

Evolution of the Otway Basin Rift, Australia: -Role and constraints of magmatic activity in continental rifting.

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The Mesozoic and Cainozoic sedimentary basins in southern Australia (including the Great Australian Bight, Duntroon, Otway, Gippsland and Bass Basins), owe their origin and development to successive stages in the evolution of the rifting systems that caused fracture and subsequent separation of Australia from Antarctica. The rifting processes and the nature of related spreading activity may be related to mantle thermal events which occurred since Early Cretaceous time. These events also correlate with major Gondwana magmatic activity, responsible for a wide compositional spectrum of igneous rocks. A major continental rift system over 4000 km long, termed the Australo-Antarctic Rift System, was in effective operation from at least the Middle Jurassic and evolved in three main stages, each marked by a period of basaltic volcanism, until the ultimate separation of Australia and Antarctica and the formation of oceanic crust in the mid-Cretaceous (~95 Ma). Detailed petrological and geochemical investigations, supported by Sr-Nd isotope systematics, characterize the three phases of basaltic volcanics and the Early Cretaceous volcanogenic sediments. These data indicate possible mantle sources during rifting and provide useful correlations with near-coeval, Gondwana-wide events of analogous tectonic significance. Specific constraints are obtained to model the generation of mantle melts related to the proposed three stage evolution.