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CRUSTAL TRANSECTS OF THE GREAT AUSTRALIAN BIGHT: A CRUISE PROPOSAL IN SUPPORT OF THE OCEAN DRILLING PROGRAM AND THE LAW OF THE SEA

BY H.M.J. STAGG & J.B. WILLCOX

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SUMMARY

The southern margin of Australia has long been considered an example of a classic passive rifted continental margin. In recent times, it has been cited as an example of a 'lower plate' margin in the terminology describing detachment models of passive margin formation. However, despite extensive study by both industry and government since the early 1970s, some fundamental aspects of the structure and geological history of the margin remain speculative.

It is proposed here to use the AGSO research vessel *Rig Seismic* to acquire 4087 km of deep-seismic data (16 s record length) in the central Great Australian Bight (GAB) and across the continental margin south of Western Australia. The survey has three principal objectives:

1. To enhance understanding of the tectonic evolution / event history of the southern margin in support of DPIE's Acreage Release Program and thus to encourage successful petroleum exploration.

2. To provide the necessary framework data in support of a proposal submitted to the Ocean Drilling Program (ODP) for drilling in the GAB; and

3. To provide data in the GAB that support Australia's claim to a Legal Continental Shelf beyond the 200 n.m. Exclusive Economic Zone (EEZ) as defined under the 1982 UN Convention on the Law of the Sea (UNCLOS).

The specific scientific aims of the work include:

- Definition of the deep crustal structure of the region and the mode of margin formation across a number of key transects. In particular, to image the key detachment surfaces which are believed to have controlled the extensional processes. Interpretation of the deep structures will be enhanced by seismic refraction data recorded by Lamont-Doherty Geological Observatory in 1976 (Talwani et al., 1979).

- Determination of the location and structural setting of the continent-ocean boundary. In places, stratified tilt-blocks that lie oceanwards of the magnetically determined COB suggest that either the COB identification is incorrect, old oceanic crust has been re-rifted, or the seismic data are imaging an amalgam of oceanic crust and continental slivers.

- Determination of the structure and origin of the enigmatic Diamantina Zone, west of the GAB, and its relationship, if any, to the change in seafloor spreading rate at 44 Ma. Is the crust to the north oceanic, or is it highly extended continental?

The data to be acquired can be considered in two distinct sets:

Margin Transects (2494 km)
Four margin 'dip' transects are proposed, with each transect extending from unextended continental craton out to oceanic crust well to the south of the currently interpreted continent-ocean boundary (COB). These transects are oriented NNW-SSE, coincident with the

probable original extension azimuth, and commence in the margin segments containing the Bremer Basin (570 km), Recherche Sub-basin (581 km), Eyre Sub-basin (637 km), and Ceduna Sub-basin (706 km). These data are necessary to our understanding of the tectonic framework and structural origins of the southern margin and provide a basis for the selection of the most appropriate ODP sites.

Law of the Sea (1593 km)
Under the 1982 UNCLOS, Australia can lay claim to an area of Legal Continental Shelf beyond the EEZ southwest of the Ceduna Terrace in the central GAB of approximately 25 000 km^2. For this area to be adequately defined, a total of seven NNE-SSW oriented lines are required, with the lines ranging in length from 88 to 260 km. An orthogonal tie line is also proposed, linking the LOS data set internally, and tieing the Eyre and Ceduna Transects described above. As the area covered by this part of the survey is also a priority area for the proposed ODP drilling, these data will satisfy both of the survey objectives.

While there are no serious time constraints on the acquisition and interpretation of the LOS data (before November 16, 2004), the ODP time constraints are critical. If a revised drilling proposal is to be submitted in time to be considered by early 1996, then the data must be acquired, processed, and interpreted by late 1995. If it is assumed that the processing, interpretation, and proposal writing require a total of six months, then it is essential that the seismic data be acquired before mid-1995. However, as weather conditions in the Southern Ocean can deteriorate severely during the winter months, it obviously makes good sense to carry out the survey as early as possible, and preferably no later than the autumn months.

INTRODUCTION

The southern margin of Australia is a divergent, passive, continental margin extending for some 4000 km from the Perth Basin and Naturaliste Plateau off southwest Australia to the South Tasman Rise in the east (Fig. 1). The margin formed during the period of rifting that culminated in the separation of Australia and Antarctica in the Cretaceous. The basins of this rift system (the 'Southern Rift System' of Stagg et al., 1990) include, from west to east, the Bremer, Great Australian Bight (Eyre, Ceduna, and Recherche Sub-basins), Duntroon, Otway, and Sorrel Basins. The margin has long been considered a classic example of passive margin development and has been used to illustrate the applicability of detachment models to continental margin formation (Etheridge et al., 1990).

The principal features of the central part of the Southern Rift System include:

- a broad continental shelf, generally underlain by shallow Precambrian basement;

- a series of upper slope terraces underlain by rift basins (Bremer and Duntroon Basins, Eyre and Ceduna Sub-basins) that are separated along-strike by segments of steep slope with thin sediment cover;

- a broad continental rise coinciding with a Magnetic Quiet Zone (MQZ) and underlain by a considerable thickness of mainly flat-lying sediments and interpreted highly extended continental crust;

- an abyssal plain (the South Australian Abyssal Plain), which is disrupted in the west by the rugged and anomalous Diamantina Zone.

The level of exploration along the southern margin varies widely. While the principal shelf and upper slope sedimentary basins have been explored by industry and AGSO/BMR since the early 1970s, exploration in deeper water is very sparse, with the only multichannel seismic surveys being recorded by Shell International Petroleum in 1972 (data were not processed) and BMR in 1986. These MCS data show that good-quality data are the norm in the deep-water GAB, providing the possibility, in conjunction with drill data, for the development of general models of passive margin formation. Exploration drilling information is principally confined to the Duntroon and Otway Basins on the eastern flank of the GAB; only two holes (Jerboa-1 and Potoroo-1) have been drilled in the central GAB, while the margin west of the Eyre Sub-basin is entirely untested.

The deep-seismic transects proposed here are designed to address three major objectives:

1. To enhance understanding of the tectonic evolution /event history of the southern margin in support of DPIE's Acreage Release Program and thus to encourage successful petroleum exploration.

2. To provide a high quality basis for future site seismic surveys by AGSO and drilling by the Ocean Drilling Program (ODP), with the specific aims of testing detachment models of

passive margin formation and refining the breakup history of Eastern Gondwanaland (Stagg & Willcox, 1995).

3. To provide the necessary information to allow definition of the Legal Continental Shelf in the central GAB as required by Australia's ratification of the UN Convention on the Law of the Sea.

While the second of these objectives does not require the recording of deep-seismic data, it is sensible to use this opportunity to acquire data that will also be valuable to ODP.

REGIONAL GEOLOGY

Stratigraphy

Knowledge of the stratigraphy of the GAB comes principally from the drilling of oil exploration wells on the continental margin. Unfortunately, all these wells were drilled high on the continental margin, necessitating extrapolation over large distances in order to interpret the deep-water stratigraphy. The stratigraphy of the GAB can best be summarised by reference to the Esso exploration well Jerboa-1 (Bein & Taylor, 1981), drilled on a tilted fault block in the Eyre Sub-basin (Fig. 2).

At Jerboa-1, the basal section above Precambrian basement consists of 410 m of Berriasian to lowest Valanginian non-marine sediments. The earliest sediments are poorly-sorted sandstones interpreted to be derived locally from basement outcrop soon after basin initiation and, as such, they have a syn-rift relationship to the basement. The remainder of the sequence consists of sandstones with interbedded siltstones and shales deposited in lacustrine and fluvial environments. With the location of Jerboa-1 on the crest of a tilted fault block, it appears that the oldest sediments in the Eyre Sub-basin were not sampled, and we believe it likely that sedimentation commenced in the Middle or Late Jurassic.

The basal section is unconformably overlain by thick, lower Valanginian to Barremian, dark grey to dark brown shales with rare interbeds of siltstone deposited in a fresh or brackish water lacustrine environment.

After a 15 Ma hiatus, the earliest marine influence is recorded in the middle Albian, when a thin, shaley, prograding unit was deposited unconformably across the Barremian shales. After a further hiatus of 3 Ma in the Late Albian, marine sedimentation resumed in the Cenomanian with the deposition of a further 452 m of interbedded shales, claystones, and sandstones in an environment interpreted as near-shore.

At Jerboa-1, the Turonian to Lower Eocene section is absent, representing a 40 Ma gap in the sedimentary record. Major unconformities spanning all or part of this time period appear to be present throughout much of the GAB. Although parts of this section may be preserved in the structurally lower parts of the basin, it is evident that a major erosional event, possibly combined with lengthy periods of non-deposition, affected the region. Sedimentation re-commenced with the deposition of a 28 m-thick section of Hampton Sandstone in the latest Early Eocene. These sands were rapidly succeeded by calcilutite and marlstone of the Eocene-

Oligocene Wilson Bluff Limestone and poorly consolidated, open-marine, prograding carbonates which comprise the remaining 335 m of section at Jerboa-1.

Structural Style of GAB Sedimentary Basins

The central GAB is interpreted to have formed when the 'lower plate' Australian margin was pulled out from beneath the 'upper plate' Antarctic margin (Etheridge et al., 1990; Fig. 3). Highly extended remnants of the upper plate occur beneath the Magnetic Quiet Zone and the Ceduna Terrace on the Australian margin. The total amount of pre-breakup extension has been estimated as 360 km (Veevers & Eittreim, 1988) and 280 km (Etheridge et al., 1990), and is assumed here to be about 300 km. The azimuth of pre-breakup extension has been interpreted by Willcox & Stagg (1990) to be approximately NW-SE from the ?Middle Jurassic to the Neocomian on the basis of seismic, magnetic, and gravity mapping of basin-forming structures in the central and western GAB.

While the GAB, and the margin to the west, contain several sedimentary basins/sub-basins the general structural style can be illustrated by reference to an interpretation of AGSO line 65-6 in the western GAB (Fig. 4). This line extends southeastwards from the Eyre Sub-basin to the broad continental rise and almost to the generally interpreted location of the continent-ocean boundary (COB). The primary structural and sedimentary features interpreted on this line include:

- A 'perched' extensional basin, the Eyre Sub-basin, containing syn- and post-rift sediments; extension is about 20%, and a detachment is predicted at about 15 km depth (Etheridge et al., 1990). The sedimentary fill, which is up to 5000 m thick in the deepest half-grabens, has been dated at Jerboa-1 (see above), where it comprises a syn-rift section of ?Upper Jurassic to lower Valanginian sediments, and a post-rift section that includes non-marine sediments of lower Valanginian-Barremian and marine sediments of Albian-Cenomanian age, overlain by prograding Tertiary sands and carbonates.

- Upper crustal tilt blocks beneath the continental rise appear to be progressively more strongly rotated southwards, until on the lower continental rise they are probably completely foundered or have been stripped off. Extension has been computed to be at least 200% (Etheridge et al., 1990), and basement has subsided to depths of at least 10 km (compared to 2-5 km in the Eyre Sub-basin).

- A very flat, strong reflector (horizon ND; Fig. 4) can be identified throughout the deep-water GAB (Stagg & Willcox, 1988). This horizon is a major decollement beneath the upper continental rise which marks a major change in the seismic stratigraphy. Ties of horizon ND to the exploration wells Jerboa-1 and Potoroo-1 rely largely on a well-defined character correlation that date it as early Neocomian (early Valanginian).

- A lower sedimentary section beneath the continental rise ('basement' to horizon ND) which is at least 3000 m thick in places and is seismically featureless (possibly indurated), except at the base of the continental slope where it has some syn-rift stratal relationships.

- A sedimentary section above horizon ND that is typically 2.5 s two-way time (twt; >3500 m) thick beneath the continental rise, and is probably of Valanginian to

Maastrichtian age. Apart from the syn-sedimentary faulting beneath the upper continental rise, the section is essentially flat and unstructured throughout most of the deep-water GAB, and has the appearance of a post-rift thermal sag section. This section contains prominent sedimentary structures that include Barremian-Albian slumps and nappe structures beneath the upper continental rise and western Ceduna Terrace, and a major Cenomanian-Maastrichtian delta beneath the southwest Ceduna Terrace.

- After a major hiatus and/or period of erosion in the Late Cretaceous and earliest Tertiary, a thin veneer of Tertiary carbonates was deposited, principally on the Eyre and Ceduna Terraces.

Figure 5 is a portion of Shell *Petrel* line N405, beyond the southern end of line 65-6, in which ND can be seen to onlap a basement ridge which Veevers (1986, fig. 3) has interpreted to be characteristic of the COB south of Australia. Seismic character correlation across this hummock, to the south, indicates that horizon ND overlies ~0.5 s twt (>500 m) of flat-lying sediment above Veevers' interpreted oceanic crust. Consequently, if the identification of oceanic basement, the dating of horizon ND as Valanginian, and the continuation of ND to the south end of line N405 are correct, then oceanic crust in the western GAB is far older than the previously interpreted oceanic age.

RECONSTRUCTIONS AND SPREADING HISTORY

Magnetic lineations in the Southern Ocean were first identified and mapped by Weissel & Hayes (1972) on the basis of data recorded on the USNS *Eltanin*. They concluded that the oldest magnetic anomaly that could be identified was Anomaly 22, and that breakup between Australia and Antarctica occurred at about 55 Ma, in the Early Eocene. In addition to the basic lineation pattern, Weissel & Hayes also identified several large scale anomalous magnetic or morphological features that are apparently fundamental to margin formation, yet are difficult to explain. These features include -

1. The ***Australia-Antarctic Discordance***, a region of subdued, yet confused magnetic anomalies and deeper than expected crust, astride the Southeast Indian Ridge south of the western side of the GAB. Following a cooperative airborne magnetic survey of the area by the US Navy and the RAAF, Vogt et al. (1983) were able to map the magnetic anomalies in detail. Veevers (1982) concluded that the discordance was part of a major morphological depression that extends from southern Australia to Wilkes Land, Antarctica, and was caused by downward convection in the lithosphere. This notion has been extended by Crawford at al. (1989) in a proposal for ODP drilling, in which it is suggested that the Australia-Antarctic Discordance is the surface expression of the boundary between major mantle convection cells underlying the Pacific and Indian Oceans.

2. The ***Diamantina Zone*** (formerly known as the Diamantina Fracture Zone), a latitudinal band of very rough topography south of southwest Australia. The Diamantina Zone is most pronounced west of 125^{O}E, where it appears to take the form of a series of ENE-striking *en echelon* ridges with southeasterly offsets, whilst to the east it gradually becomes buried by sediments. Basic and ultrabasic rocks have been dredged from the

zone. The eastward extent of the Diamantina Zone is ill-defined, but there are plans for acquisition of a single swath of 20 km-wide multibeam sonar data along the zone in 1995, under the auspices of the France-Australia Scientific Agreement (Royer & Beslier, 1994).

3. A broad ***Magnetic Quiet Zone*** (MQZ) bounded landward by a prominent ***Magnetic Trough*** (MT), extending along the southern margin of Australia from the west of the continent (where it is relatively disturbed) to the eastern side of the GAB where it encompasses the oldest magnetic anomalies. The crust beneath the MQZ has variously been interpreted at continental (Falvey, 1974; Boeuf & Doust, 1975; Deighton et al., 1976) or as a hybrid "rift-valley" crust (Talwani et al., 1979).

In a major re-interpretation of the oldest part of the magnetic anomaly series, Cande & Mutter (1982) suggested that the anomalies originally identified as 19-22 could be better modeled as Anomalies 20-34, with spreading during this period being at a very slow 'half-rate' (~4.5 mm/yr); spreading since approximately 44 Ma has taken place at more normal spreading rates. Cande & Mutter estimated that breakup of Australia and Antarctica took place at some time in the interval 110-90 Ma. This revised anomaly identification, which is now quite widely accepted, accounts for the roughness of the Diamantina Zone (attributed to the slow spreading), the previous difficulties in identifying the older magnetic anomalies, and the period of rapid basin subsidence prior to 90 Ma on the southern margin of Australia (Falvey & Mutter, 1981).

More recently, Veevers (1986, 1988) has refined the estimate of breakup age to 96 +/-4 Ma (Cenomanian-Turonian) by proposing that Cande & Mutter's Anomaly 34 is, in fact, the continent-ocean boundary (COB) edge-effect anomaly and by extrapolating the 4.5 mm/yr spreading rate.

While Cenomanian breakup is currently quite widely accepted, recent work by Stagg & Willcox (1992) points to a number of problems that remain to be resolved, both with the breakup age and also with other aspects of the seafloor spreading history. Stagg & Willcox concluded that:

- interpretation of seismic data from the continent-ocean boundary (COB) demonstrated that it is likely that the oldest interpreted oceanic crust is overlain by several hundred metres of sediment that is no younger than Valanginian (*ca* 125 Ma); that is, the emplacement of the first oceanic crust between Australia and Antarctica must have occurred at least 30 Ma prior to the proposed Cenomanian breakup;

- that breakup between Greater India and Western Australia and between Australia and Antarctica may well have been contemporaneous; and

- that previously geophysically identified oceanic crust may actually be either extensively thinned continental crust (a metamorphic 'core complex'; Fig. 6), interfingered slivers of oceanic and continental crust, or re-rifted oceanic crust from a previous phase of restricted sea-floor spreading.

OCEAN DRILLING PROGRAM REQUIREMENTS

In early 1994, Stagg & Willcox (1994) submitted a letter of intent (LOI) to the Ocean Drilling Program that foreshadowed the submission of a formal proposal for ODP drilling on the southern margin of Australia. The LOI addressed a number of objectives that could be summarised as:

1. Testing of pure and simple shear detachment models and their applicability to the southern margin of Australia (particularly the drilling of detachment surfaces);

2. Refinement of the rifting and breakup history of Eastern Gondwanaland through an improved understanding of the early separation of Australia and Antarctica; and

3. Characterisation of the different crustal types developed during extreme continental extension and during the earliest stages of slow seafloor spreading.

In considering an ODP Proposal as a follow-up to the LOI, it became obvious that, while the southern margin appears to have all the classic features of a 'lower plate' margin in the detachment model lexicon, insufficient high-quality data exist to adequately define a set of suitable sites (Stagg & Willcox, 1995). In view of the success of the deep-seismic technique, as applied by AGSO on the North West Shelf using the RV *Rig Seismic* (AGSO North West Shelf Study Group, 1994), we as the ODP proponents believe it is critical to the development of a successful ODP proposal that deep-seismic data be acquired along several key transects in the GAB and across the continental margin to the west. These transects will allow many of the existing uncertainties about the structure of the margin adjacent to the COB to be addressed and should enable high-priority ODP sites to be defined.

As a follow-up to the acquisition, processing, and interpretation of the southern margin transects, it is essential that the *Rig Seismic* be made available in 1996 for site surveys.

LAW OF THE SEA REQUIREMENTS

With the proclamation of the Maritime Legislation Amendment Act (1994) on 1 August 1994, the definition of Australia's marine zones was brought into line with the 1982 UNCLOS. On November 16, 1994, Australia ratified the 1982 UNCLOS, further highlighting the new definition of the Legal Continental Shelf (LCS). Australia has 10 years from the date of entry into force of the convention, in which to submit particulars and data to support its claim to a LCS beyond the existing 200 nautical mile Exclusive Economic Zone (EEZ). Much of the technical advice needed in support of this claim must come from AGSO, which has expertise in seabed morphology, geology, and resource studies. Symonds & Willcox (1989) defined eight areas where the Australian LCS extends beyond the EEZ and for which data and particulars are needed to meet Australia's UNCLOS claims. One of the areas lies on Australia's southern margin and consists of approximately 25 000 km^2 of continental rise to the southwest of the Ceduna Terrace in the central GAB. In this region, 4000-5000 m of Cretaceous and Tertiary sediments overlie deeply subsided continental and oceanic crust (Fig. 7).

KEY SCIENTIFIC AIMS

1. Define the deep crustal structure of the region and the mode of margin formation at a number of key transect locations. In particular, image the key detachment surfaces which are believed to have controlled the extensional processes.

2. Determine the location and structural appearance of the continent-ocean boundary. In places, stratified tilt-blocks that lie oceanwards of the magnetically determined COB suggest that either the COB identification is incorrect, old oceanic crust has been re-rifted, or a mixture of oceanic crust with continental slivers is imaged.

3. What is the structure and origin of the enigmatic Diamantina Zone, west of the GAB? What is its relationship, if any, to the change in seafloor spreading rate at 44 Ma? Is the crust to the north oceanic, or is it highly extended continental?

PROPOSED PROGRAM

The data to be acquired can be considered in two distinct sets (Fig. 8):

Margin Transects (2494 km)
Four transects are proposed, with each transect extending from unextended continental craton to oceanic crust well to the south of the currently interpreted continent-ocean boundary (COB). These transects are oriented NNW-SSE, coincident with the original extension azimuth as interpreted by Willcox & Stagg (1990), commencing in the margin segments containing the Bremer Basin (570 km), Recherche Sub-basin (581 km), Eyre Sub-basin (637 km), and Ceduna Sub-basin (706 km). These data are necessary to our understanding of the tectonic framework and structural origins of the southern margin and provide a basis for the selection of the most appropriate ODP sites.

Law of the Sea (1593 km)
To provide data for Australia to lay claim to the area of Legal Continental Shelf southwest of the Ceduna Terrace, a total of seven lines are required, oriented NNE-SSW, orthogonal to the morphologic grain. The lines range in length from 88 to 260 km. An orthogonal tie line is also proposed, linking the LOS data set internally and to the Eyre and Ceduna Transects described above. As the area covered by this part of the survey is also a priority area for the proposed ODP drilling, these data will satisfy both of the survey objectives.

Cruise Scheduling
While there are no serious time constraints on the acquisition and interpretation of the LOS data, the ODP time constraints are critical. If a revised drilling proposal is to be submitted in time to be considered by early 1996, then the data must be acquired, processed, and interpreted by late 1995. If it is assumed that the processing, interpretation, and proposal writing require a total of six months, then it is essential that the seismic data be acquired before mid-1995. However, as weather conditions in the Southern Ocean can deteriorate

severely during the winter months, it obviously makes good sense to carry out the survey as early as possible, and preferably no later than the autumn.

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APPENDIX 1: WAY POINTS FOR SEISMIC LINES

Line	Way Pt	Latitude	Longitude
Bremer	1	34° 43' 12"	119° 00' 00"
Bremer	2	39° 00' 00"	122° 30' 00"
Recherche	1	33° 08' 46"	125° 05' 35"
Recherche	2	38° 00' 00"	127° 29' 35"
Eyre	1	32° 56' 24"	127° 07' 12"
Eyre	2	38° 00' 00"	130° 27' 00"
Ceduna	1	32° 33' 36"	130° 00' 00"
Ceduna	2	38° 00' 00"	134° 00' 00"
LOS-A	1	35° 11' 49"	129° 07' 34"
LOS-A	2	36° 02' 42"	128° 54' 40"
LOS-B	1	35° 04' 12"	129° 43' 30"
LOS-B	2	36° 39' 18"	129° 20' 20"
LOS-C	1	34° 51' 00"	130° 21' 47"
LOS-C	2	37° 09' 40"	129° 48' 00"
LOS-D	1	35° 02' 10"	130° 54' 43"
LOS-D	2	37° 09' 40"	130° 24' 00"
LOS-E	1	35° 33' 54"	131° 21' 07"
LOS-E	2	37° 07' 01"	131° 00' 00"
LOS-F	1	36° 16' 08"	131° 46' 41"
LOS-F	2	37° 10' 12"	131° 36' 00"
LOS-G	1	36° 24' 47"	132° 19' 59"
LOS-G	2	37° 11' 49"	132° 10' 01"
GAB-TIE	1	35° 45' 00"	128° 36' 00"
GAB-TIE	2	36° 44' 24"	133° 28' 12"

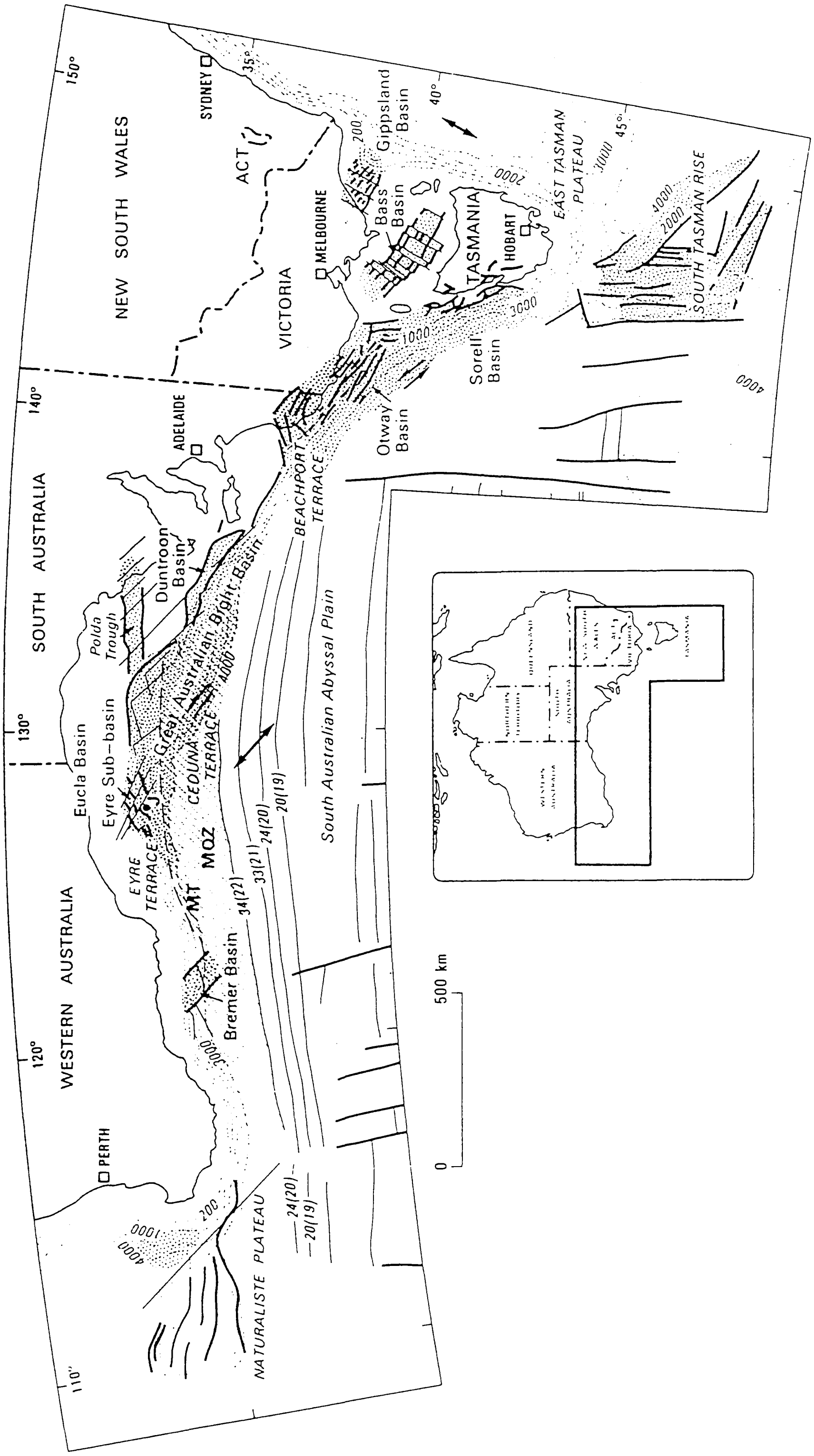

Figure 1: Map of the southern margin of Australia and part of the Southern Ocean, showing the major structural features of the passive margin (after Willcox, 1990).

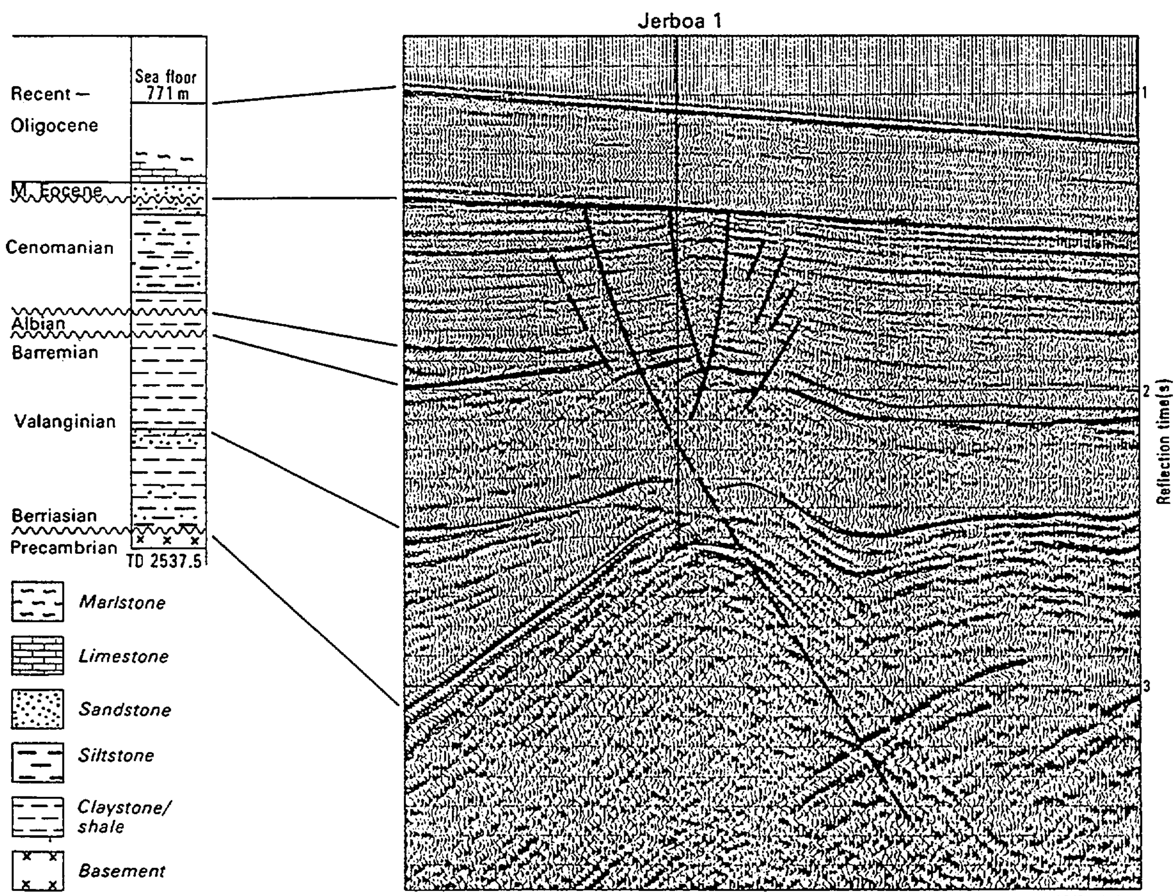

Figure 2: Portion of AGSO seismic line 65-6 through Esso Jerboa-1 exploration well, showing ages and lithologies of sequences penetrated (after Stagg & Willcox, 1992).

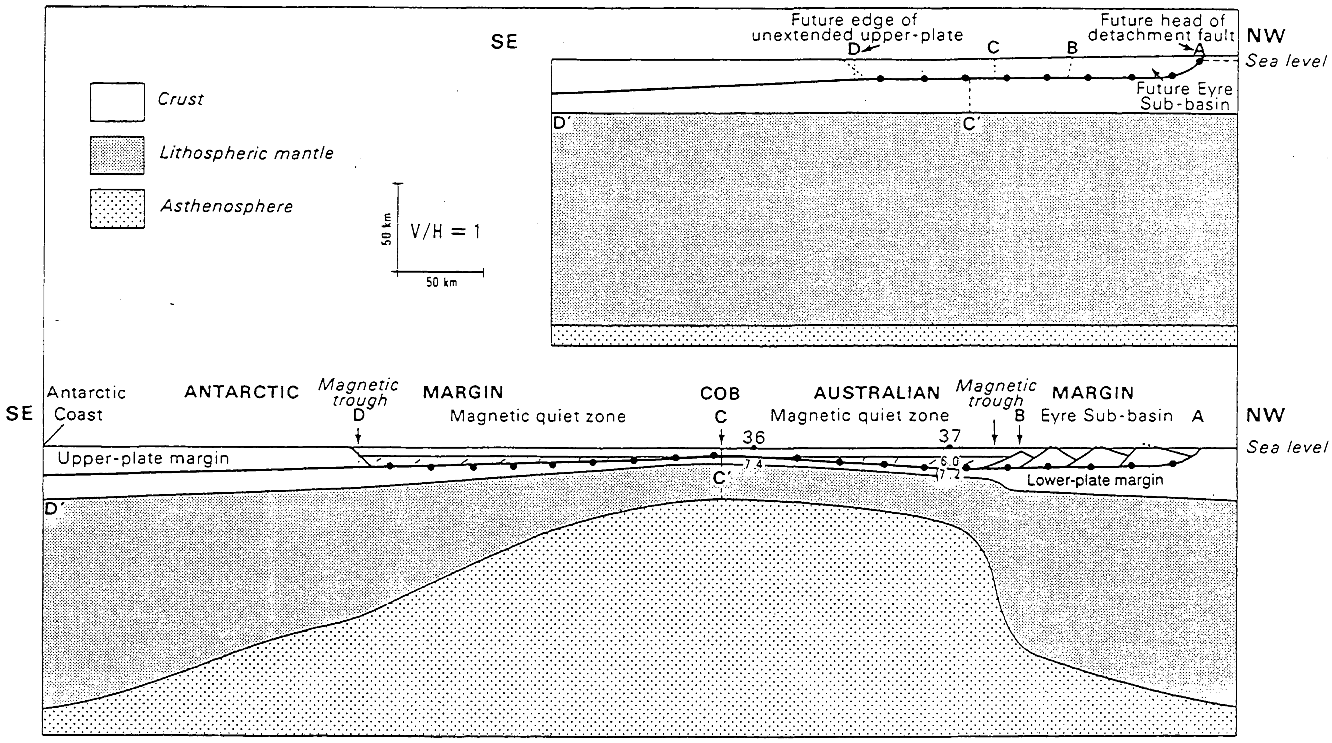

Figure 3: Balanced detachment model from the Eyre Terrace to Wilkes Land, Antarctica (after Etheridge et al., 1990).

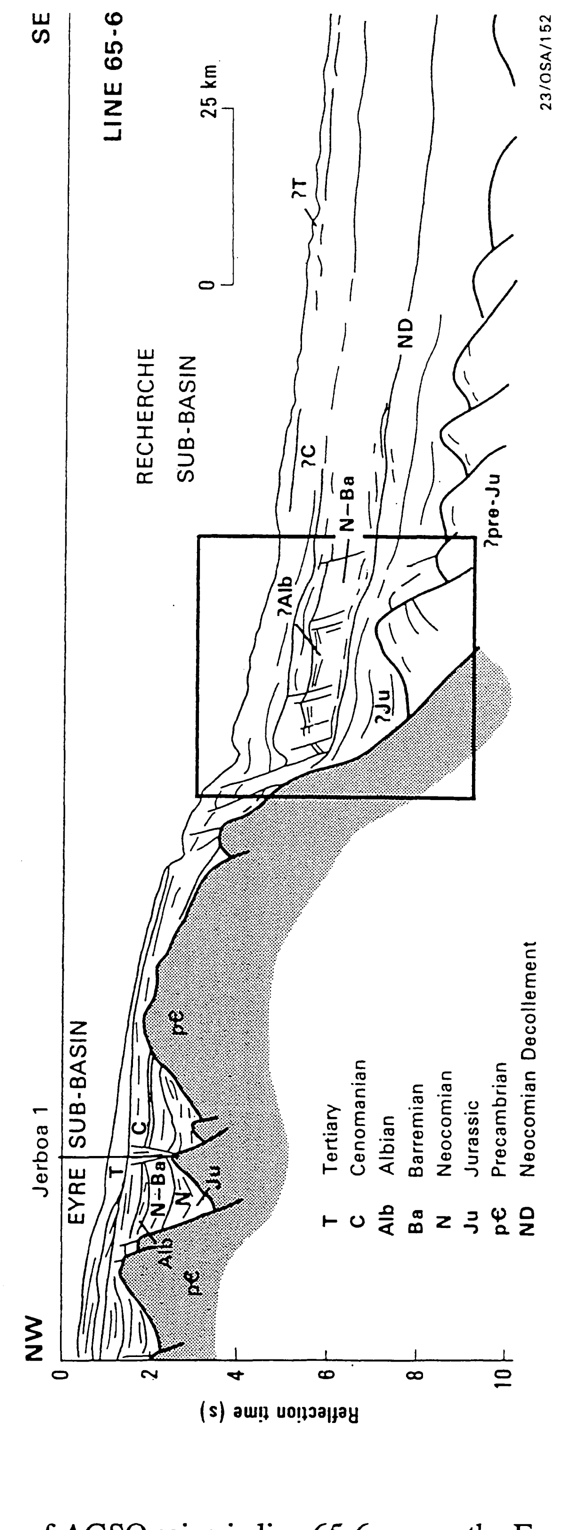

Figure 4: Line drawing of AGSO seismic line 65-6 across the Eyre Sub-basin and adjacent continental rise (Recherche Sub-basin) in the western Great Australian Bight (after Stagg & Willcox, 1992).

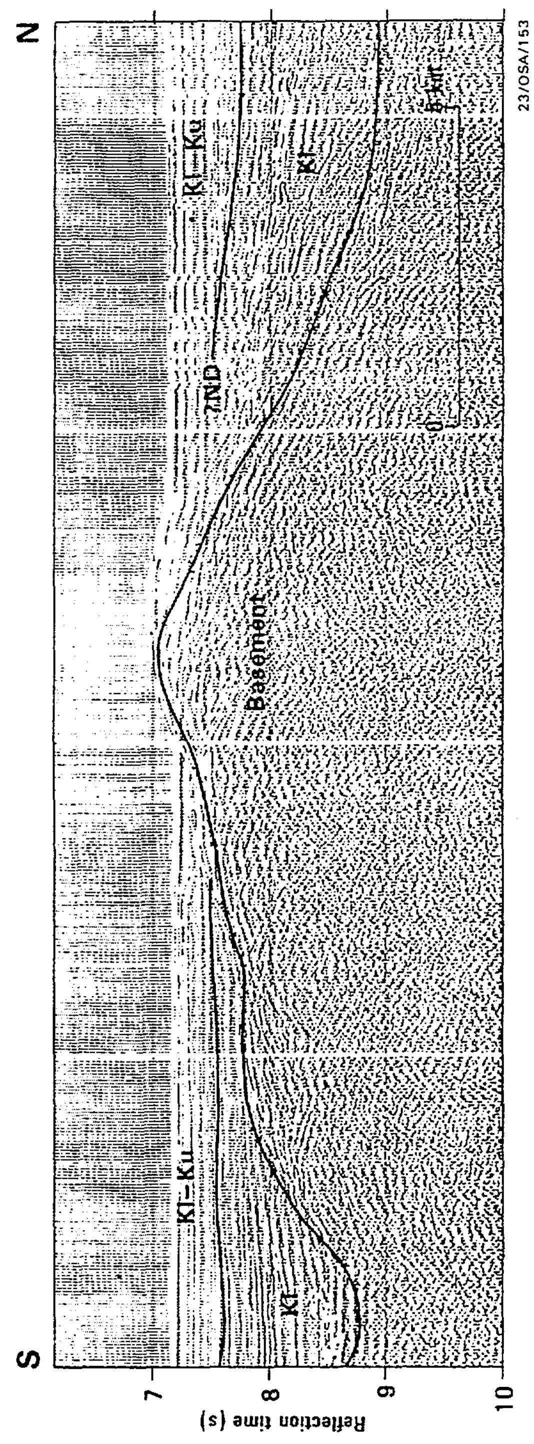

Figure 5: Portion of Shell *Petrel* line N.405 across the basement hummock that has been interpreted as the COB in the western Great Australian Bight (after Stagg & Willcox, 1992). Correlation of the Valanginian horizon ND across this hummock is shown.

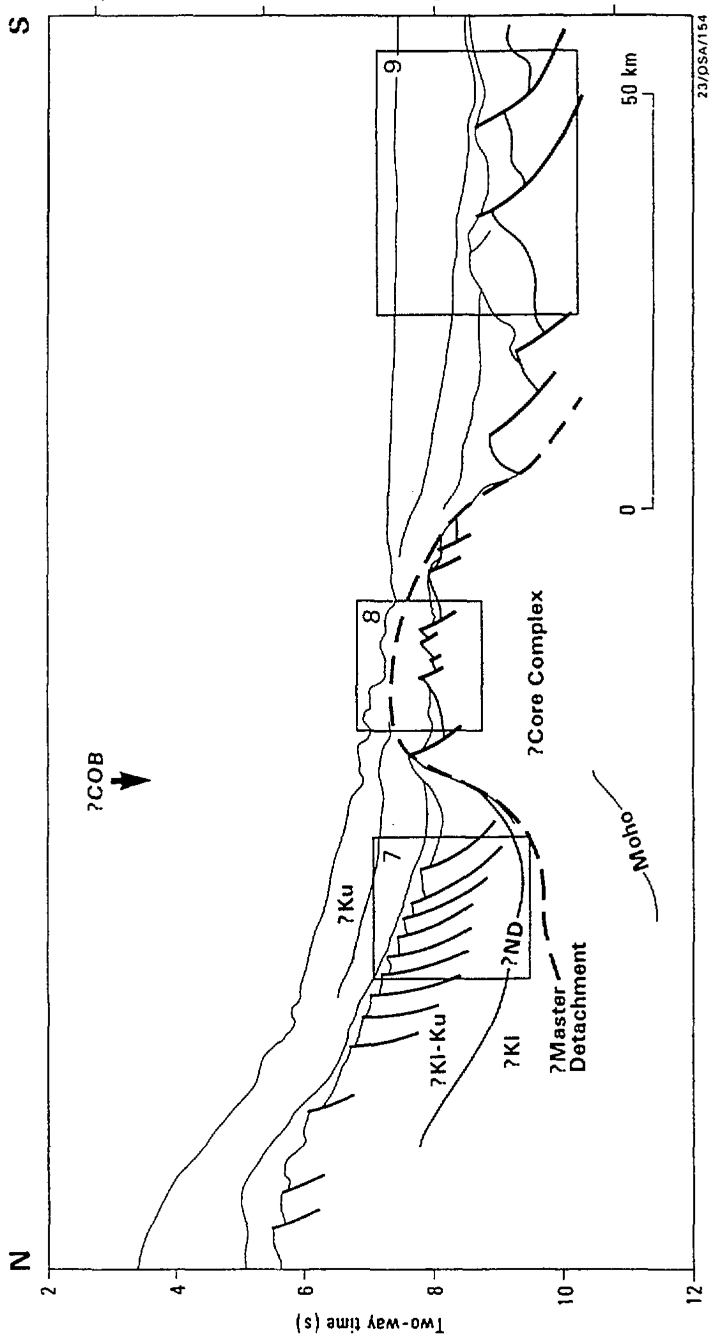

Figure 6: Line drawing of AGSO seismic line 65-14, extending from the outer margin of the Ceduna Terrace, across the narrow continental rise, and onto the South Australian Abyssal Plain (after Stagg & Willcox, 1992). Position of the magnetically-defined COB is shown. If the shallow basement shown in the centre of the profile is a metamorphic core complex (or 'outer high'), then the true position of the COB is to the south of the profile shown here.

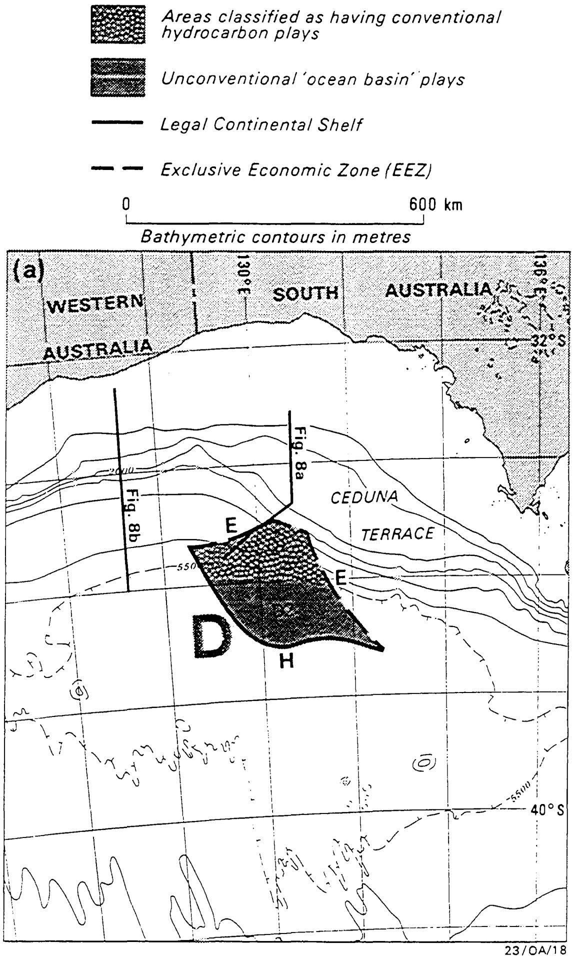

Figure 7: Area of Legal Continental Shelf beyond the 200 n.m. EEZ in the central Great Australian Bight (after Symonds & Willcox, 1989).

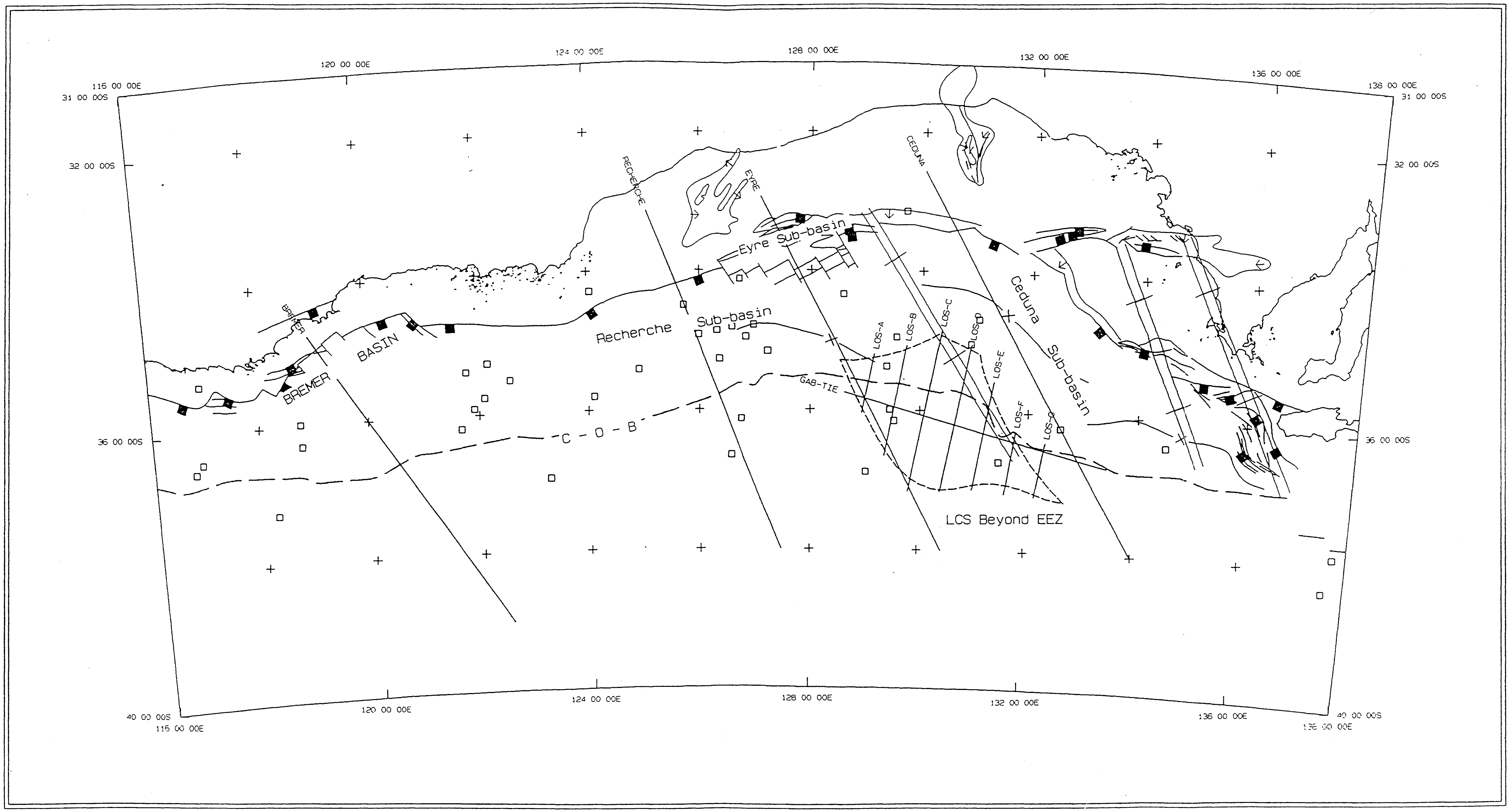

Figure 8: Location of proposed deep-seismic lines on the southern margin of Australia.