific reports produced detailing the activities of the 1985 BMR surveys 50 and 51 (cruises 4 and 5). (Davies P.J and Symonds P.A)
Location
Features studied were the Townsville and Queensland Troughs, the Osprey Embayment, the Torres Shelf/Pandora Trough area, the slope of the Great Barrier Reef and the western margin of the Queensland Plateau.
Organisations/ Companies Involved
BMR
Aims
The cruises were designed to achieve scientific objectives through a combination of regional framework, semi-detailed grid and transect studies. Geological sampling was conducted in association with geophysical studies. The overall program objectives were to determine the regional stratigraphy and structural framework; the relations between tectonics, sealevel change and sediment style; and the lithofacies, age and depositional processes adjacent to a large epi-continental reef system
Summary
During September/October and November/December 1985 BMR conducted surveys 50 and 51 off northeast Australia using the Rig Seismic
Activity
3860 km of multi-channel deep seismic reflection profiling were collected, together with magnetic and gravity data; 9 sonobuoy refraction profiles; 207 km of sidescan sonar data; 22 dredge sites and 93 coring stations.
Comments
Scientific results from the cruises included: defining the structural style and seismic stratigraphic development of the Townsville Trough, Osprey Embayment, Torres Shelf, Pandora Trough, Queensland Trough and the slope of the Great Barrier Reef.

Related Papers

- Davies P.J. & Symonds P.A., 1985. A proposal for a research programme over the Australian continental margin of northeastern Australia.
- Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1987. Horizontal plate motion: a key allocyclic factor in the evolution of the Great Barrier Reef. Science 238; 1697-1700.
- Forman D.J., Powell T.G. & Robertson C.S., 1988. Australia's Petroleum Potential. *In.* Petroleum in Australia: The First Century, 1988. BMR.
- Revill K., Saunders R.G. & Stagg H.M.J., 1988. Rig Seismic research cruises 4 and 5, north east Australia, Queensland Plateau: explanatory notes to accompany release of non-seismic data. BMR Record 1988/6.
- Davies PJ, Symonds PA, Feary DA, Pigram CJ. The evolution of the carbonate platforms of northeast Australia. Society of Economic Paleontologists and Mineralogists. Special Publication. 1989; 44:233-58.
- Harris P.T. & Davies P.J., 1989. Submerged reefs and terraces on the shelf edge of the Great Barrier Reef, Australia. *In* Coral reefs: Journal of the International Society for Reef Studies, 87-98.
- Falvey D.A., Symonds P.A., Colwell J.B., Willcox J.B., Marshall J.F., Williamson P.E. & Stagg H.M.J., 1990. Australia's deepwater frontier petroleum basins and play types. APEA Journal 30 (1); 239-262
- Harris P.T., Davies P.J. & Marshall J.F., 1990. Late Quaternary sedimentation on the Great Barrier Reef continental shelf and slope east of Townsville, Australia. Marine Geology 94; 55-77.
- Symonds P.A., Davies P.J., Pigram C.J., Feary D.A & Chaproniere G.C.H., 1990. BMR Continental Margins Folio No. 4: Northeast Australia Torres Shelf-Pandora Trough.
- Heggie J., Lane J. & Herczeg A., 1993. Geochemistry of sediments from the north east Australian continental margin, including the Great Barrier Reef slope, Queensland Plateau and Trough and the Osprey Embayment. AGSO Record 1993/33.
- Pigram C.J., 1993. Carbonate platform growth, demise and sea level record: Marion Plateau, northeast Australia. PhD Thesis, Australian National University (unpubl.).
- Pigram C.J. & Symonds P.A., 1993. Eastern Papuan Basin – a new model for the tectonic development, and implications for petroleum prospectivity, Petroleum Exploration and Development in Papua New Guinea: Proceedings of the Second PNG Petroleum Convention, Port Moresby; 213-231.
- Struckmeyer H.I.M., Symonds P.A., Fellows M.E. & Scott D.L., 1994. Structural and stratigraphic evolution of the Townsville Basin, Townsville Trough, offshore northeastern Australia. Australian Geological Survey Organization. Record 1994/50:71p
- Struckmeyer H. & Symonds P., 1996. Tectonostratigraphic evolution of the Townsville Basin 1996/133.
- Symonds P.A., Colwell J.B., Struckmeyer H.I.M., Willcox J.B. and Hill P.J. 1996. Mesozoic rift basin development off eastern Australia. In: Mesozoic geology of the eastern Australia Plate conference. Geological Society of Australia Abstracts, 43; 528-542.

- Struckmeyer H.I.M. & Symonds P.A., 1997. Tectonostratigraphic evolution of the Townsville Basin, Townsville Trough, offshore northeastern Australia. Australian Journal Of Earth Sciences 44(6); 799-817.
- Townsville Trough Study- Northeast Australia – Project 121.11, 1992/833.


BMR Survey 50
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CAIRNS
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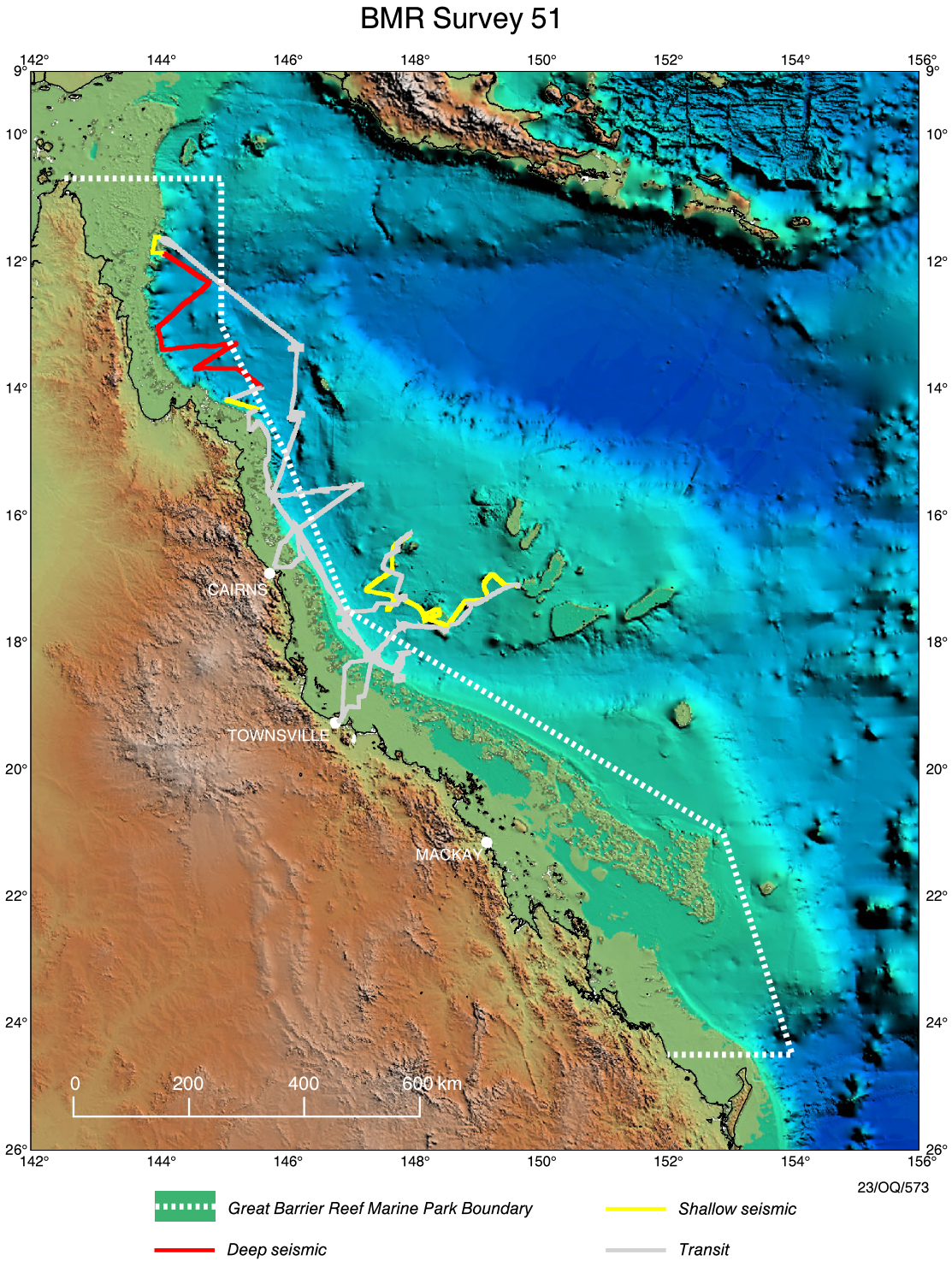
23/OQ/572
Great Barrier Reef Marine Park Boundary
Deep seismic
Shallow seismic
Transit


BMR Survey 51
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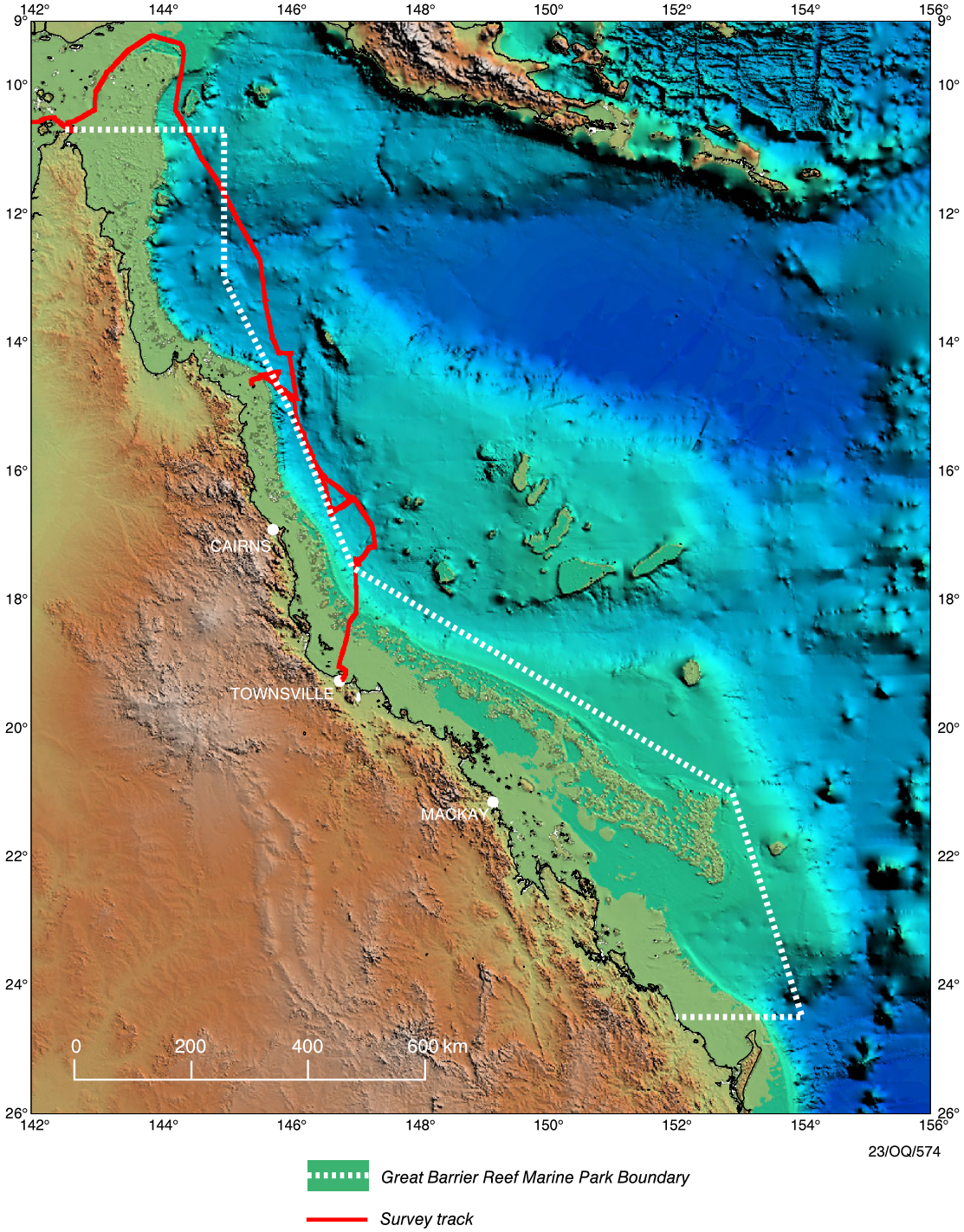
Great Barrier Reef Marine Park Boundary
Deep seismic
Shallow seismic
Transit

Activity 1986

BMR Survey 53 (Heat-flow) Year of Survey: 1986 Survey No.: 53 Category: CMS
Reference
Choi D.R., Stagg H.M.J. & others, 1987. Rig Seismic Research Cruise 6: Northern Australia heat flow – post cruise report. BMR Record 274.
Location
Queensland Trough and the Exmouth Plateau.
Organisations/ Companies Involved
BMR
Aims
To produce a heat-flow study for the analysis of the thermal and burial history of sedimentary basins.
Summary
Heat-flow from Australian waters have, until now, been sparse and only rarely recorded from the continental margins. Historically, marine heat-flow studies have concentrated on deep-water oceanic sites. Cruise 6 of the R/V *Rig Seismic* (BMR Survey 53) is the first cruise on which heat-flow data have been collected systematically on the Australian margin. A transect along the axis of the Queensland Trough and a dip line and a strike line over the Exmouth Plateau were recorded. Fifty Five new Heat-flow values were determined in the two areas, representing an approximate 40% increase in the Australian marine heat-flow data base. Ship-board examination of the data showed that the average heat-flow in both areas studied (-60 mW/m^2) is close to the world average. As expected, in the Queensland Trough the data show a general correlation with the sedimentary basin sediment thickness, the higher values being recorded over shallow basement; and lower values, at the depocentres. Data from the Exmouth Plateau show a greater range than the Queensland Trough data and a general correlation with the gross geological structure is implied. The heat-flow along the dip line transect appears to vary from high in the Montebello Trough to low on the eastern side of the Exmouth Plateau Arch, before rising again towards the northwest margin. The strike line transect shows considerable variation: this is thought to be a structural effect.

Activity
55 new heat-flow measurements acquired using ship-board heat-flow instrumentation including; a thermal gradient probe penetrating several metres below the sea bed, thermal-conductivity measuring equipment and a computer system for heat-flow data retrieval and data processing.
Comments
An important and straightforward extension of the seismic/sampling studies in any area is evaluation of the present and past heat-flow regimes, with the aim of asessing the thermal and burial history of the sediments and elucidating the importance of different tectonic processes in the geological evolution of the area.
Related Papers
• Lui Y.S.B., Choi D.R., Stagg H.M.J. & Swift M., 1987. Marine heat-flow system – instrumentations and technique. BMR Record 1987/47. • Stagg H.M.J & Darke B., 1987. Rig Seismic Research Cruise 6, northern Australia heatflow: explanatory notes to accompany release of geophysical data. BMR Record 1987/44. • Swift M.G., 1989. Heat flow studies on the Australian continental margin. BMR Research Symposium.

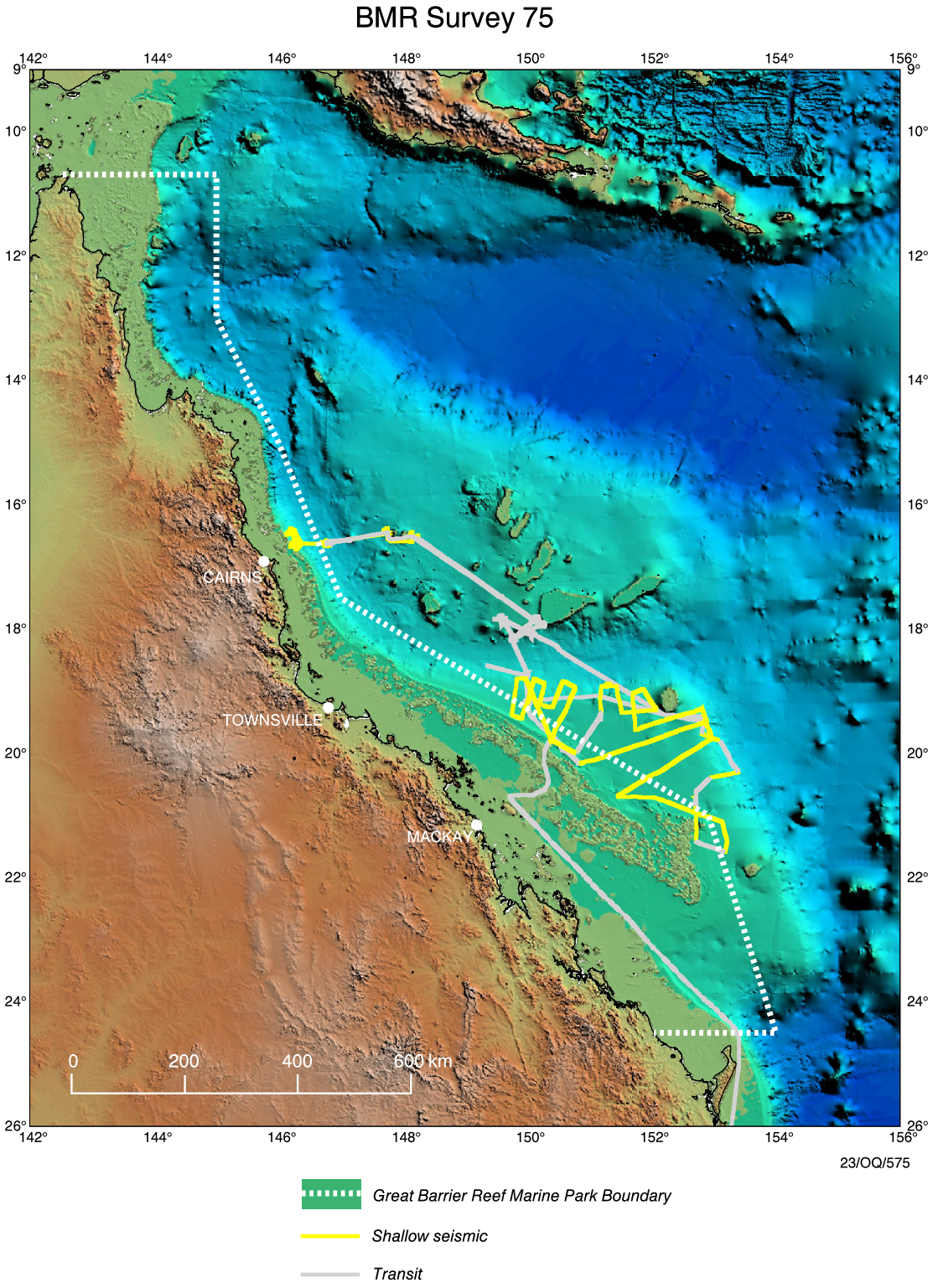
BMR Survey 53



Activity 1987

Structure, Stratigraphy, Evolution and Regional Framework of the Townsville Trough and Marion Plateau Region. Research Cruise Proposal – Project 9131.11 Year of Survey: 1987 Survey No.: 75 & 76 Category: CMS, ODP & RA
Reference
Symonds P.A. & Davies P.J., 1988. Structure, stratigraphy, evolution and regional framework of the Townsville Trough and Marion Plateau region. Research cruise proposal – project 9131.11. BMR Record 1988/48.
Location
Townsville Trough and Marion Plateau regions
Organisations/ Companies Involved
BMR
Aims
The major objectives of the cruises were: • To determine the exact structural style of the Townsville Trough, its relationship to the adjacent Queensland and Marion Plateaus, and its implications to the development of the northeast Australian continental margin • To establish a seismic stratigraphic framework for the Townsville Trough that will provide a basis for understanding the nature of the depositional systems and facies variations within it, and that will aid future exploration in the region • To define the positions of the major depocentres and structural leads in the Townsville Trough • To define play concepts likely to aid petroleum exploration from analysis of the structural and sedimentological evolution of the Townsville Trough, and a preliminary understanding of its thermal and burial history • To define the structural and sedimentological evolution of the Marion Plateau • To determine the timing and extent of reef growth on the Marion Plateau, and to define the causes of the demise of reef growth • To define the relations between the evolution of the Marion Plateau and the Great Barrier Reef • To determine any structural and stratigraphic relationships between coastal and shelf basins such as Hillsborough, the Narrows and Capricorn Basins, and the continental margin rift basin systems • To conduct site surveys in support of the Ocean Drilling Program proposals
Summary
Surveys 75 and 76 by the BMR took place in Sept/Oct and Oct/Nov 1987.

Activity
Rig Seismic collected site-survey data over and between 14 sites proposed for drilling during ODP Leg 133. Approximately 1400 km of multi-channel deep seismic reflection data and associated bathymetric, gravity and magnetic data were collected. Gravity and piston cores were obtained from the proposed ODP sites.
Comments
The results of surveys 75 and 76 lead to the publication of several subsequent papers relating to the tectonostratigraphic evolution of the Townsville Trough
Related Papers
• Forman D.J., Powell T.G. & Robertson C.S., 1988. Australia's Petroleum Potential. *In.* Petroleum in Australia: The First Century, 1988. BMR. • Davies PJ, Symonds PA, Feary DA, Pigram CJ. The evolution of the carbonate platforms of northeast Australia. Society of Economic Paleontologists and Mineralogists. Special Publication. 1989; 44:233-58. • Mowat E.J. & Revill K., 1990. BMR marine survey 76, Townsville Trough, Queensland, explanatory notes to accompany release of non-seismic data, BMR Record 1990/12. • Falvey D.A., Symonds P.A., Colwell J.B., Willcox J.B., Marshall J.F., Williamson P.E. & Stagg H.M.J., 1990. Australia's deepwater frontier petroleum basins and play types. APEA Journal 30 (1); 239-262 • Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1991. The evolution of the carbonate platforms of northeast Australia. The Cainozoic in Australia: a Re-Appraisal of the Evidence, Edited by M.A.J. Williams, P. De Deckker and A.P. Kershaw. Geological Society of Australia Special Publication 18:44-78. • Feary D.A., Davies P.J., Pigram C.J. and Symonds P.A. 1991. Climatic evolution and control on carbonate deposition in northeast Australia. Palaeogeography, Palaeoclimatology, Palaeoecology (Global and Planetary Change Section) 89, 341-361. • Saunders G. & Mowat E.J., 1991. North east Australia 3, BMR marine survey 75, explanatory notes to accompany the release of non-seismic data, BMR Record 1991/100. • Townsville Trough Study- Northeast Australia – Project 121.11, 1992/833. • Hill P.J., 1994. Geology and geophysics of the offshore Maryborough, Capricorn and northern Tasman Basins: results of AGSO Survey 91. Australian Geological Survey Organization. Record 1994/1:71p. • Struckmeyer H.I.M., Symonds P.A., Fellows M.E. & Scott D.L., 1994. Structural and stratigraphic evolution of the Townsville Basin, Townsville Trough, offshore northeastern Australia. Australian Geological Survey Organization. Record 1994/50:71p. • Struckmeyer H. & Symonds P., 1996. Tectonostratigraphic evolution of the Townsville Basin 1996/133. • Symonds P.A., Colwell J.B., Struckmeyer H.I.M., Willcox J.B. and Hill P.J. 1996. Mesozoic rift basin development off eastern Australia. In: Mesozoic geology of the eastern Australia Plate conference. Geological Society of Australia Abstracts, 43; 528-542. • Struckmeyer H.I.M. & Symonds P.A., 1997. Tectonostratigraphic evolution of the Townsville Basin, Townsville Trough, offshore northeastern Australia. Australian Journal Of Earth Sciences 44(6); 799-817.


BMR Survey 75
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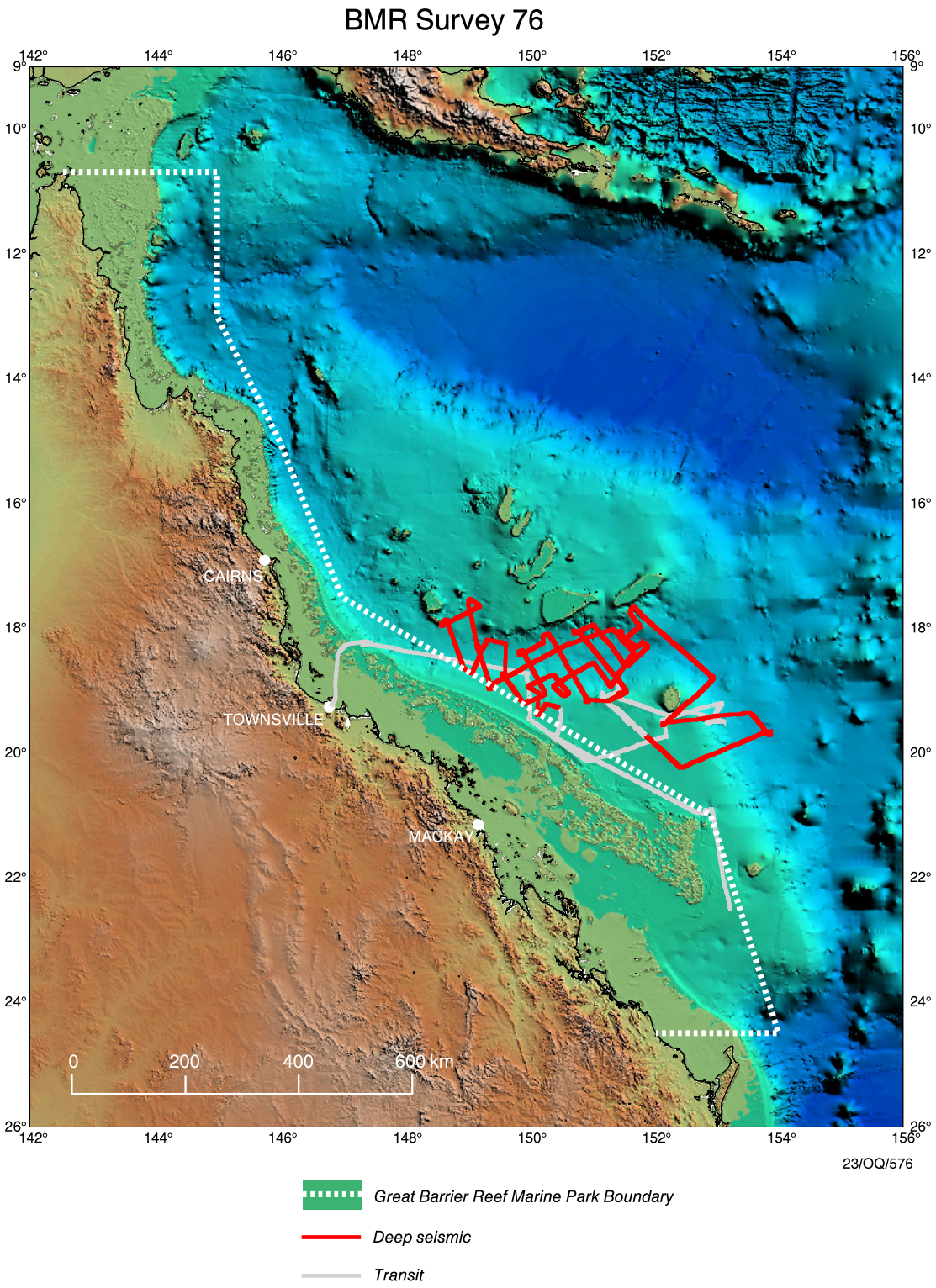
23/OQ/575
Great Barrier Reef Marine Park Boundary
Shallow seismic
Transit


BMR Survey 76
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MACKAY
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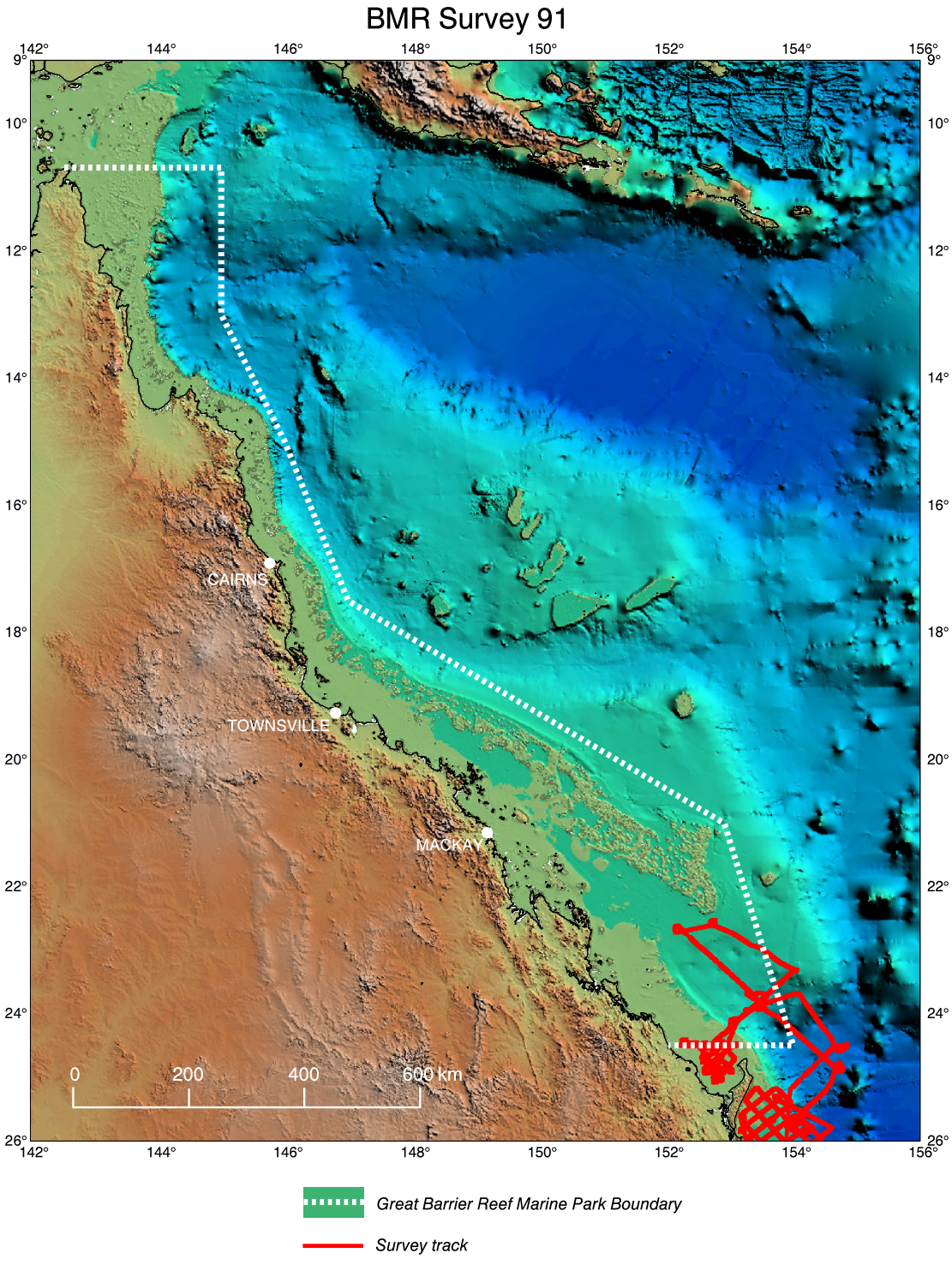
23/OQ/576
Great Barrier Reef Marine Park Boundary
Deep seismic
Transit

Activity 1989

BMR/AGSO Survey 91 Year of Survey: 1989 Survey No.: 91 Category: CMS & RA
Reference
Hill P.J., 1994. Geology and geophysics of the offshore Maryborough, Capricorn and Northern Tasman Basins: results of AGSO Survey 91. Australian Geological Survey Organization. Record 1994/1:71p.
Location
The Maryborough, Capricorn Basins and the northern margins of the Tasman Basin
Organisations/ Companies Involved
BMR/AGSO
Aims
To acquire seismic for the Maryborough, Capricorn Basins and the northern margins of the Tasman Basin to study structural and stratigraphic development.
Summary
The Australian Geological Survey Organisation (AGSO) completed a major marine multichannel seismic (MCS) reflection survey off southeast Queensland in December 1989 using RV Rig Seismic. The research cruise (AGSO Survey 91) was designed to investigate the structure, stratigraphy and evolution of offshore basins along this sector of the Australian Continental Margin. About half of the 2900 km of seismic data collected was recorded over the Maryborough Basin; the remainder was collected over the Capricorn Basin and the margins of the northern Tasman Basin. The general aim of the cruise was to; 1) Investigate the extent and petroleum propectivity of the offshore Maryborough Basin and its extension onto the south-east Queensland continental shelf. 2) Define its relation to the adjacent northern Tasman Basin and Kenn Plateau conjugate margin. 3) Tie the stratigraphy of the Maryborough Basin area to exploration wells in the Capricorn Basin. 4) Improve our understanding of the structural style and petroleum potential of the deepwater Capricorn Basin.
Activity
The primary activity was the acquisition of 2900 km of deep seismic during a 4 week period from the 17 November to the 16 December 1989. The Survey included seismic ties to the only deep offhsore wells in the region; Aquarius 1 and Capricorn 1A located in the northern Capricorn Basin.

Comments
Seismic acquired for research purposes with permission from the GBRMPA.
Related Papers
• Hill P.J.. Research cruise proposal project 121.21, offshore Maryborough Basin, southern Queensland continental margin and northern Tasman basin – structure, stratigraphy and petroleum resource potential. Division of Marine Geoscience & Petroleum Geology. • Hill P.J. & Pigram C., 1990. Mapping the offshore Maryborough Basin aboard Rv *Rig Seismic*. BMR Rsearch Newsletter 13; 3-4. • Hill P.J. & Pigram C.J., 1990. Preliminary post-cruise: BMR survey 91: RV Rig Seismic investigation of the offshore Maryborough Basin, southern Queensland continental margin and northern Tasman Basin – structure, stratigraphy and petroleum resource potential. Bureau of Mineral Resources, Geology and Geophysics. Record 1990/69. • Hill P.J., 1991. Maryborough and Capricorn basins – new geophysical data. Queensland Exploration and Development, Thirteenth Annual PESA Petroleum Symposium 1991. • Hill P.J. 1992. Capricorn and Northern Tasman Basins: Structure and Depositional Systems. Exploration Geophysics, 23, 153-162. • Hill P.J., 1992. Offshore Maryborough, southeast Queensland: extent, structure and petroleum potential from new geophysical survey data. AAPG Bulletin 76(7); 1107-1108.


BMR Survey 91
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CAIRNS
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600 km
Great Barrier Reef Marine Park Boundary
Survey track

Activity 1990

ODP LEG 133 Year of Survey: 1990 Survey No.: 1333 Category: ODP
Reference
• McKenzie J.A., Davies P.J., Palmer-Julson A., et al., 1991. Proceedings of the Ocean Drilling Program Initial Reports 133: College Station, TX (Ocean Drilling Program). • McKenzie J.A., Davies P.J., Palmer-Julson A., et al., 1993. Proceedings of the Ocean Drilling Program, Scientific Results. Volume 132/133: College Station TX (ODP).
Location
The Leg 133 sites form two transects over the platforms and basins of the northeast Australian margin; an east-west transect from the Great Barrier Reef east of Cairns, across the Queensland Trough to the Queensland Plateau near Holmes Reef; and a north/south transect from the Queensland Plateau, southwest of the Tregrosse Reefs, across the western Townsville Trough to the northeastern Marion Plateau.
Organisations/ Companies Involved
JOIDES Resolution, then registered as Sedco/BP 471, is the research vessel for the ODP, which is funded by the United States National Science Foundation, the Canada/Australia Consortium for the ODP, the European Science Foundation Consortium for the ODP, the Federal Republic of Germany, France, Japan and the United Kingdom.
Aims
The Scientific drilling off the Northeast Australian Margin had two primary objectives: 1) To define sedimentary response to global sea level changes in the Late Cenozoic and Quaternary. 2) To define the influence of palaeochemistry, paleoclimate and paleooceanography on the initiation, growth, and demise of carbonate platforms, and the effect of shifting from temperate to tropical latitudes or vice versa, due to plate motion, on the biological and lithological facies types in an environment analogous to the Jurassic eastern margin of the USA. Secondary objectives included; - to define the slope to basin variations on both sides of the rift basin in order to evaluate facies and stratigraphic models of passive margin evolution. - To define the diagenetic history of contrasting mixed carbonate/ siliciclastic and pure carbonate margins in an environment saturated with respect to aragonite and high-Mg calcite at relatively shallow water depths.

Summary
The platforms of the Great Barrier Reef represent the largest areas of neritic carbonate deposition currently on earth, and their tectonic setting on a young passive margin proximal to major depocenters makes them of immense scientific interest as analogues for similar associations that have occurred repeatedly throughout geological time. Litho-, chemo-, magneto-, and biostratigraphic analyses will establish a Cenozoic record of environmental change which differentiates between the influences of sea-level fluctuation, tectonic subsidence, terrigenous flux, paleoclimate, and palaeoceanography on carbonate platform development.
Activity
During Leg 133 of the ODP, between 4 August 1990 and 11 October 1990, 16 sites were drilled (Site 811 through to 826) recovering approximately 5.5 km of core. Underway geophysical data equals 3222 nmi (5971 km). This covers transits to and between sites and over the sites themselves. This data was mainly bathymetric and magnetic but includes 154 nmi (285 km) of single-channel water-gun shallow seismic reflection data over the sites to confirm their positions prior to drilling
Comments
ODP is involved in scientific research and not hydrocarbon exploration. Petroleum is generally not mentioned except when referred to for safety precautions. The ODP has strict guidelines to ensure that no hydrocarbons are found during the drilling process; 1) The terminal depth of the drill site is always above the calculated depth of thermal maturity. 2) Each sight is not located near closures or other structural features which may lead to migration and trapping of hydrocarbons developed at greater depth. These rules are necessary as the drillship JOIDES Resolution, in being adapted for scientific drilling, has had blowout protection removed. Drilling into oil or gas reservoirs amounts to a safety risk. The Great Barrier Reef Marine Park Authority approved this scientific activity designed to study the history of the Great Barrier Reef.

Related Papers

- Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1988. The evolution of the carbonate platforms in northeast Australia – the goal of the ocean drilling program. Achievements in Australian Geoscience. Ninth Australian Geological Convention, University of Queensland, Brisbane, February 1-5, 1988. Geological Society of Australia. Abstracts 21: 110-2.
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- Barton C.E. & Peerdeman F.M., 1993. Palaeomagnetism, rock magnetism and evolution of the Great Barrier Reef. Exploration Geophysics 24(2):311-4.
- Chaproniere G.C.H. & Pigram C.J., 1993. Miocene to Pleistocene foraminiferal biostratigraphy of dredge samples from the Marion Plateau, offshore Queensland, Australia. AGSO Journal of Australian Geology and Geophysics 14(1):1-19.
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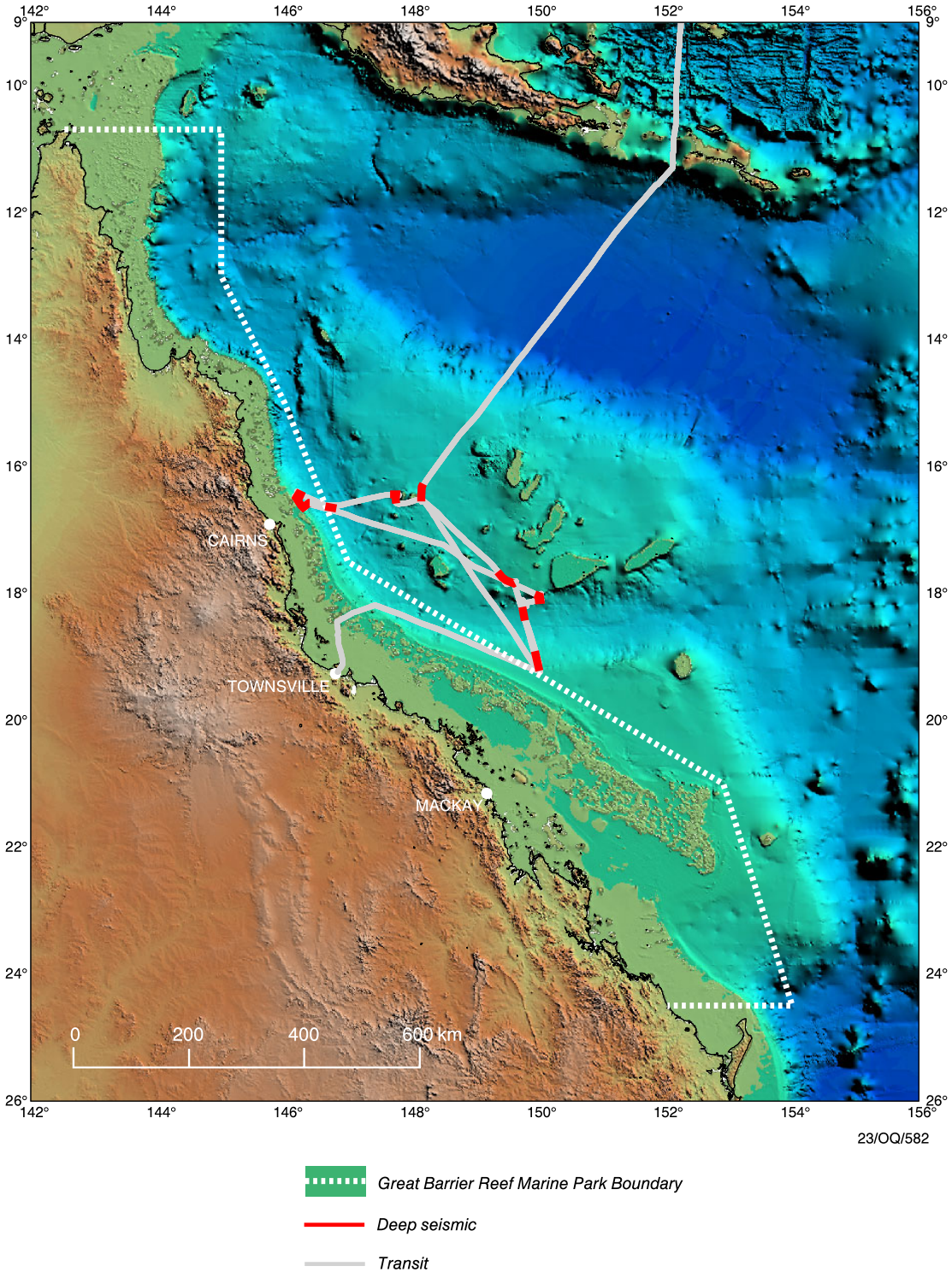
ODP Leg 133: Survey 1333



Activity 1991

Joint AGSO/JNOC Program – Southern Queensland Margin

Year of Survey: 1991-1992
Survey No.: 105
Category: MR

Reference

Tsuji Y., Marshall J.F., Honda N., Davies P.J. & Matsuda H., 1992. Facies relationships of subtropical and warm temperate carbonate environments: southern Queensland continental shelf, Australia: a joint program between the Marine Geoscience and Petroleum Geology Program, Australian Geological Survey Organisation and the Technology Research Center, Japan National Oil Corporation: final report. Canberra, Australian Geological Survey Organisation.

Location

Continental shelf off southern Queensland:
Area 1 – off Noosa Heads between latitudes 26°10'S and 26°40'S.
Area 2 – off Fraser Island between latitudes 24°50'S and 25°20'S

Organisations/ Companies Involved

AGSO, JNOC (Japan National Oil Corporation)

Aims

The goal of this project was to study the development of these modern carbonate environments as an analog for hydrocarbon exploration in ancient reefs.

Summary

The principal objectives of the cruise were;

- To define the facies distribution on the shelf and upper slope in the two selected areas of the southern Queensland margin to a depth of approximately 1000m.
- To define the three dimensional facies geometry.
- To define the principal factors effecting facies distribution:

- To relate facies geometry to the above factors, particularly to sea level change.
- To define both the effect of climate and sea level change on the physical position of the East Australian Current and the chemical fingerprint of this specific watermass in the sediments.
- To understand and model the changes in climate and sea level paticularly in the past 500, 000 years and to relate sea level change to facies geometry.
- To understand the post depositional factors affecting the physical make-up of the sediments and in particular to define and understand the differences in process and products in warm water and cold water carbonates limestones.

Activity

Data collected included 900 km of multichannel high resolution shallow seismic data, 350 km of boomer data, 50 km of sidescan data, and 49 camera stations, 25 dredge stations, 36 gravity core stations, 25 vibrocore stations and 103 grab sample stations. A total of ninety three metres of core was collected.

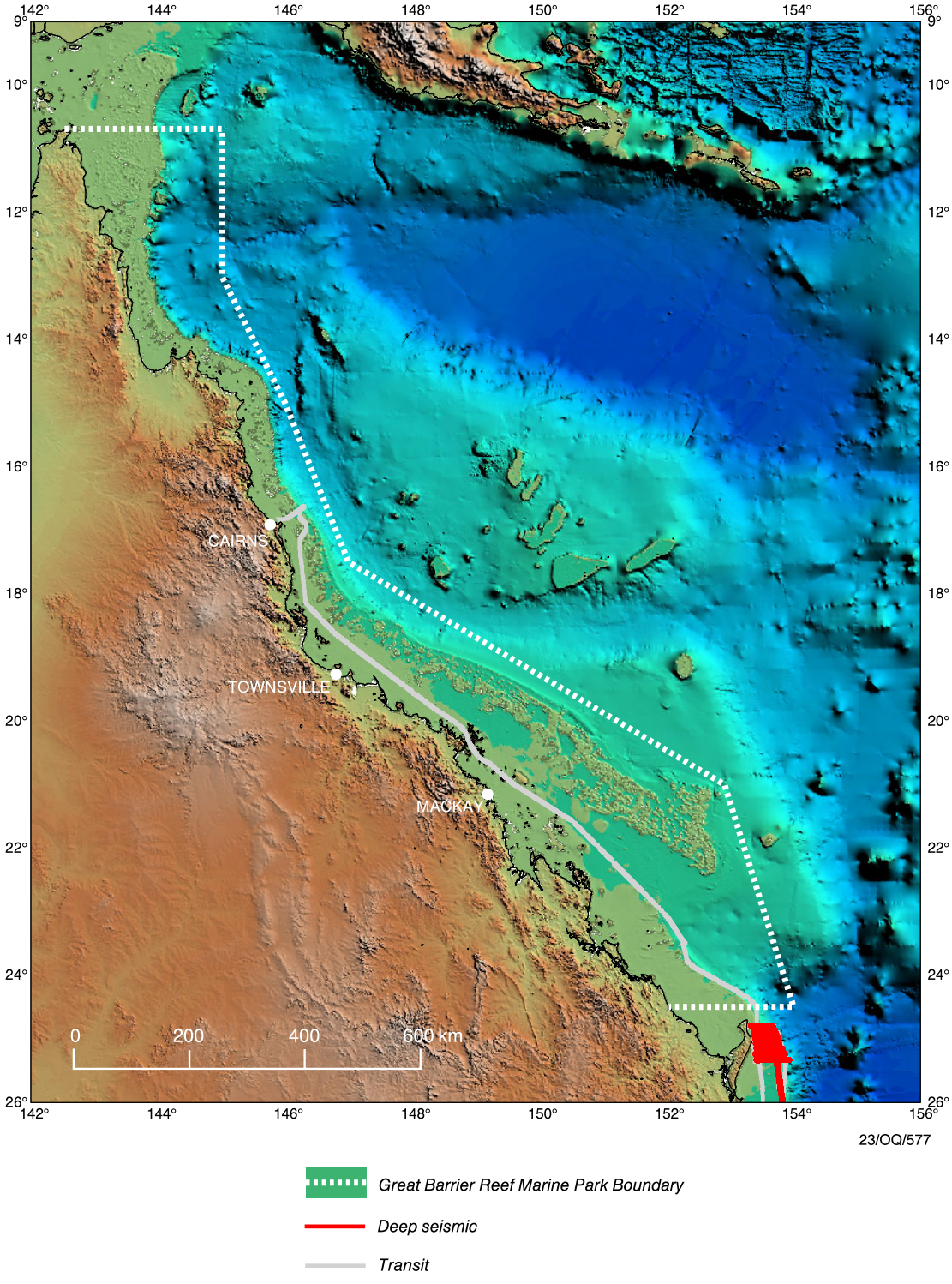
Comments

The reef study is to be used as an analog for hydrocarbon exploration in buried ancient reef reservoirs not in the Great Barrier Reef. It had nothing to do with hydrocarbon assessment in the Great Barrier Reef Marine Park.

Related Papers

- Tsuji Y., Honda N., Matsuda H., Davies P.J. & Marshall J.F., 1991. Tropical and temperate carbonate environments – the effects of sea level, climate and tectonics on facies development. Joint BMR/TRC-JNOC Program. Phase 1: 1991/92 Southern Queensland margin: pre-cruise proposal. Bureau of Mineral Resources, Geology and Geophysics. Record 1991/88.
- Co-operative Program with JNOC / Technical Research Centre 1992/587
- Co-operative Program with JNOC / Technical Research Centre 1992/1447
- Davies P.J., Tsuji Y., Honda N., et al., 1992. Tropical and temperate carbonate environments: the effects of sea level, climate and tectonics on facies development. Joint BMR/TRC-JNOC Program. Phase 1: 1991/92 Southern Queensland margin: post cruise report. Bureau of Mineral Resources, Geology and Geophysics. Record 1992/17.
- Tsuji Y., Honda N., Matsuda H., Marshall J.F., Feary D. & Davies P., 1992. Tropical and temperate carbonate environments - the effects of sea level, climate and tectonics on facies development. Joint BMR/TRC-JNOC Program. Phase 2: 1992/93 Southern Great Barrier Reef: pre-cruise proposal. Bureau of Mineral Resources, Geology and Geophysics. Record 1992/51.
- Japan National Oil Corporation – Cooperative Project 1993/140
- Harris P.T., Tsuji Y., Marshall J.F., Davies, P.J., Honda N. & Matsuda H., 1995. Sand and rhodolith-gravel entrainment on the mid- to outer-shelf under a western boundary current: Fraser Island continental shelf, eastern Australia. Marine Geology 129; 313-330.

AGSO/JNOC Survey 105



Activity 1995

Oil and Gas Resources of Australia 1995 Category: RA
Reference
Oil and Gas Resources of Australia 1995, Bureau of Resource Sciences (1996)
Location
Organisations/ Companies Involved
Bureau of Resource Sciences, AGSO, BMR, Commonwealth Government of Australia
Aims
The Oil and Gas Resources of Australia (OGRA) is an annual publication released by the Agency of the Commonwealth Government responsible for assessing Australia's oil and gas resources.
Summary
OGRA 1995 Section 3.3 discusses the assessment of undiscovered resources offshore northeast Queensland. It notes that the northeastern margin basins are of considerable interest, as they may contain very large oil and gas accumulations, and they lie in moderately deep water offshore from the Great Barrier Reef Marine Park. OGRA outlines reassessments of the Townsville Basin and the Queensland Basin that were made by the BMR and AGSO. The reassessments confirm earlier assessments that there is a fairly small chance of discovering petroleum in this area but that it is possible that any such discoveries could be very large. OGRA presents comparative unrisked assessments of undiscovered crude oil and sales gas in the northeastern margin basins for 1986 and 1994. Risked assessments for 1986 and 1994 are also presented.
Activity
Comments
OGRA 1995 clearly states that the Australian Government has placed an indefinite moratorium on petroleum exploration activities immediately adjacent to the Park. The report stresses that the assessments made are speculative.
Related Papers

Activity 1999

ODP 194 Year of Survey: 1999 Survey No.: 209 Category: ODP
Reference
Isern A.R., Pigram C.J., Swart P.K., Kroon D., 1997. ODP drilling in the Coral Sea: sealevel variation, palaeoceanography, and fluid flow. Australian Geological Survey Organisation Record 1997/3:66p.
Location
Marion Plateau
Organisations/ Companies Involved
ODP
Aims
To investigate the amplitude and timing of past eustatic sea level changes; the development of carbonate platforms; facies changes and development; the mechanisms and causes of fluid flow within carbonate depositional environments and the role of climatic and paleoceanographic change in the sub-tropical South Pacific.
Summary
The Marion Plateau carbonate platform provides a natural laboratory to study the causes, magnitudes, and effects of sea-level change on continental margin sediments. One of the fundamental controls on the nature and geometry of continental margin sediment deposition is sea level; however, much of the information on the relationship between sea-level and depositional facies is qualitative. Leg 194 coring will provide a superb and unique opportunity to determine the absolute magnitude of the major Cenozoic sea-level falls. The carbonate platforms and adjacent slopes of the Marion Plateau also preserve a superb record of third-order sea-level variations within a mixed carbonate-siliciclastic depositional environment. High-resolution seismic data collected for the Leg 194 site surveys provide quasi-three-dimensional images of Oligocene-Pliocene depositional geometries. The correlation of these seismic images with drill core and logging data will provide a synoptic view of depositional processes in a mixed carbonate-siliciclastic carbonate platform setting.

Activity
1997: Drilling proposed (referred to in 1997 publications by Isern & others). 1999: 1 month site survey in April funded by AGSO. A high resolution multichannel seismic grid consisting of 1700 km of seismic lines, gravity cores, dredges, and bottem photographs was acquired from the National Facility *RV Franklin* vessel (FR 03/99; AGSO 209), operated by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) data. Older seismic data covering the area were also used to provide the geometric framework to locate the drill sites, including data from Leg 133 of the ODP.
Comments
ODP is involved in scientific research and not hydrocarbon exploration. Petroleum is generally not mentioned except when referred to for safety precautions. The ODP has strict guidelines to ensure that no hydrocarbons are found during the drilling process; 1) The terminal depth of the drill site is always above the calculated depth of thermal maturity. 2) Each sight is not located near closures or other structural features which may lead to migration and trapping of hydrocarbons developed at greater depth. These rules are necessary as the drillship JOIDES Resolution, in being adapted for scientific drilling, has had blowout protection removed. Drilling into oil or gas reservoirs is a safety risk. The Great Barrier Reef Marine Park Authority approved this scientific activity, designed to study the history of the Great Barrier Reef.

Related Papers

- Pigram C. J., 1992. Absolute magnitude of the second order middle to late Miocene sea level fall – Marion Plateau – NE Australia. 91/1417.
- Pigram C.J., 1992. A model for development of rhodoliths on platforms influenced by storms – the middle Miocene carbonates of the Marion Plateau. 92/599.
- Pigram C.J., Davies P.J & Chaproniere G.C.H., 1992. Cement stratigraphy – Marion Plateau ODP manuscript. 92/301.
- Carter R.M. & Duckworth R.C., 1996. Australian participation in the Ocean Drilling Program, ODP phase III 1999-2003. Australian ODP Secretariat.
- Isern A.R., Pigram C.J., Swart P.K. & Anselmetti F., 1997. ODP drilling in the Coral Sea: sealevel variation, fluid flow, and paleoceanography. Proposal 510-Rev 1. Australian Geological Survey Organisation. Record. 1997; 1997/52:114p.
- Isern A.R., Pigram C.J., Muller D. & Anselmetti F., 1998. Sea-level magnitudes and variations recorded by continental margin sequences on the Marion Plateau, northeast Australia. Proposal 510-Full 3. Australian Geological Survey Organisation. Record. 1998; 1998/5:103p.
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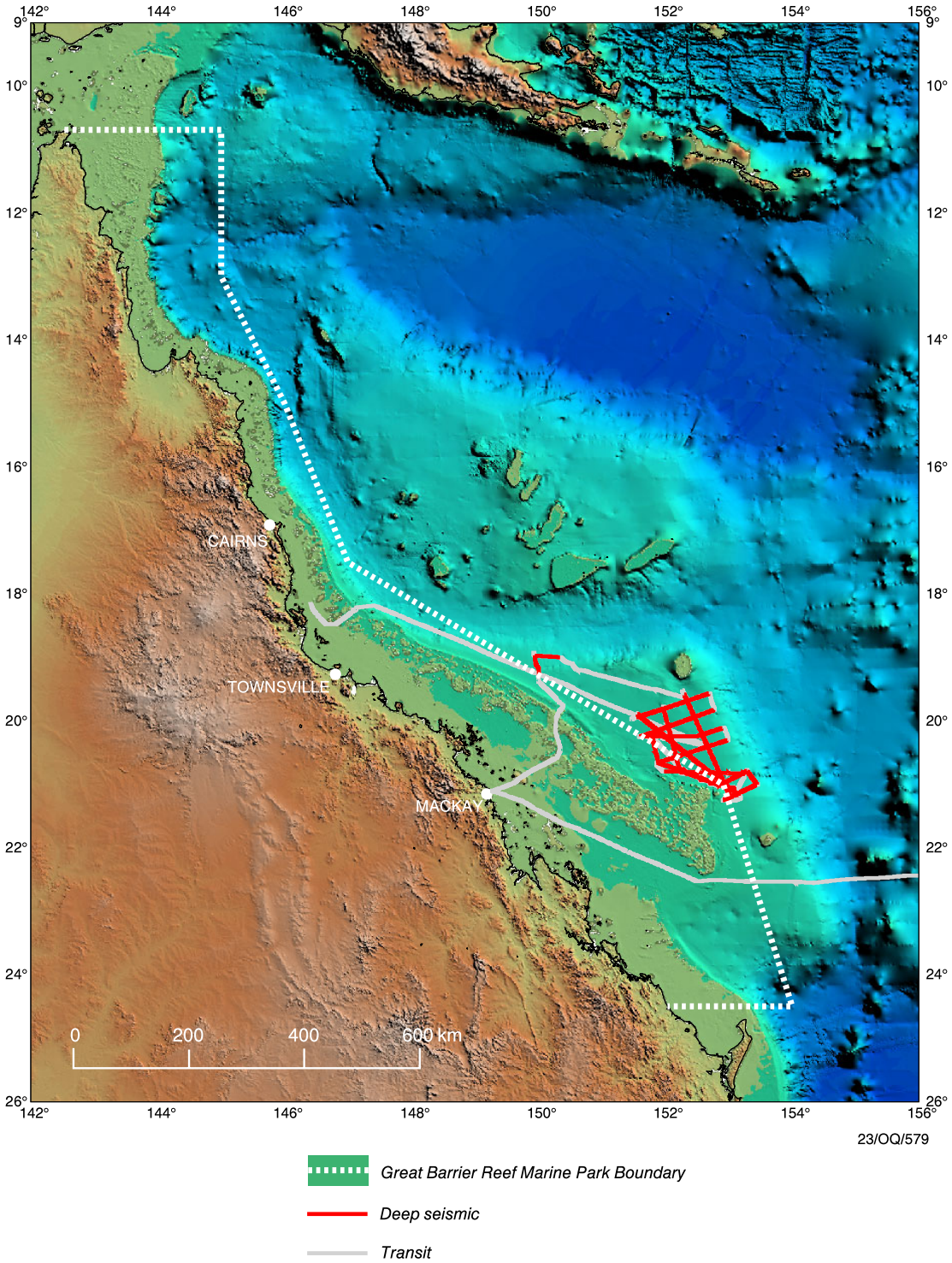
- Marion Plateau ODP site survey RV Franklin 99/3 9 April to 5 May 1999 Survey 209 98/869.
- Marion Plateau ODP site survey RV Franklin 99/3 9 April to 5 May 1999 Survey 209 1999/1080.
- Isern A.R., Anselmetti F.S., Baldauf J & Blum P., 2000. Ocean Drilling Program LEG 194 Scientific Prospectus Marion Plateau.
- Isern A.R., Anselmetti F.S., Blum P & the Leg 194 Scientific Party, 2001. ODP Leg 194: Sea level magnitudes recorded by continental margin sequences on the Marion Plateau, Northeast Australia. JOIDES Journal 27(2); 7-11.
- Isern A.R., Anselmetti F.S., Blum P., et al., 2002. Proceedings of the Ocean Drilling Program, Initial Reports 194.
- Shipboard Scientific Party, 2002. Constraining Miocene sea level change from carbonate platform evolution, Marion Plateau, northeast Australia Sites 1192-1199 3 January-2 March 2001. Proceedings of the Ocean Drilling Program Initial Reports Volume 194.

”Franklin” Cruise 99/03: Survey 209



Activity 2001

ODP 194 Year of Survey: 2001 Category: ODP
Reference
Shipboard Scientific Party, 2002. Constraining Miocene sea level change from carbonate platform evolution, Marion Plateau, northeast Australia Sites 1192-1199 3 January-2 March 2001. Proceedings of the Ocean Drilling Program Initial Reports Volume 194.
Location
Marion Plateau
Organisations/ Companies Involved
ODP
Aims
To investigate the amplitude and timing of past eustatic sea level changes; the development of carbonate platforms; facies changes and development; the mechanisms and causes of fluid flow within carbonate depositional environments and the role of climatic and paleoceanographic change in the sub-tropical South Pacific.
Summary
The Marion Plateau carbonate platform provides a natural laboratory to study the causes, magnitudes, and effects of sea-level change on continental margin sediments. One of the fundamental controls on the nature and geometry of continental margin sediment deposition is sea level; however, much of the information on the relationship between sea-level and depositional facies is qualitative. Leg 194 coring will provide a superb and unique opportunity to determine the absolute magnitude of the major Cenozoic sea-level falls. The carbonate platforms and adjacent slopes of the Marion Plateau also preserve a superb record of third-order sea-level variations within a mixed carbonate-siliciclastic depositional environment. High-resolution seismic data collected for the Leg 194 site surveys provide quasi-three-dimensional images of Oligocene-Pliocene depositional geometries. The correlation of these seismic images with drill core and logging data will provide a synoptic view of depositional processes in a mixed carbonate-siliciclastic carbonate platform setting.
Activity
From January to March a series of eight sites was drilled (locations in Figure 1). The *JOIDES resolution* vessel was used for the cruise. At each site approximately 500-700 m of sediment was drilled, and five sites penetrated into acoustic basement. During this leg approximately 2 km of sediment was recovered from a total cored interval of 5 km. Water depths of the drill sites ranged from 304 to 419 m.

Comments
ODP is involved in scientific research and not hydrocarbon exploration. Petroleum is generally not mentioned except when referred to for safety precautions. The ODP has strict guidelines to ensure that no hydrocarbons are found during the drilling process; 1) The terminal depth of the drill site is always above the calculated depth of thermal maturity. 2) Each sight is not located near closures or other structural features which may lead to migration and trapping of hydrocarbons developed at greater depth. These rules are necessary as the drillship JOIDES Resolution, in being adapted for scientific drilling, has had blowout protection removed. Drilling into oil or gas reservoirs is a safety risk. The Great Barrier Reef Marine Park Authority approved this scientific activity, designed to study the history of the Great Barrier Reef.

Related Papers

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- Pigram C.J., 1992. A model for development of rhodoliths on platforms influenced by storms – the middle Miocene carbonates of the Marion Plateau. 92/599.
- Pigram C.J., Davies P.J & Chaproniere G.C.H., 1992. Cement stratigraphy – Marion Plateau ODP manuscript. 92/301.
- Carter R.M. & Duckworth R.C., 1996. Australian participation in the Ocean Drilling Program, ODP phase III 1999-2003. Australian ODP Secretariat.
- Isern A.R., Pigram C.J., Swart P.K. & Anselmetti F., 1997. ODP drilling in the Coral Sea: sealevel variation, fluid flow, and paleoceanography. Proposal 510-Rev 1. Australian Geological Survey Organisation. Record. 1997; 1997/52:114p.
- Isern A.R., Pigram C.J., Swart P.K., Kroon D., 1997. ODP drilling in the Coral Sea: sealevel variation, palaeoceanography, and fluid flow. Australian Geological Survey Organisation. Record 1997/3:66p.
- Isern A.R., Pigram C.J., Muller D. & Anselmetti F., 1998. Sea-level magnitudes and variations recorded by continental margin sequences on the Marion Plateau, northeast Australia. Proposal 510-Full 3. Australian Geological Survey Organisation. Record. 1998; 1998/5:103p.
- Horsfall K., 1999. Seismic survey on the Marion Plateau, northeast Australia, provides site survey data for ODP drilling. Aus.Geo News. 1999; 53:5,8.
- Isern A. & Anselmetti F., 1999. Cruise summary ORV Franklin FR 03/99 (AGSO 209).
- Isern A. & Pigram C., 1999 Ocean drilling scheduled for the Marion Plateau, Northeast Australia. Aus Geo News 54:14, 18.
- Marion Plateau ODP site survey RV Franklin 99/3 9 April to 5 May 1999 Survey 209 98/869.
- Marion Plateau ODP site survey RV Franklin 99/3 9 April to 5 May 1999 Survey 209 1999/1080.
- Isern A.R., Anselmetti F.S., Baldauf J & Blum P., 2000. Ocean Drilling Program LEG 194 Scientific Prospectus Marion Plateau.
- Isern A.R., Anselmetti F.S., Blum P & the Leg 194 Scientific Party, 2001. ODP Leg 194: Sea level magnitudes recorded by continental margin sequences on the Marion Plateau, Northeast Australia. JOIDES Journal 27(2); 7-11.
- Isern A.R., Anselmetti F.S., Blum P., et al., 2002. Proceedings of the Ocean Drilling Program, Initial Reports 194.

Activity 2002

Cross-shelf Sediment Transport in the Torres Strait - Gulf of Papua Region. (Geoscience Australia Cruise 234)

Year of Survey: 2002
Category: MR

Reference

Cross-shelf sediment transport in theTorres Strait - Gulf of Papua Region.RV *Franklin* Cruise 01/-02, January-February, 2002
(Geoscience Australia Cruise 234). (Preliminary cruise report prepared for the CSIRO)

Location

Torres Strait – Gulf of Papua Region.

Organisations/ Companies Involved

- Geoscience Australia and Antarctic CRC, University of Tasmania,
- School of Geosciences, University of Sydney,
- School of Earth Sciences, James Cook University of North Queensland,
- School of Geography and Environmental Studies, University of Tasmania,
- CSIRO Division of Marine Research

Aims

The cruise aims were to verify and quantify modelling results predicting the occurrence of a potential sediment transport path across the northern end of the Great Barrier Reef and into the Gulf of Papua. The objectives were, therefore, to map the seabed bathymetry, bedforms and Holocene sediment deposits and to measure currents and near-bed suspended sediment concentrations in a transect across the shelf from northeastern Torres Strait (in the vicinity of the southern Fly River Delta) to the shelf break. Seabed photography and surface grab sampling provided information on seabed character, evidence of sediment mobility such as small-scale bedforms, as well as benthic habitats and communities. A second research goal was to establish linkages between benthic communities and sedimentary environments and facies.

Summary

The cruise discovered that a zone of strong tidal currents at the northern end of the Great Barrier Reef prevents the southward advance of sediment derived from Papua New Guinea's rivers that would otherwise bury the coral reefs. The Fly River, located in close proximity to the northern end of the Great Barrier Reef, discharges about 120 million tonnes/yr of sediment, equal to more than that all of Australia's rivers combined. This sediment does not penetrate as far south into the reef area as might be expected, because southward prograding deposits are eroded by tidal currents.

Activity
Swath sonar mapping and underwater video equipment aboard the research vessel RV Franklin, was used to map a series of channels up to 220 m deep that extend for more than 80km from eastern Torres Strait across the northern end of the Great Barrier Reef.
Comments
None of the sample data have been analysed to date (25-3-02), but results will be published in a Geoscience Australia record, that is scheduled for draft completion in June 2002.
Related Papers

PART THREE: KEY PAPERS

The formation of the Great Barrier Reef 1975 Category: Paper
Reference
Davies P.J., 1975. The formation of the Great Barrier Reef. Bureau of Mineral Resources, Geology and Geophysics. Record 1975; 1975/135.
Location
The Great Barrier Reef
Organisations/ Companies Involved
BMR
Aims
To summarise the formation of the Great Barrier Reef.
Summary
The Barrier Reef has grown on the Queensland continental shelf, a feature which came into existence 50-60 million years ago as the results of continental drift, seafloor spreading and tensional subsidence. Coral reefs began to grow 18 million years ago. The present-day reefs owe their shape and size to the depth and shape of the Pleistocene karst surface off which they have grown, and are only 8-9 000 years old. This magnificent present-day structure which we call the Great Barrier Reef has therefore grown in a very short period of time, and is probably only one of many Barrier Reefs that have existed in the area for the past 18 millions years.
Activity
Comments
Hydrocarbon potential is not mentioned.
Related Papers

A review of the geology, and geophysics of the Queensland Plateau 1976

Category: Paper

Reference

Jongsma D. 1976. A review of the geology, and geophysics of the Queensland Plateau. Bureau of Mineral Resources, Geology and Geophysics. Record 1976/39:6p.

Location

Queensland Plateau

Organisations/ Companies Involved

BMR

Aims

A summary of the geology and geophysics of the Queensland Plateau based on previous gravity, magnetic, drill and seismic data.

Summary

The Queensland Plateau supports numerous small islands and reefs which are composed of coralline and algal limestone. The basement of the plateau is probably folded and intruded rocks of the Tasman Geosyncline. It is covered with a relatively thin section of Cainozoic calcareous sediments. Mineral and hydrocarbon prospectivity in the area is extremely low.

Activity

Contains references to:

- Gravity, magnetic and seismic reflection profiles by the Lamont-Doherty Geological Observatory and the University of New South Wales; 1967.
- Geophysical survey by BMR; 1970.
- DSDP drill site (209); 1971.

Comments

The only foreseeable mineral resource is petroleum.

Related Papers

Compagnie Generale de Geophysique & BMR 1975. Geophysical surveys of the continental margins of Australia, Gulf of Papua and the Bismarck Sea – operations and techniques. Record 1975/151.

Notes on the petroleum prospectivity of the Great Barrier Reef area (and a proposal for further seismic surveying) 1977

Category: Paper

Reference

Turpie A., Fraser A.R., Mutter J.C., Temple P.R. & Wilcox J.B., 1977. Notes on the petroleum prospectivity of the Great Barrier Reef area (and a proposal for further seismic surveying). Bureau of Mineral Resources, Geology and Geophysics. Record 1977/42.

Location

Great Barrier Reef

Organisations/ Companies Involved

BMR

Aims

To outline existing information on the Great Barrier Reef area and to propose further seismic work to assist further exploration.

Summary

If National Parks are not declared over areas of the Great Barrier Reef which may contain petroleum, then it is necessary to establish the boundaries of such areas. Some petroleum exploration has already been done, but present knowledge is based largely on a little seismic work supported by widespread aeromagnetic data. A regional seismic survey is required to acquire accurate sediment thicknesses and basin boundaries which could be vital for assessments of prospectivity and future exploration.

Activity

General reference to geophysical surveys.

Comments

This paper outlines the lack of information about the area. It refers to possible petroleum exploration because at this time National Parks had not been declared in this area.

Related Papers

Petroleum prospectivity of Australian marginal plateaus 1981

Category: Paper

Reference

Wilcox J.B., 1981. Petroleum prospectivity of Australian marginal plateaus. In: Halbouty, MT (Ed), Energy Resources of the Pacific Region. AAPG Studies in Geology 12:245-72

Location

Australia wide.

Organisations/ Companies Involved

AAPG

Aims

Summary of Australia's petroleum prospectivity including offshore Queensland.

Summary

Australia is flanked by a vast area of continental margin incorporating 16 deeply submerged plateaus, terraces and rises, which are largely unexplored for petroleum. Some are now within range of drilling and well-completion technology. Fair prospects are assigned to three features offshore of Queensland – the Queensland and Townsville Troughs and a depocentre flanking the Marion Plateau.

Activity

References:

- Regional surveys by BMR between 1965-1970.
- Seismic by Gulf (1973) and Shell (1974).

Comments

Related Papers

Structure and Stratigraphy of the Central Great Barrier Reef 1983

Category: Paper

Reference

Symonds P.A., Davies P.J. and Parisi A., 1983. Structure and Stratigraphy of the Central Great Barrier Reef. Journal of Australian Geology and Geophysics 8(3); 277-291.

Location

Between the coast and the 1000m isobath between Mossman and Ayr.

Organisations/ Companies Involved

BMR

Aims

Two questions are central to the aims of this paper:
1) What is the total thickness of the reefs within the Great Barrier Reef Province?
2) What is the age and nature of the substrate from which the reefs have grown?

Summary

The goals of this paper are to analyse new high-resolution, multi-channel seismic reflection and boomer profiles, and vibrocores of the top part of the inter-reef section in an attempt to elucidate the structure and depositional sequences beneath the central Great Barrier Reef.

Activity

- Continental Margin Survey (1970-72) seismic data.
- GSI seismic.
- Shell seismic.
- Surveys 38, 40 and 41 seismic data.

Comments

Conclusions from this data are placed in the context of the geological evolution of the continental shelf.

Related Papers

- Central Great Barrier Reef Inter-reefal study report for the third quarter. BMR.
- Symonds PA. Relation between continental shelf and margin development – central and northern Great Barrier Reef. In: Baker, J T, Et Al., (Eds), Proceedings of the Inaugural Great Barrier Reef Conference, Townsville, August 29-September 2, 1983, Hosted by James Cook University and Australian Institute of Marine Science. Townsville, James Cook University Press. 1983; 151-7.
- Symonds P.A., Davies P.J. & Parisi A., 1983. Structure and stratigraphy of the central Great Barrier Reef. BMR Journal of Australian Geology and Geophysics 8; 277-291.
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- Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1988. Facies models in exploration – the carbonate platforms of north-east Australia. APEA Journal 28(1); 123-143.

The Evolution of the Carbonate Platforms of Northeast Australia 1989

Category: Paper

Reference

Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1989. The evolution of the carbonate platforms of northeast Australia. SEPM Special Publication 44.

Location

Great Barrier Reef province and the Eastern, Queensland and Marion Plateaus.

Organisations/ Companies Involved

BMR

Aims

To describe the major features of the platforms; to describe the major processes controlling platform development; and to discuss the global implications of this study in terms of the long- and short-term factors that control carbonate platform development, emphasising both the major features and principal stages of development and the dynamic interactions between the controlling factors.

Summary

The carbonate platforms of northeast Australia, the Great Barrier Reef province and the Eastern, Queensland and Marions Plateaus, contain a record of the complex interactions between the factors which controlled carbonate deposition over the past 60 million years. Analysis of the extensive geological and geophysical data shows that both long-term (plate-motion and subsidence) and short-term (rifting, eustacy, climate, oceanography, and collision) factors influenced platform evolution. General conclusions applicable to other carbonate platforms may be deduced from analysis of the factors which controlled deposition on the northeast Australian platforms.

Activity

- DSDP Site 209
- Boreholes on Heron Island and Wreck Reef.
- Seismic from survey 50 & 51.
- Various BMR seismic.

Comments

Related Papers

- Burns R.E., Andrews J.E., et al., 1973. Initial Reports of the Deep Sea Drilling Project, Volume 21, Washington (U.S. Government Printing Office).
- Andrews J.E., Packam G., et al., 1975. Initial Reports of the Deep Sea Drilling Project, Volume 30, Washington (U.S. Government Printing Office).
- Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1987. Horizontal plate motion: a key allocyclic factor in the evolution of the Great Barrier Reef. Science 238; 1697-1700.
- Marshall J.F. and Davies P.J., 1988. *Halimeda* bioherms of the northern Great Barrier Reef. *In* Coral reefs: Journal of the International Society for Reef Studies 6; 139-148.
- Davies P.J., Symonds P.A., Feary D.A. & Pigram C.J., 1991. The evolution of the carbonate platforms of northeast Australia. The Cainozoic in Australia: a Re-Appraisal of the Evidence, Edited by M.A.J. Williams, P. De Deckker and A.P. Kershaw. Geological Society of Australia Special Publication 18:44-78.

The northeast Australian margin and adjacent areas – a biostratigraphic review and geohistory analysis 1990

Category: Paper

Reference

Chaproniere G.C.H., Pigram C.J., Symonds P.A. & Davies P.J., 1990. The northeast Australian margin and adjacent areas – a biostratigraphic review and geohistory analysis, BMR Record 1990/7.

Location

Reviews previous exploration wells in the Papuan and Capricorn Basins, DSDP sites in the Coral Sea Basin and the Lord Howe Rise

Organisations/ Companies Involved

BMR

Aims

To conduct a review of the geohistory of previous wells and drill sites in the region.

Summary

Eight wells from the southeastern part of the Papuan Basin (Anchor Cay-1, Borabi-1, Kusa-1, Pasca-A1, Pasca-A2, Pasca-C1, Pasca-C2 and Uramu-1A) and four wells from the southern end of the Great Barrier Reef and Capricorn Basin (Aquarius-1, Capricorn-1A, GSQ Sandy Cape-1-3R and Wreck Island-1) provided the database for the study. In addition DSDP Sites in the region were used (208, 209, 210, 287, 587 and 588)

Activity

The report reviews previously obtained data, and did not involve new exploration or surveys

Comments

The work provides a detailed analysis of the geological history, subsidence rates and sedimentation patterns in the region.

Related Papers

Townsville Trough Study Project 121.11 1992

Category: Paper

Reference

Struckmeyer H.I.M., Symonds P.A., Fellows M.E. & Scott D.L., 1994. Structural and stratigraphic evolution of the Townsville Basin, Townsville Trough, offshore northeastern Australia. Australian Geological Survey Organization. Record 1994/50:71p.

Location

Townsville Trough

Organisations/ Companies Involved

AGSO

Aims

To examine the Townsville Trough as part of AGSO's Continental Margins Program.

Summary

The Townsville Basin is an extensional basin which underlies the Townsville Trough, an east-west trending bathymetric feature separating the Marion and Queensland Plateaus off northeastern Australia. The present study forms part of a wider study of the regional stratigraphic and structural framework of Australia's northeastern continental margin, conducted as a part of the Australian Geological Survey's (AGSO) Continental Margin Program. This was the first integrated study of a regional seismic grid across the Townsville Basin, and details the results of the interpretation of AGSO and industry seismic reflection data across the area.

Activity

Interpretation of 5667 km of AGSO and industry seismic reflection data including;

- 1967 Lamont-Doherty Geological Observatory and University of New South Wales joint Survey
- CMP (1971) by BMR
- 73 (1973-1974) by Gulf and Shell.
- 79 (1979)
- 50 (1985) by BMR
- 75 (1987) by BMR
- 76 (1987) by BMR

Comments

This study is part of the Australia's northeastern continental margin project, conducted as part of the Australian Geological Survey Organisation's Continental Margin Program.

Related Papers

- Symonds P.A., Capon D., Davies P.J., Pigram C.J. & Feary D.A., 1987. Structural style of the Townsville Trough and its implications for the development of the northeast Australian margin. Bureau of Mineral Resources, Geology and Geophysics. Record 1987/51: 165-72.
- Townsville Trough Study- Northeast Australia – Project 121.11, 1992/833.
- Hill P.J., 1994. Geology and geophysics of the offshore Maryborough, Capricorn and northern Tasman Basins: results of AGSO Survey 91. Australian Geological Survey Organisation. Record 1994/1:71p.
- Struckmeyer H. & Symonds P., 1996. Tectonostratigraphic evolution of the Townsville Basin 1996/133.
- Struckmeyer H.I.M. & Symonds P.A., 1997. Tectonostratigraphic evolution of the Townsville Basin, Townsville Trough, offshore northeastern Australia. Australian Journal Of Earth Sciences 44(6): 799-817.
- Wellman P., Struckmeyer H.I.M., Symonds P.A., Fellows M.E., Scott D.L. & Draper J.J., 1997. Coral Sea Region *In.* North Queensland Geology. AGSO Bulletin 240.

Architecture of the Queensland Trough: implications for the structure and tectonics of the Northeastern Australian Margin 1993

Category: Paper

Reference

Scott D.L., 1993. Architecture of the Queensland Trough: implications for the structure and tectonics of the Northeastern Australian Margin. AGSO Journal of Australian Geology and Geophysics 14; 21-34

Location

Queensland Trough

Organisations/ Companies Involved

AGSO, Australian National University

Aims

To review the existing seismic data-set, in order to develop a better understanding of the evolution and architecture of the Queensland Trough.

Summary

Re-appraisal of the seismic data provided greater knowledge of the basin and basement architecture, and enabled alternative rifting models to be proposed for the region.

Activity

Various BMR/AGSO seismic used.

Comments

This work complements other studies that address the evolution of Australia's northeast margin.

Related Papers

- Symonds P.A., Davies P.J. & Parisi A., 1983. Structure and stratigraphy of the central Great Barrier Reef. BMR Journal of Australian Geology and Geophysics 2;284-303.
- Symonds P.A. & Davies P.J., 1988. Structure, stratigraphy, evolution and regional framework of the Townsville Trough and Marion Plateau region. Research cruise proposal – project 9131.11. BMR Record 1988/48.

Late Holocene sediment in Nara inlet, central Great Barrier Reef platform, Australia: sediment accumulation on the middle shelf of a tropical mixed clastic/carbonate system 2001

Category: Paper

Reference

Heap A.D., Dickens G.R. & Stewart L.K., 2001. Late Holocene sediment in Nara inlet, central Great Barrier Reef platform, Australia: sediment accumulation on the middle shelf of a tropical mixed clastic/carbonate system. Marine Geology 176; 39-54.

Location

Nara Inlet in the Whitsunday Islands

Organisations/ Companies Involved

James Cook University

Aims

To understand sediment accumulation in a tropical mixed clastic/carbonate system over time.

Summary

Three sediment cores were collected from the inlet

Activity

Three vibracores were collected from the Nara inlet during cruise KG97/2 of the research vessel RV *James Kirby*.

Comments

This research was carried out as part of the senior authors PhD studies at JCU (James Cook University).

Related Papers

- Heap A.D., Larcombe P. & Woolfe K.J., 1999. Storm-dominated sedimentation on a protected basin fringed by coral reefs, Nara Inlet, Whitsunday Islands, Great Barrier Reef, Australia. Australian Journal of Earth Sciences 46; 443-451.

PART FOUR: EXPLANATORY NOTES ON TECHNIQUES, COVERAGES AND DATA TYPES

Offshore Queensland Synthetic Aperture Radar Scenes

Overview:

This technique uses satellite-based radar to detect anomalies in wave height and character on the ocean surface. These anomalies can be caused by many factors both natural and anthropogenic. Some sea surface anomalies can be caused by natural hydrocarbon seepage from the sea floor. There is some evidence from Western Australia that coral reefs may grow preferentially over such nutrient-rich seeps. GA has acquired some SAR data offshore Queensland to determine if there are any such seeps in the Great Barrier Reef area (shown in the following figure), and if so whether the reefs are growing over them. SAR anomalies can also indicate the presence of possible petroleum resources, but this is not the purpose of the current study, as the GBRMP is a protected area.

SAR coverage is limited in offshore Queensland, with 22 ERS2-SAR and 2 WI scenes. Some 21 scenes over parts of the Maryborough Basin, Capricorn Basin, Marion Plateau, Cato Trough and North Tasman Basin are contiguous. One isolated scene covers part of the Marion Plateau just south of the Townsville Basin. GA has purchased and holds the raw data for these scenes.

SAR interpretation contract:

A contract for interpretation of these data is in progress at the time of this report. The contract is to provide Geoscience Australia with a professional image processing and analysis service, by processing, interpreting and mapping offshore satellite SAR data and attribute any/all natural hydrocarbon seeps that may occur with these images. A report will also be provided at the conclusion of the mapping as part of the project.

The contract is with Resource Industry Associates (principal: John Lee), who are subcontracting the interpretation to Image Analysis and Mapping Pty Ltd (principal: Robert Cook). The contract is to be completed by the end of August 2002.

Gravity Studies

In recent years, shipboard gravity has largely been supplanted by high-resolution satellite gravity data sets (e.g. Sandwell & Smith, 1997). These data are collected by satellites carrying radar altimeters measuring the shape of the ocean surface along tracks 3-4 km apart. Variations in the sea surface shape are caused by very small changes in the Earth's gravitational field. For instance, a seamount 2000m high and having a radius of 20km will produce a 2 m high positive perturbation at the ocean surface.

Sandwell & Smith (1997) developed a method to convert geoid height measurements into images of free-air gravity anomaly. Testing the accuracy of this method through comparisons with shipboard gravity measurements has shown agreement with the ship data to within 5 milligals. Gravity datasets produced by this technique are now availible from National Geophysical Data Center (NGDC).

Seismic Studies

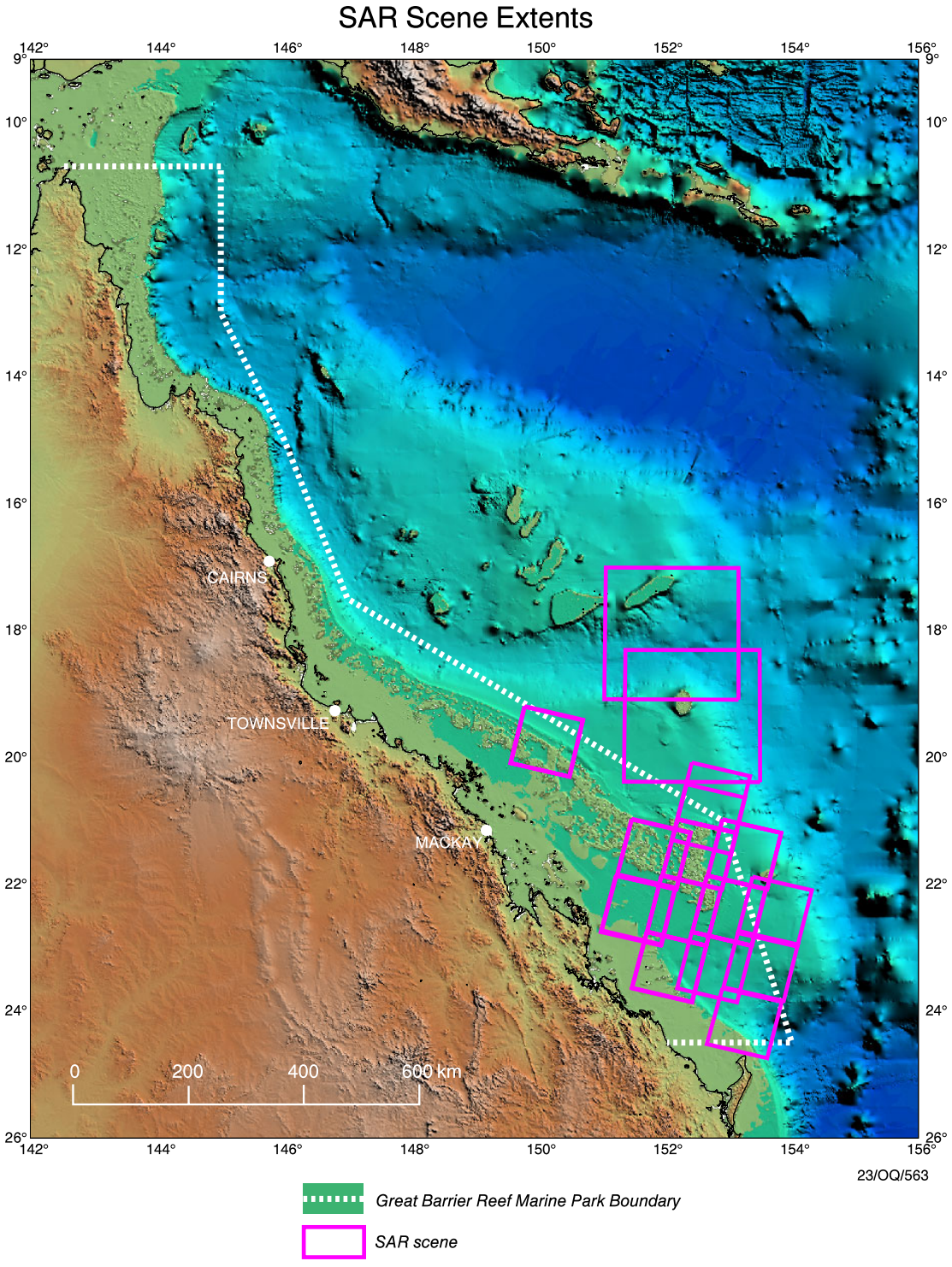
Seismic operations have been carried out in the GBR region since the 1970s in order to determine the morphology of the seafloor and continental margin, the shallow geology of the region, and criteria that could be used to determine Australia's jurisdictional limits. The geological investigations have attempted to image the shape of sub-bottom strata under and around the GBR, the nature of the structures which support the reef, and where possible an indication of the age and thickness of the reef and associated rocks.

The seismic (reflected sound) method that has been used can be thought of as sub-bottom echo-sounding with a penetration of about 1000-3000 metres below seabed. It can only determine the sub-bottom geometry and provides no direct measure of age or resources. The systems used generally comprised a hollow cable about 600-1200 metres long, towed behind a trawler-type vessel. The cable contained several hundred hydrophones (that is, pressure sensitive microphones) wired to a computer/tape recorder aboard the ship. The hydrophones recorded echoes from the seafloor and below. Within and around the GBR, the energy source that created the outgoing signal (ping) was a small 'sparker device' charged by a generator. In areas well to the east of the GBR, the energy source was a device in which compressed air is charged into a cylinder and then released, forcing a shuttle forward. This was a relatively small version of the systems used by the petroleum industry to survey deep sedimentary basins, and has been given the environmentally insensitive name of 'air-gun'.

Processing the seismic reflection data leads to production of charts or cross-sections along the line of the ship's track. These have the appearance of complex echo-sounding records showing the seabed and the shallower part of the underlying strata.

Magnetic Surveys

During seismic operations, it is usual to measure both the gravimetric and magnetic properties of the area, as this involves little additional cost. A times, these parameters can assist with the interpretation of sub-bottom characteristics, for example, to discriminate between volcanic and non-volcanic rocks. The devices used are both passive. The magnetometer essentially comprises a small tightly-sealed cylinder (about 1 metre long) filled usually with kerosene, and towed on an electrical cable about 200 metres astern of the survey vessel. A small electrical current is periodically passed around the hydrogen-bearing kerosene and then relaxed. The subsequent proton precession provides a measure of the magnetic field strength.
Seismic Studies


SAR Scene Extents
142°
144°
146°
148°
150°
152°
154°
156°
9°
10°
12°
14°
16°
18°
20°
22°
24°
26°
CAIRNS
TOWNSVILLE
MACKAY
0
200
400
600 km
23/OQ/563
Great Barrier Reef Marine Park Boundary
SAR scene

APPENDIX 1: REFERENCE LIST IN CHRONOLOGICAL ORDER

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APPENDIX 2: DEFINITIONS AND ACRONYMS

DEFINITIONS

Petroleum: operations carried out by industry for general resource assessment purposes and petroleum exploration.

Continental margin studies (CMS): operations carried out by government to assess the broad geological framework of areas.

ODP: Ocean Drilling Program

Resource assessment (RA): activities carried out to assess long-term resource potential.

Geological history of the reef and its processes (GH): studies of carbonate build-up formed in last 25 ma.

Modern reef studies (MR): studies of the reef and associated sediments since the last ice age.

Onshore and island geological mapping (OGM)

Paper: Work that is interpreting or summarising previously gathered data.

ACRONYMS

AGSO: Australian Geological Survey Organisation
BGR: German Geological Survey
BMR: Bureau of Mineral Resources, Geology and Geophysics
DSDP: Deep Sea Drilling Project
GBRMP: Great Barrier Reef Marine Park
GBRMPA: Great Barrier Reef Marine Park Authority
GSI: Geophysical Services International
GSNSW: Geological Survey of New South Wales
GSQ: Geological Survey of Queensland
JCU: James Cook University
NATMAP: Commonwealth Division of National Mapping

APPENDIX 3: MATERIAL GROUPED BY WORK TYPE

Continental margin studies (CMS)

ODP

Resource assessment (RA)

Geological history of the reef and its processes (GH)

Modern reef studies (MR)

Paper

APPENDIX 4: BUREAU OF MINERAL RESOURCES (BMR) AND GEOLOGICAL SURVEY OF QUEENSLAND (GSQ) 1:250 000 GEOLOGICAL SERIES – EXPLANATORY NOTES WHICH DISCUSS THE POTENTIAL FOR HYDROCARBON RESERVES IN EASTERN QUEENSLAND.

- Explanatory Notes on the Mackay Geological Sheet, Compiled by Jensen A.R., BMR, 1965.
- Explanatory Notes on the Cape Melville Geological Sheet, Compiled by Lucas K.G. and de Keyser F., BMR, 1965.
- Explanatory Notes on the Bowen Geological Sheet, Compiled by Paine A.G.L. and Cameron R.L., BMR and GSQ, 1972.
- Explanatory Notes on the Proserpine Geological Sheet, Compiled by Paine A.G.L., BMR and GSQ, 1972.
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- Explanatory Notes on the Bundaberg Geological Sheet, Compiled by Ellis P.L. and Whitaker W.G., GSQ 1976.
- Explanatory Notes on the Torres Strait-Boigu-Daru Geological Sheet, Compiled by Willmott W.F. and Powell B.S., BMR and GSQ, 1977
- Explanatory Notes on the Cape Weymouth Geological Sheet, Compiled by Willmott W.F. and Powell B.S., BMR and GSQ, 1977
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APPENDIX 5: PAPERS WITH REFERENCE TO PETROLEUM EXPLORATION – SUMMARY

Pinchin J. & Hudspeth J.W., 1974. The Queensland Trough: some recent geophysical results, and its petroleum potential. BMR Record 1974/170.

> Summary: The report describes the findings of the Continental Margins Survey, conducted by the BMR in 1970-1972. The Queensland Trough was one of the focuses of the survey. The report concludes that petroleum prospects appear favourable in the south of the Queensland Trough, especially in the trough's marginal reef development and in the region of the pre-Eocene pinch-out against Palaeozoic basement.

Pinchin J. & Hudspeth J.W., 1975. The Queensland Trough: Its petroleum potential based on some recent geophysical results. The APEA Journal, 21-31.

> Summary: Notes that petroleum prospects appear favourable in the south of the Queensland Trough, especially in the trough's marginal reef development and in the region of pre-Eocene pinch-out against Palaeozoic basement. Recommended that future petroleum exploration in the area should be concentrated on the continental slope outside the GBR, and within the southern end of the trough. Also recommended that the next step in the petroleum exploration should be a seismic survey in the area between the Great Barrier Reef and Flinders Reef.

McAvoy W.J and Temple P.R. 1978. An appraisal of petroleum exploration title areas – offshore northern and central Queensland, May 1974. In confidence BMR Record 1978/80.

> Summary: This record is the result of a brief examination of data relevant to the titles areas. Summaries are given of the regional geology, hydrocarbon potential, geophysical activity and drilling results. Assessments have been made of the prospectivity of the title areas, and recommendations are made for further exploration. The report acknowledges the moratorium on exploration on the Great Barrier Reef.

Falvey D.A., Symonds P.A., Colwell J.B., Willcox J.B., Marshall J.F., Williamson P.E. & Stagg H.M.J., 1990. Australia's deepwater frontier petroleum basins and play types. APEA Journal 30 (1); 239-262

> Summary: The paper speculates that if the Queensland and Townsville Troughs' pre-rift sections are similar to those in the onshore Laura and Maryborough basins, then Jurassic-Lower Cretaceous source and reservoir facies may be present. The authors conclude that it is likely that depositional environments may have produced potential source and reservoir facies, and that Type 2 maturation is likely to be the most common in the central Queensland and Townsville Troughs. Type 3 maturation could only occur in restricted parts of the Queensland and Townsville Troughs where any early post-breakup source rocks are buried beneath a substantial post-Eocene section.

Deepwater northeast Australia (offshore of the GBRMP) is considered a province with high potential, although the absence of any direct indicators from drilling makes it a high risk area.

Hill P.J., 1992. Offshore Maryborough Basin, southeast Queensland: extent, structure and petroleum potential from new geophysical survey data. AAPG Bulletin 76(2); 1107-1108

Summary: States that previously petroleum exploration in the Maryborough Basin had been limited to onshore activities. The 1989 Rig Seismic Survey was the first offshore petroleum-oriented geophysical survey to be conducted in the region since 1974.

Symonds P.A. & Pigram C.J., 1992. Geological development and potential petroleum plays of the Townsville Trough off northeast Australia. AAPG Bulletin 76(2):1128.

Summary: The paper discusses findings of ODP Leg 133, which drilled holes in the flanks of the Townsville Trough. Certain sedimentary facies, which indicated the presence of evaporative sequences, could also include potential source and reservoir facies. The authors state that the Townsville Trough is considered to have good petroleum potential, but the absence of direct information on the nature of any source, reservoir and seal facies also makes it a very high risk frontier basin province.

Pigram C.J. & Symonds P.A., 1993. Eastern Papuan Basin – a new model for the tectonic development, and implications for petroleum prospectivity, Petroleum Exploration and Development in Papua New Guinea: Proceedings of the Second PNG Petroleum Convention, Port Moresby; 213-231.

Summary: The paper provides an analysis of the regional tectonic framework of the eastern Papuan Basin and western Coral Sea. It has important implications for petroleum prospectivity in the region, as it provides a new understanding of the nature, distribution and timing of late Mesozoic and Tertiary tectonic events.

Carter R.M. & Duckworth R.C. 1996. Australian Participation in the Ocean Drilling Program, ODP Phase 3, 1999-2003 Attachments.

Summary: In the “Evaluation of Results of Australian Participation in ODP” section, the information gained from drilling legs off NW Australia is described as being of major significance to AGSO and the petroleum industry. The results of Leg 133, drilling on and adjacent to the GBR were foreseen to attract considerable international interest (to the genesis of the GBR), and the results were described as “highly significant for AGSO and the petroleum industry, recognising the special characteristics and economic significance of the Great Barrier Reef Marine Park and the existence of marine plateau’s and troughs in the Coral Sea, beyond Park limits.”

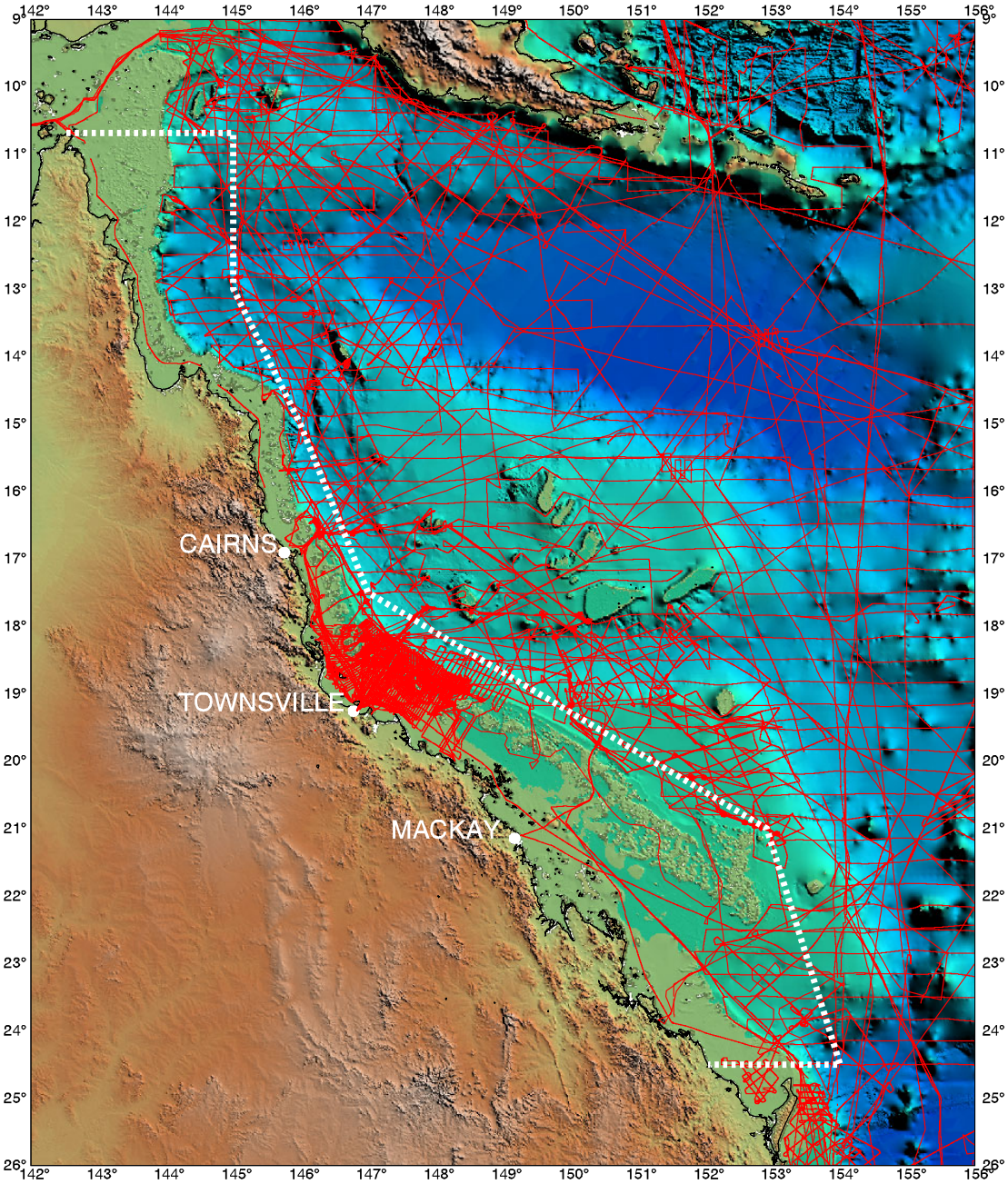
APPENDIX 6: SUMMARY OF THE DECEMBER 2000 TGS-NOPEC TOWNSVILLE TROUGH NON-EXCLUSIVE 2D SEISMIC SURVEY PROPOSAL

TGS-NOPEC proposes to collect approximately 4900 km of 2D seismic data from an area in the Townsville Trough. The purpose of the seismic program is to provide data used to evaluate the petroleum prospectivity of the area.

The survey is expected to take approximately 50 days. TGS-NOPEC proposed to conduct seismic surveys in the Townsville Trough offshore Queensland under a Special Prospecting Authority. The seismic program will be conducted in waters ranging from 500-2500 m depth.

The seismic source will be an air-gun array, with a working pressure of 2000 psi, discharged at 50 m intervals. A 5000in^3 air-gun array will be used to map subsurface geology in depths in excess of 10 km during the program.

APPENDIX 7: SUMMARY MAP



All Surveys