

Revising the structural elements map of the North West Shelf

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SUMMARY

The widely used scheme of naming basins and their regional subdivisions on the North West Shelf emerged from relatively sparse data collected during the early stages of exploration. Such data allow the recognition of large-scale structures and depocentres with a broadly distinct tectono-stratigraphic framework. While that scheme has endured, the availability of extensive, high quality seismic data and stratigraphic information from numerous exploration wells means that we can define much more precisely the structural elements that comprise the margin and the stratigraphic signatures of the basin fill. This has highlighted some inconsistencies in the existing nomenclature, the presence of structural elements of different ages and the presence of boundaries between basins that sometimes can appear rather arbitrary.

We present a revised map for the North West Shelf that shows the structural elements with distinct tectono-stratigraphic signatures that comprise the margin, and applies a consistent nomenclature to them. The aim is to provide a framework that will allow for the better demarcation of distinct hydrocarbon provinces and improved targeting of exploration programmes. This is a work in progress and we invite you to annotate the map shown on our poster with your own comments or to provide feedback via our blog.

Key words: North West Shelf, Sedimentary Basins, Structural Elements.

INTRODUCTION

At the first WABS conference a seminal paper by Hocking *et al.* (1994) introduced the concepts of basins and sub-basins, as applied to Western Australia. While the definition of a basin is clear (“an area underlain by a substantial thickness of sedimentary rock which possess unifying characteristics of stratigraphy and structure...”), and elements such as graben, troughs, platforms and terraces are well defined, that of a sub-basin is less distinct and has never been clearly defined in the literature. The sub-division and boundaries recognised by Hocking *et al.* (*op. cit.*) persist, with some modification, and form the basis for the attribution of wells and acreage.

Since then, much new data have been acquired and our understanding of the evolution of margin continues to evolve. Improved seismic imaging, the increased availability of deep seismic data, and more detailed interpretation of gravity data have all helped to define the fundamental structures that comprise the North West Shelf, the distinct nature of Paleozoic

basins, and the complexity, or uncertain validity of some of the structures which demarcate Mesozoic basins.

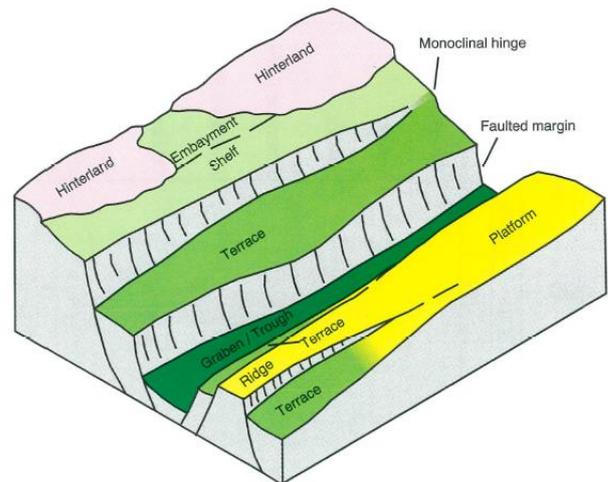


Figure 1. Structural elements of sedimentary basins (from Hocking *et al.*, 1994)

A REVISED STRUCTURAL ELEMENTS MAP

From a structural viewpoint, sedimentary basins are typically separated by a recognised structural high. In this context, a single line on a map to mark the boundary between, for instance, the Northern Carnarvon and Roebuck basins, makes little sense. The Thouin Graben may mark part of that boundary, but it is a broad feature, not a single line, and it may only have formed a significant structure for part of the history of these two “basins”. Along strike, the Turtle Dove Hinge marks the same boundary, but this is a diffuse zone of faults, many of which are detached, and hence are not fundamental crustal structures. There is also continuity of Triassic and Jurassic sedimentary systems across this boundary.

The Northern Carnarvon Basin is an amalgamation of a number of distinct tectonic elements – a major Triassic depocentre that we can now map more precisely, narrow Jurassic rifts and Upper Cretaceous to Holocene compressional structures. These features should be recognised in their own right. The Bonaparte Basin is even more of an amalgamation of distinct structural elements of different ages, with distinct stratigraphic signatures. The Petrel Basin is a case in point, worthy of recognition in its own right as a Paleozoic basin, rather than as a sub-basin of a largely Mesozoic feature. The way in which the boundary between the Browse and Bonaparte basins is defined is particularly unclear, and features such as the Heywood Graben appear to straddle it.

Rather than a rigid definition of basins demarcated by lines on a map, we propose a revised structural elements map for the North West Shelf based on regional scale, detailed mapping of

structures, isopachs and gravity maps. This is a work in progress, and can only be improved by broad community input. We invite you to visit our poster, to use the pens available to add details that we have missed, correct errors that we have made, and rectify any omissions. Alternatively, you can add comments to our blog where you will also be able to see that latest version of the map, share your thoughts and contribute to a stimulating discussion. Please go to:
<https://wordpress.com/view/nwshelfstrucelements.home.blog>

CONCLUSIONS

The traditional nomenclature of the basin divisions that comprise the North West Shelf are well established, serve a number of useful functions and will persist. However, we hope that a new structural elements map will better reflect our vastly improved understanding of the margin, provide a framework which reflects the geological evolution of the margin, and a context for defining distinct hydrocarbon provinces. We also

hope that such a map will continue to evolve as we continue to discover more details of this intriguing continental margin.

ACKNOWLEDGMENTS

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REFERENCES

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