

Hydrocarbon migration and mixing in four recently discovered oil fields of the southwestern Eromanga Basin

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Abstract

The Cooper and Eromanga Basin is located in northeastern South Australia and southwestern Queensland. Nine samples from four fields within the SA sector of the Cooper-Eromanga Province along the southwestern Patchawarra Trough (Sellicks and Christies) and western Wooloo Trough (Worrior and Arwon) were analysed. The aromatic source and maturity cross-plot of 1-MP/9-MP *versus* 2-MP/1-MP was used to determine the ratio of mixing between Permian- and Jurassic/Cretaceous-sourced hydrocarbon in oils. These oils from the Patchawarra Formation within the Sellicks Field has ~0.9% Rc and is a Family 2 Permian end-member, which has migrated a *minimum* distance of 23-24 km. This same oil contributes 60-70% of the input to the Birkhead and Hutton reservoirs in the Christies Field. The Jurassic input (~0.6% Rc) came from a Birkhead source located 15-30 km to the east.

The Worrior and Arwon Fields contain mixed oils within Jurassic and Cretaceous reservoirs. Here the Permian input decreases up section (Hutton 70%, Birkhead 65%, McKinlay 60%) with the Permian Toolachee Formation and Jurassic Birkhead Formation being the likely source rocks. The *minimum* migration distance for the oil sourced within the Birkhead Formation is 4-5 km from the west and ~24 km from the east.