Sedimentary basins and petroleum systems of the Southern Rift System

J.E. Blevin

Geoscience Australia, Petroleum and Marine Division, GPO Box 378, Canberra, ACT 2601, Australia.

Abstract

The rifted margins of eastern and southern Australia formed during multiple periods of extension associated with the fragmentation and dispersal of Gondwana in the Late Jurassic to Early Eocene (Veevers & Ettreim 1988; Veevers et al. 1991). The sedimentary basins of the Southern Rift System (Stagg et al. 1990) extend from Broken Ridge in the west, to the South Tasman Rise (STR) in the east. Collectively, these depocentres cover an area in excess of 1 million square kilometres (excluding the STR), with the thickest sediments (up to 15 km) occurring in the Ceduna Sub-basin of the Bight Basin. Early phases of the extension during the late Middle Jurassic to Early Cretaceous resulted in the formation of a series of west-northwesterly trending continental rift basins along the southern margin of Australia and a series of north-northwest trending transtensional basins along the western margin of Tasmania. The amount of upper crustal extension varied between basins of the rift system. This phase of upper crustal extension preceded eventual breakup between the Australian and Antarctic plates off the Bight Basin in the latest Santonian to earliest Campanian (Sayers et al. 2001).

The nature of source rocks within the rift basins reflects the eastward propagation of the rift system through time, with largely terrestrial systems dominating in the early rift stages, followed by marine inundation from the Aptian onwards (west of the Otway Basin). In the Otway Basin, the first marine influence is recorded during the early Turonian, while in the Sorell and Bass basins marine conditions prevailed from ?Maastrichtian and Middle Eocene time, respectively. Terrestrial progradational systems in the Late Cretaceous are important in the maturation of potential source rocks in the Bight and Otway basins, while Neogene carbonate-dominated systems are important in the Sorell, Bass and Gippsland basins. Outside of the Gippsland Basin where exploration has reached a mature status, the southern margin basins remain frontier to moderately explored areas, with an overall drilling density (excluding the Gippsland Basin) of approximately one well per 6,000 square kilometres.

Keywords: Australian Southern Margin, Southern Rift System, petroleum systems

Biography

Jane Blevin is a Principal Research Scientist and Project Leader in the Petroleum and Marine Division of Geoscience Australia, where she has been employed since 1990. Jane is past leader of the Southern Australia Regional Project, and is now in charge of the Business Analysis and Resource Assessment Project. She obtained a BS (1981) and MS (1985) in Geology at SFA State University in Texas, and worked in the exploration industry in Houston before coming to Australia in 1985 to undertake PhD studies at James Cook University. Jane's research interests include the application of seismic and sequence stratigraphic concepts to understanding the evolution of basin systems and their resource potential. Jane is a current member and past-president (ACT Branch) of PESA.

References

SAYERS, J., SYMONDS, P.A., DIREEN, N.G. and BERNARDEL, G., 2001. Nature of the continent-ocean transition on the non-volcanic rifted margin of the central Great Australian Bight. *In:* Wilson, R.C.L., Whitmarsh, R.B., Taylor, B., and Froitzheim, N., (Eds), Non-Volcanic Rifting of Continental Margins; A Comparison of Evidence from Land and Sea. Geological Society, London, Special Publication, v. 187, 51–77.

STAGG, H.M.J., COCKSHELL, C.D., WILLCOX, J.B., HILL, A., NEEDHAM, D.J.L., THOMAS, B., O'BRIEN, G.W. and HOUGH, P., 1990. Basins of the Great Australian Bight region, geology and petroleum potential. Bureau of Mineral Resources, Australia, Continental Margins Program Folio 5.

VEEVERS, J.J. and ETTREIM, S.L., 1988. Reconstruction of Australia and Antarctica at breakup (95 ± 5 Ma) from magnetic and seismic data at the continental margin. Australian Journal of Earth Sciences, v. 35, 355–362.

VEEVERS, J.J., POWELL, C.MCA. and ROOTS, S.R., 1991. Review of seafloor spreading around Australia, I. Synthesis of the patterns of spreading. Australian Journal of Earth Sciences, v. 38, 373–389.