BARREMIAN PROSPECTS OF THE NORTHERN PLETMOS BASIN

Introduction

The Pletmos Basin is one of 5 sub-basins situated in the Outeniqua Basin off the south coast of South Africa (Figure 1) and covers approximately 18000 km^2.

The Outeniqua Basin is bounded to the west by the Columbine-Agulhas Arch, to the east by the Port Alfred Arch and to the south by the Diaz Marginal Ridge (Figure 1). It comprises a series of rift sub-basins which are separated by fault-bounded Basement arches comprising Ordovician to Devonian metasediments of the Cape Supergroup (Figure 2).

BASIN GEOLOGY

The Northern Pletmos sub-basin comprises two en-echelon depocentres, the Plettenberg Graben and the Superior Graben, which are separated by a 4000 m high prominent transfer arch. Sediment thicknesses of up to 9000 m have been mapped adjacent to basin-bounding faults.

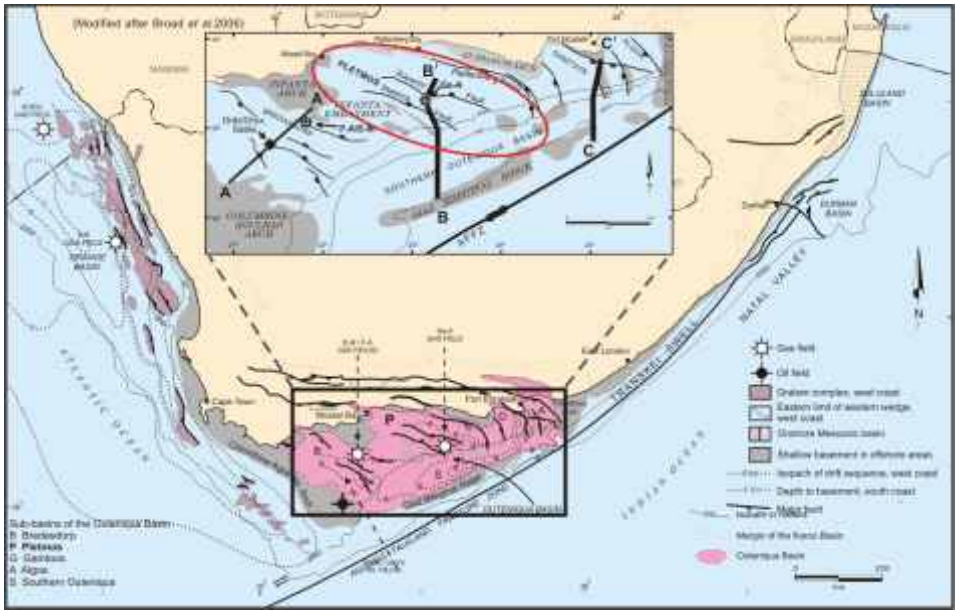


Figure 1: Map indicating the locality of the Pletmos sub-basin.

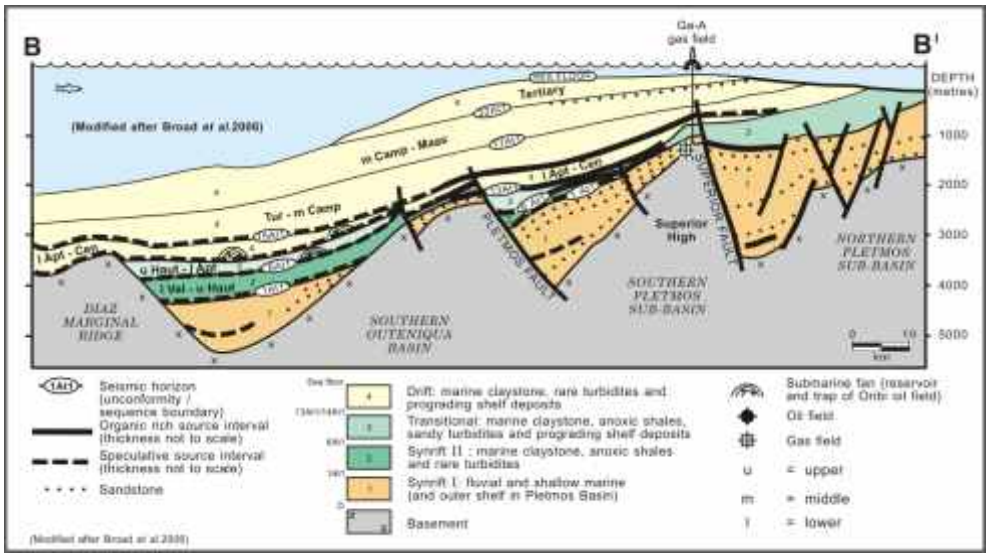


Figure 2:Schematic geological profile across sub-basins of the Outeniqua Basin, based on seismic profiles and well data, to illustrate the graben and half-graben structural style and stratigraphic subdivision into Synrift and Drift sequences. Some economic aspects are also illustrated.

STRUCTURAL DEVELOPMENT OF THE PLETMOS BASIN

The stratigraphy and chronostratigraphy of the Pletmos sub-basin (Figure 3) is similar to that of the Bredasdorp sub-basin and has been described by Brown *et al*. (1996) and utilise the time scale of Haq *et al*. (1988).

Early graben fill (Figure 2) consists of Synrift I sediments, which have been dated as Kimmeridgian but may be as old as Oxfordian in the deep undrilled areas. Where intersected, Synrift I sediments comprise thick aggradational fluvial sediments in the north and marginal marine sandstones in the south. The later Synrift I interval (Portlandian to Valanginian) comprises fluvial, shallow marine and shelf deposits which were sourced from the southwestern and northwestern margins of the basin.

The overlying horizon 1At1 unconformity marks the onset of transform movement on the AFFZ and the onset of a second phase of rifting (Synrift II). Major subsidence of the Outeniqua Basin after the transform-onset unconformity (1At1), led to deep marine, poorly oxygenated conditions within the Pletmos and other sub-basins. Sequences 1A to 5A of Synrift II deposition comprise aggradational deep marine claystones and thin turbidites, and contain organic-rich shales which are significant as petroleum source rocks.

The overlying late Hauterivian to early Aptian (6At1 to 13At1) interval, is characterised by high energy shelfal progradation (Transitional) from the northern margin of the sub-basin. These deposits consist of interbedded claystones and shelf sandstones around the northern rim, and postulated basin floor fan sandstones within the depocentres. Prospects mapped in the Barremian Play are discussed below.

A period of sand starvation followed the erosive event that caused the mid-Aptian unconformity (13At1). Organic-rich shales were deposited in the southern Pletmos sub-basin and probably also in the Southern Outeniqua sub-basin during this period. Late Cretaceous and Tertiary sediments were deposited in a shelf environment (Drift), and comprise interbedded calcareous sandstones and marls.

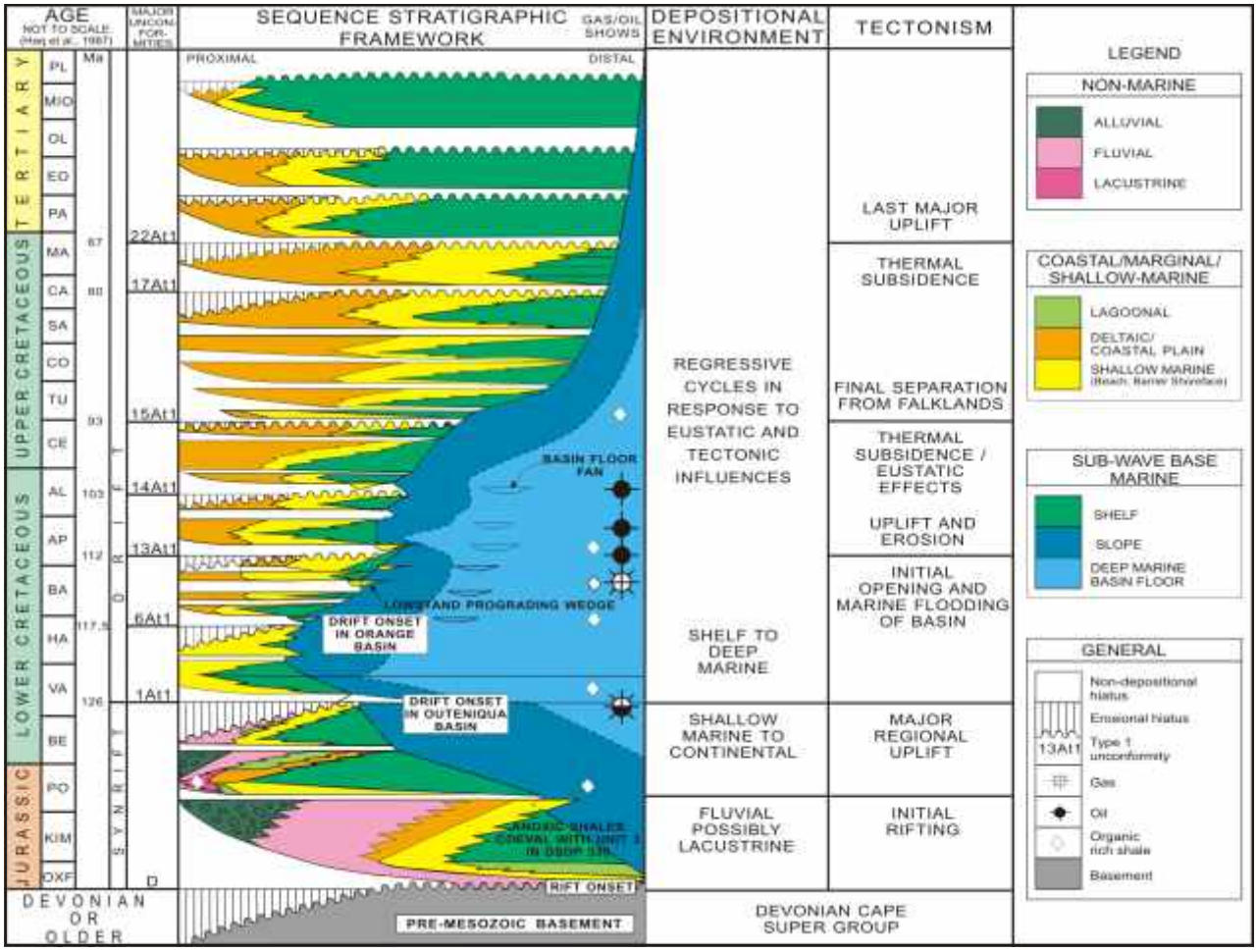


Figure 3: Generalised stratigraphy of the Pletmos Basin.

BARREMIAN PROSPECTS

The Barremian basin floor fan channels (Figures 4 to 10) formed in a westerly direction down the axis of the Northern Pletmos Basin.

Surrounding wells intersected good to fair quality Hauterivian oil to wet-gas prone shales (30 to 60m thick) which directly overly the Synrift succession

Two adjacent wells also intersected gas-charged sandstone interbeds within the Synrift succession, which implies a potential Synrift source for gas.

The channel feature (Prospect 3424A1) is dissected by a fault. The structurally closed areas of the prospects are 15km^2 (Figures 4 to 6), 17km^2 (Figures 7 and 8) and 23km^2(Figures 9 and 10), respectively.

The three prospects are defined by amplitude anomalies and a soft seismic signal. Seismic resolution of Prospect 3424A1 at target depths of 1620m bmsl suggests porous channel sandstone exceeding 27m in thickness.

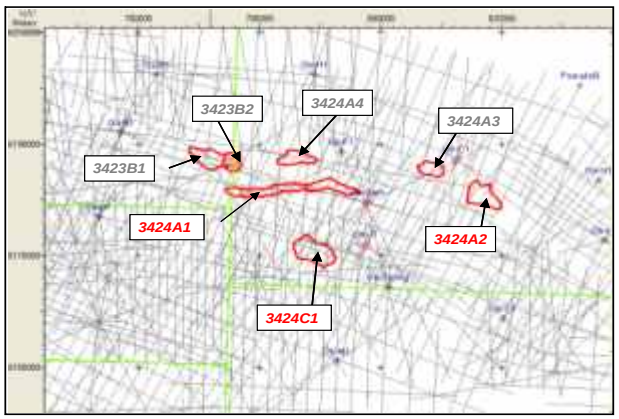
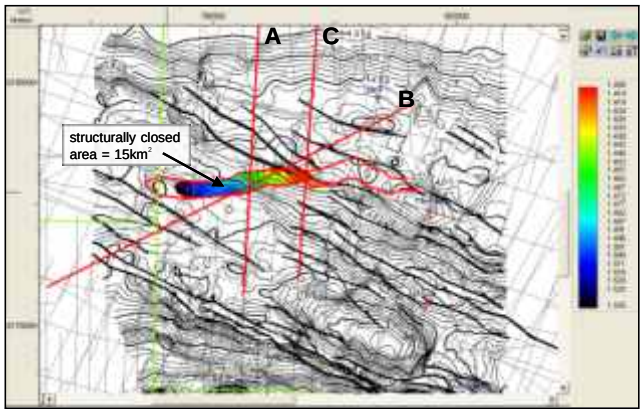


Figure 4: Barremian prospects currently mapped in the Northern Pletmos Basin. Three prospects that are highlighted in red script are discussed opposite.



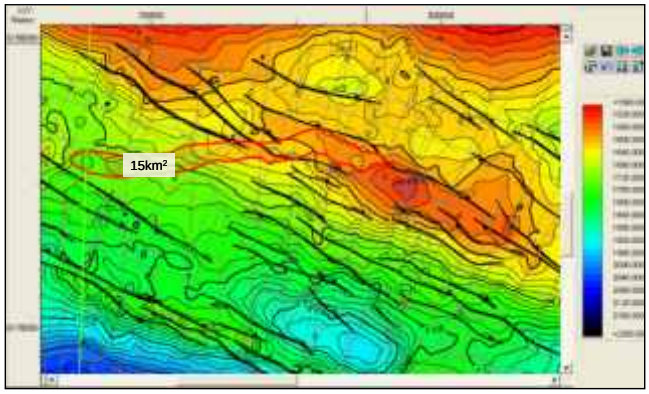
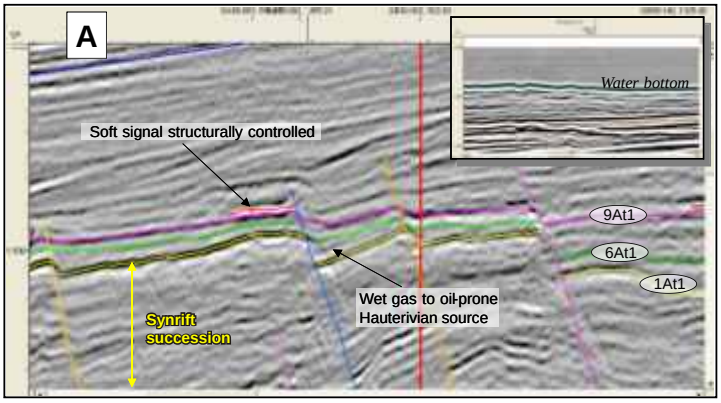
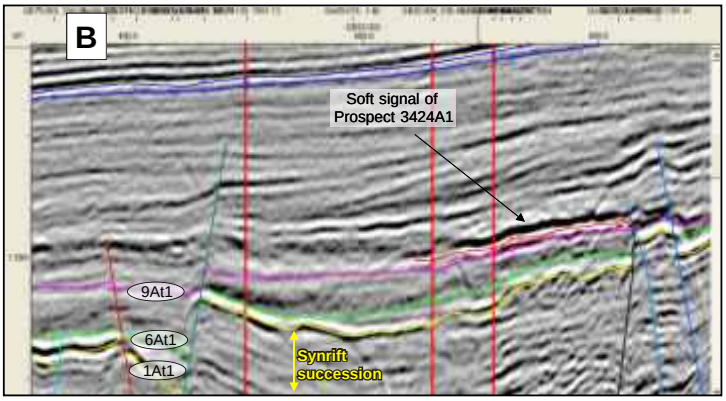


Figure 5a and b: Two-way time map to Barremian Unconformity (9At1), showing structure and prospect 3424A1. Lines A, B and C marked on Figure 5a are shown in Figures 6 a, b and c.





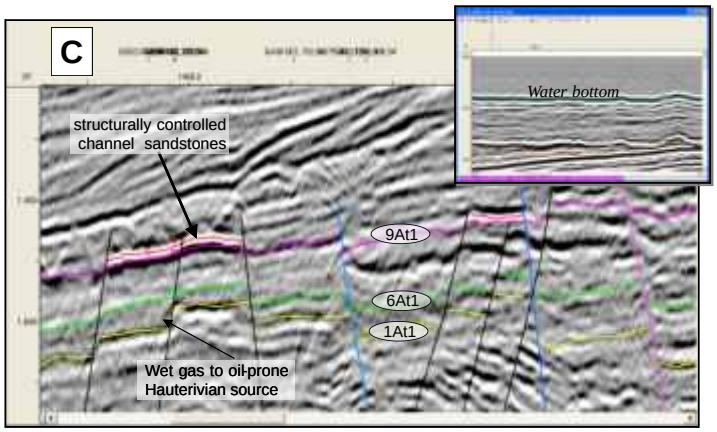


Figure 6a, b and c: Composite seismic sections of various seismic lines indicated in Figure 5a, showing the geological, as well as structural setting and extent of Prospect 3424A1

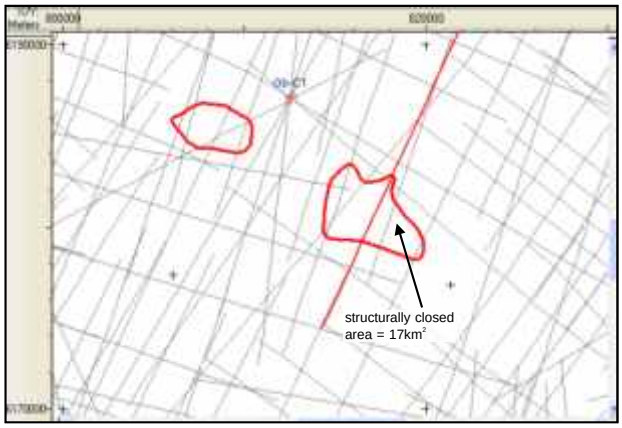


Figure 7:Locality of Prospect 3424A2 and the seismic line displayed in Figure 8 below.

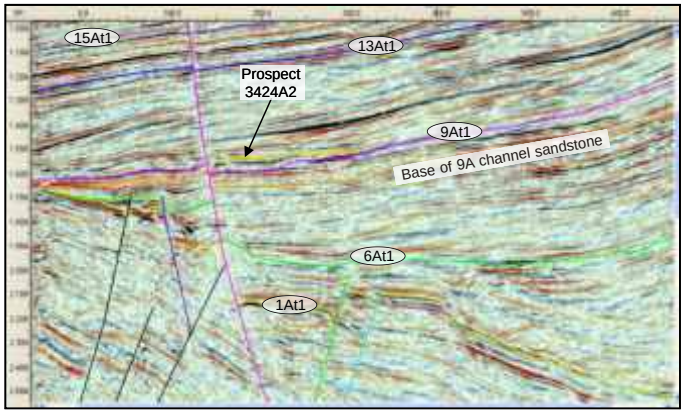


Figure 8: Prospect 3424A2 in the Northern Pletmos Basin.

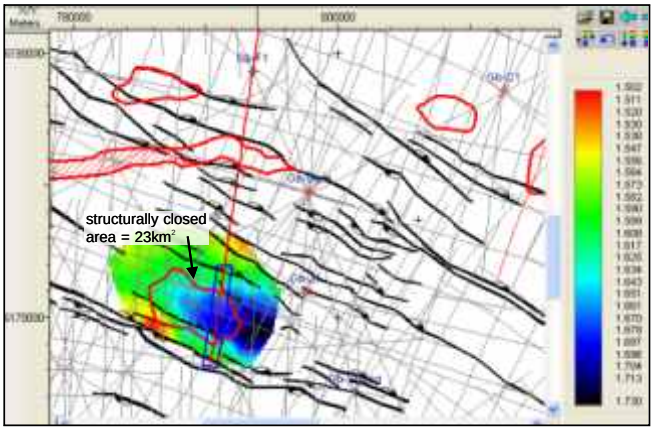


Figure 9: Two-way time map to the Barremian Unconformity showing the locality of Prospect 3424C1 and the seismic line displayed in Figure 10 below.

RESOURCE ASSESMENT

Using deterministic assessment, the most likely reserve estimates for some of these Barremian prospects are displayed in Table 1 :

Prospect Name	GIIP Tscf	STOIIP MM bbl
3424A1	1.47	127
3424A2	1.38	120
3424C1	1.86	162

Table 1: Reserve Estimates of prospects 3424A1, 3424A2 and 3424C1 in the Northern Pletmos Basin.

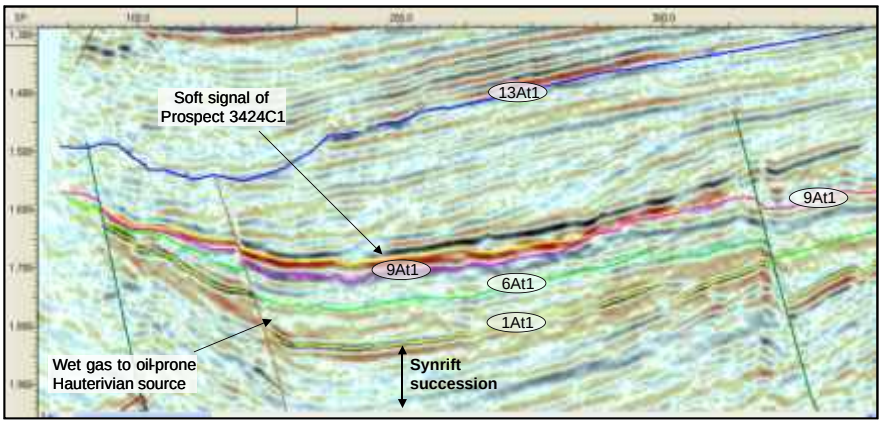


Figure 10: Prospect 3424C1 in the Northern Pletmos Basin.

CONCLUSION

The Pletmos Basin has proven operating petroleum systems with numerous oil shows, mature oil- to wet-gas prone source rocks and good quality reservoir sandstones.

These Barremian prospects are well positioned in relation to mature source rocks and seismic data shows demonstrable closure as well as encouraging indications of reservoir facies.

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Petroleum Agency SA

Tygerpoort House
7 Mispel Street
BELLVILLE 7500
REPUBLIC OF SOUTH AFRICA

For more information, contact :

Mr Mthozami Xiphu
The Chief Executive Officer: Petroleum Agency SA
Fax: (27) 21 938-3520
Email: vanderspuyd@petroleumagencysa.com
Web: www.petroleumagencysa.com

P.O. Box 1174
PAROW 7499
RSA
(27) 21 938-3500