PETROLEUM IMPLICATIONS OF STACKED DELTAS IN THE FAIRWAY BASIN, OFFSHORE NEW CALEDONIA, NORTHERN TASMAN FRONTIER

Pierrick ROUILLARD[1], Julien COLLOT[2], François BACHE [3], Rupert SUTHERLAND [3]
Karsten KROEGER[3], Rob FUNNELL [3]

[1]Economical development agency of New Caledonia (ADECAL), [2] Geological Survey of New Caledonia, [3] GNS Science

INTRODUCTION

The Fairway Basin is a mid-to-Late Cretaceous basin which lies between Australia and New Caledonia in the **northern Tasman Frontier** (Fig. 1)
Indirect **petroleum system indicators** are known within the basin such as a 70000 km^2 BSR, diapirism and fluid escapes features and sedimentary thicknesses and geometries capable of trapping hydrocarbons (Figs. 2 & 3)

Tectono-sedimentary history and palaeogeography are deduced from a seismic data set and available wells (Figs. 1 & 2). This work also allowed the discovery of deeply buried deltas probably of the same type as the deep-water Taranaki Delta in New Zealand (Figs 2 and 3).

This stratigraphic framework is used to constrain a multi-1D generation modelling and to **test different hypotheses of source rocks and heat flow scenarii**, but only two cases are developped here (for others see Kroeger and Funnell, 2011).

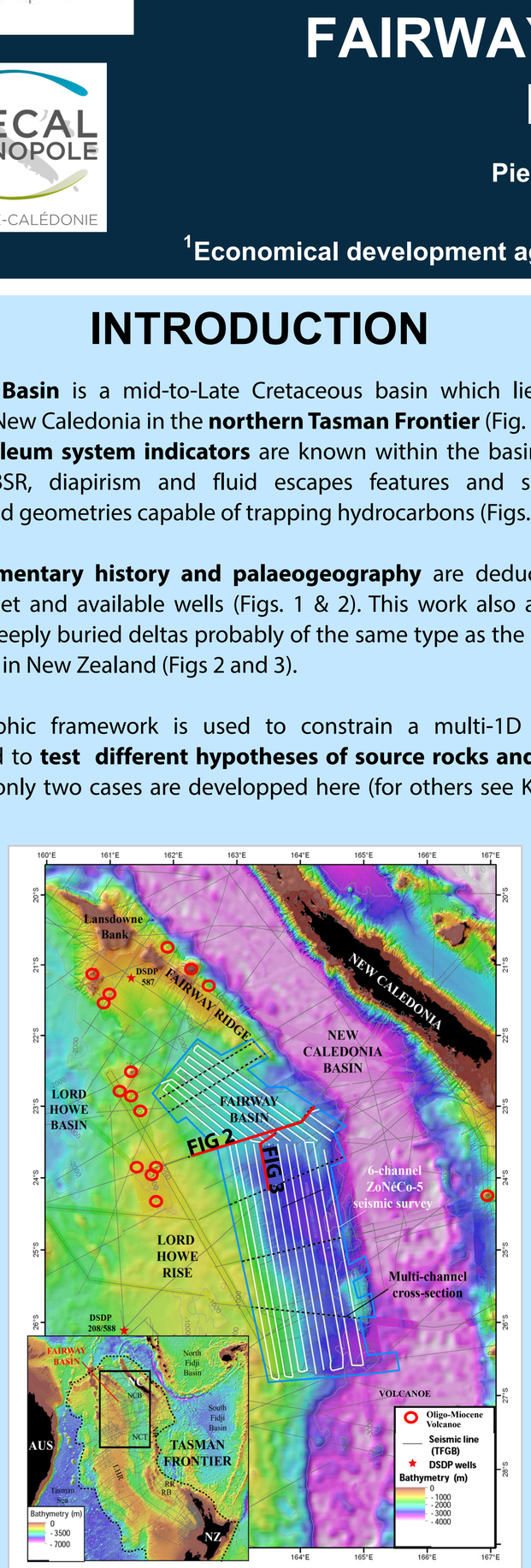

Fig. 1 : Location of the Fairway Basin, Tasman Frontier area and data set

SEISMIC STRATIGRAPHY

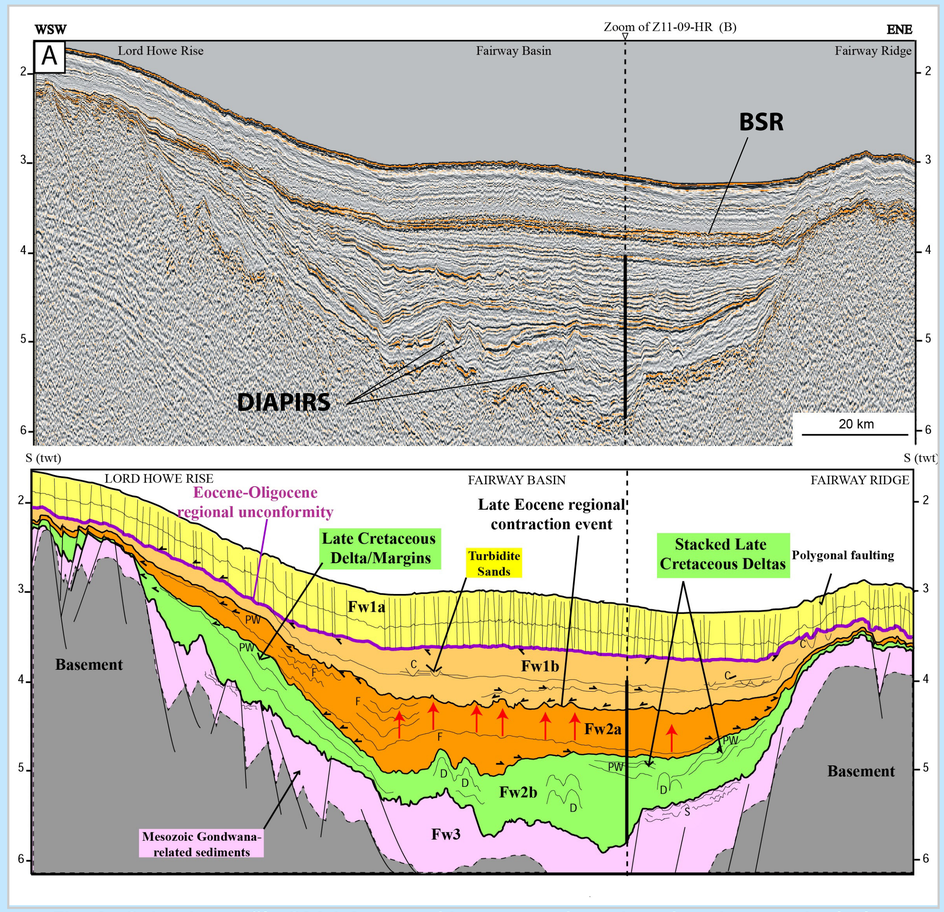

Fig. 2 : Seismic profile S206-2-ga and interpreted section showing particularly Late Cretaceous buried deltas, diapirs and the BSR

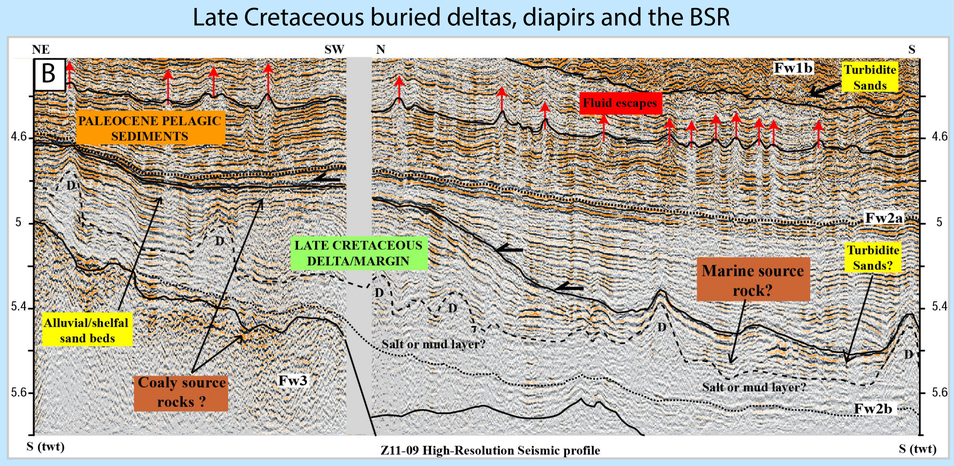

Fig. 3 : Interpreted zoom of Z11-09 high resolution seismic profile show a Late Cretaceous prograding series and potential distribution of source rocks (location see figs. 1 & 2)

MAPPING

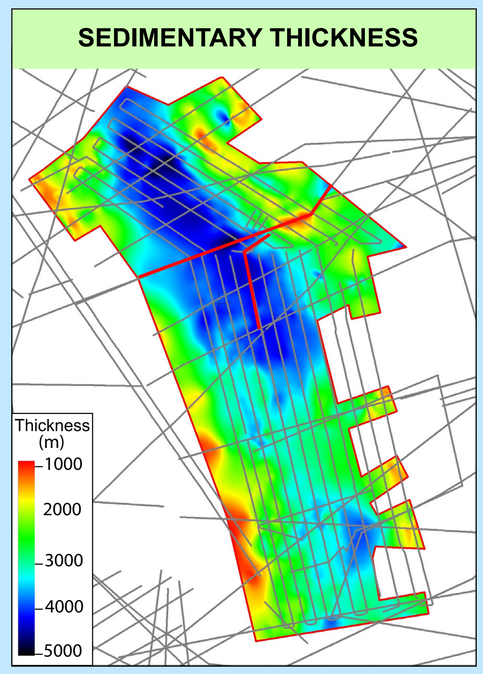

Fig. 4: Sedimentary thickness map

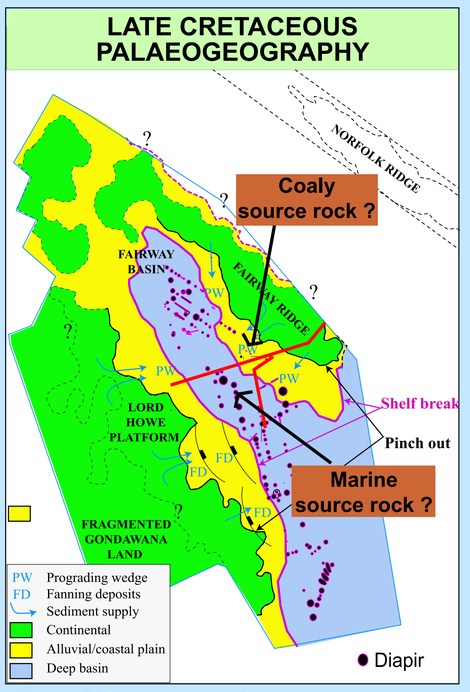

Fig. 5: Palaeogeographic reconstruction during the Late Cretaceous

MULTI-1D GENERATION AND FLOW-PATH MODELLING

MESOZOIC COALY SOURCE ROCK (WALLOON EQUIVALENT)

Heat flow A

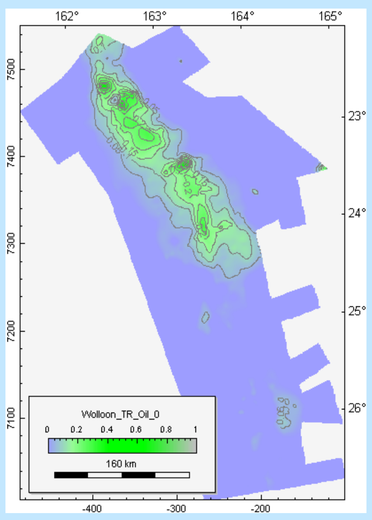

Fig. 6: Predicted oil transformation (TR)

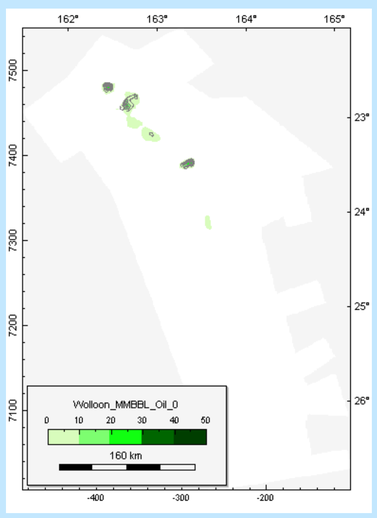

Fig. 7: Predicted volume of oil expelled

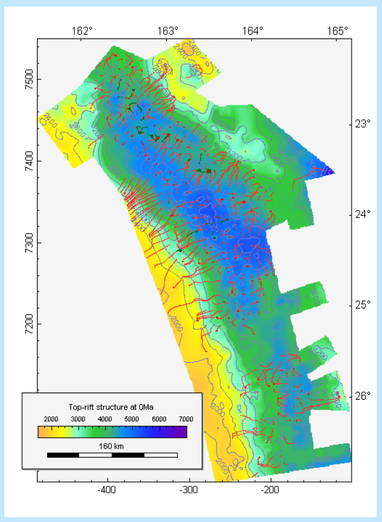

Fig. 8: Migration results from flow-path modelling

LATE CRETACEOUS MARINE SOURCE ROCK

Heat flow B

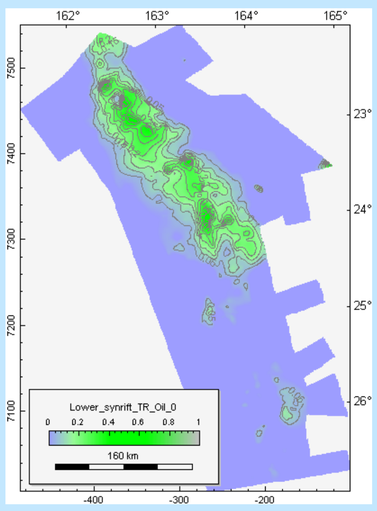

Fig. 9: Predicted oil transformation (TR)

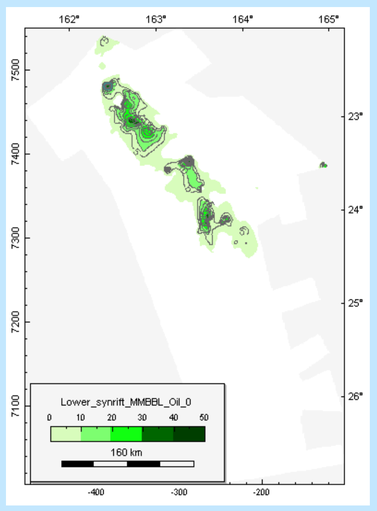

Fig. 10: Predicted volume of oil expelled

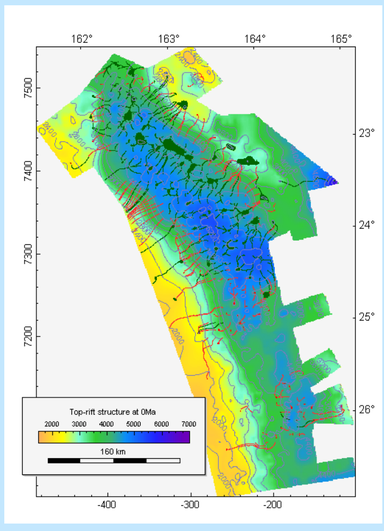

Fig. 11 Migration results from flow-path modelling

2 HEAT FLOW SCENARII

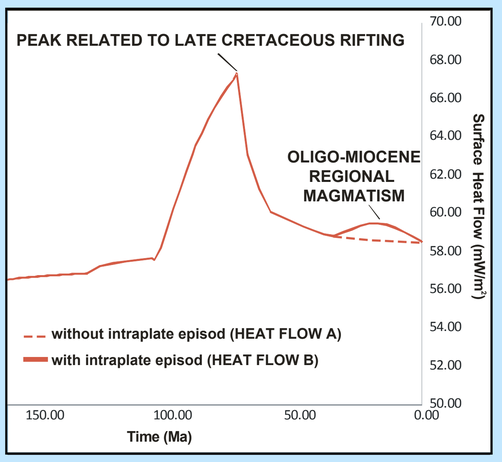

Fig. 12: Modelled heat flow history showing effect of both rifting and Oligo-Miocene intraplate volcanism

Sedimentary cover is thick enough (Fig. 4) but heat flow is a critical parameter to determine the Fairway Basin prospectivity

A **wide spread intraplate magmatism** is observed over the Tasman Frontier from **late Eocene to Miocene** (example of volcanoes on Fig. 1)

This increased the heat flow increased and kerogen to oil transformation ratio (Fig. 6) and hence the volumes of oil expelled

CONCLUSION

Seismic stratigraphy especially reveals that the northern Fairway Basin hosts stacked Late Cretaceous deltas/margins presumably of same as type as the Deep Water Taranaki in New Zealand where coaly and marine source rock could have been deposited.

Modelling of different source rock types within these newly discovered features and of an Eastern Australia (Walloon) and a Deep-water Taranaki (Rakopi) source rocks equivalents confirm the petroleum prospectivity of the Fairway Basin.

Due to the basin configuration and a higher degree of adsorption, coaly source rocks are of low maturity and low volumes of oil are expelled. However, when considering a marine source rock and a higher heat flow scenario volumes of oil are significant.

This study also emphasizes the need for more industry standard seismic data to better characterize the sedimentary column down to basement and more particularly the lateral extension of the stacked deltaic bodies. Further data are required to constrain the nature and distribution of source rocks, the quality of reservoir and seals, and to further assess heat flow variations.

Reference :
Kroeger, K.F.; Funnell, R. 2011. Generation and flow-path migration modelling of the Fairway Basin, New Caledonia, GNS Science Consultancy report 2011/349. 36p. Freely available on : www.dimenc.gouv.nc