



The effect of lithospheric properties on the variation of stretching factor (β) and modes of rifting along the Southern margin of Australia

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Abstract

The Southern margin of Australia is a passive continental margin, formed during the Late Jurassic-Cretaceous rifting phase. This rifted continental margin includes a series of Mesozoic extensional basins from west to east (Denmark, Bremer, Bight, Ceduna, Duntroon, Otway, Bass, Sorell and Gippsland) that overlie pre-existing basement terranes. The development of this passive margin is mainly associated with extensional processes which caused crustal thinning. In this work, we have measured the amount of extension and the stretching factors (Beta factor) across seven transect profiles approximately evenly distributed across the margin. The obtained results show that the amount of extension and the beta factor along the margin vary from west to east. The lowest amount of extension, low beta factors and a very narrow margin are observed in the western part with 80 km of extension. This region is underlain by the old Archean Yilgarn Craton. Another region of low extension and low beta factor is underlain by the Gawler Craton in the centre of the south Australian margin. The largest amount of extension (384 km) and the largest beta factor ($\beta=1.88$) is found in the eastern part of the passive margin in an area underlain by Phanerozoic Tasman units. Our results imply that there is a strong control of the age and properties of the continental lithosphere on the style of rifting along the Australian passive margin. Rifting of old and cold lithosphere results in a narrow passive margin, with the formation of relatively few faults with relatively wide spacing, while rifting of younger, warmer lithosphere leads to wide rifting accommodated by a large number of faults with small spacing.

Keywords: Australian southern margin, rifting, passive margin, extension, crust, beta factor, narrow rift, wide rift, lithosphere properties