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# The Concertina Coast: the role of basement inheritance during repeated reactivation events along Australia's northern margin since the Permian

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The present day configuration of Australia's northern margin includes a series of Phanerozoic sedimentary basins forming the North West Shelf. Their polyphase history, dominantly extensional, and closely associated with the breakup of Eastern Gondwana, includes the early formation of intracratonic basins (from the mid-Devonian), overprinted by Permo-Carboniferous rifting that generated the dominant NE-trending structural trends that persist to the present-day. Subsequent Mesozoic extension, associated with the formation of abyssal plains, further refined the margin, creating additional depocentres.
During this polyphase rift history, a number of periods of inversion have punctuated the margin. These include a Carboniferous event (the Meda Transpression), a late Permian to Early Triassic event, sometimes referred to as the Bedout Movement (possibly transtensional), and two events, one in the Middle to Late Triassic, followed by another in the Late Triassic to Early Jurassic, often referred to as the Fitzroy events. These various events, recorded locally, caused inversion, folding, uplift and erosion where documented, with the Fitzroy events described as transpressional, resulting from right-lateral oblique inversion. Subsequent inversion during the Cretaceous, also attributed to dextral transpression, caused long wavelength folding and fault inversion in some basins.
Whereas the effects of earlier inversions are somewhat sporadic across the North West Shelf, the effects of Neogene inversion have been documented across both the active and passive segments of the present day North West Shelf, and also appear to be strongly controlled by right-lateral oblique reactivation mechanisms, with associated seismicity and focal mechanism solutions.
The history of the North West Shelf therefore includes 6 discrete episodes of reactivation and inversion, apparently strongly dominated by oblique mechanisms, which punctuate the long, multi-phase extensional history. Whereas Neogene to Recent inversions can be attributed at least in part to plate collision (locally) and far-field stress (generally), the cause(s), distribution(s) and intensity of these previous events remains unclear. Distributions of Precambrian basement and lineaments beneath the shelf, seen in potential field data, seemingly exert strong controls on reactivation locations and geometries. Interactions of long-lived, reactivated basement trends with larger-wavelength dynamic topography may also be important in dictating where and when inversion events occur.
This presentation will examine the locations and manifestation of Late Permian to Recent events as seen in seismic data from areas of the NWS, and examine possible causes and consequences of repeated inversion of this rift/passive margin region.