



The Unconventional Petroleum Potential of the Officer Basin, Australia

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Abstract:

The Officer Basin is a Neoproterozoic Basin located in Central Australia. This study looks at the unconventional prospectivity of the source rocks in the depocentres of the Officer Basin. The Savory, Gibson, Yowalga, Gibson and Lennis sub-basins are located in the Western Australian section of the Officer Basin. The Birksgate Trough, and the Munyarai, Tallaringa, and Manya Troughs, are located in the South Australian section of the Officer Basin. The Munyarai Trough contains the Observatory Hill Formation, the most prospective source rock in the Officer Basin. In the region of the Marla Overthrust Zone on the northern margin of the Munyarai Trough, the Observatory Hill Formation is the most prospective region for shale gas continuous accumulations. The thrust faulting in the Marla Overthrust Zone, and also in the Yowalga Sub-Basin, in combination with salt diapirism in these zones, poses a risk to the lateral continuity of a continuous accumulation of shale gas in these regions.

The Officer Basin contains pre-Devonian source rocks which are devoid of plant material, containing algal-sourced hydrocarbons. Triaromatic hydrocarbons such as methylphenanthrene can be exploited as a measure of maturity and distribution, and have been used to map the maturity of the source rocks in the basin.

The sampled data available in the underexplored Officer Basin indicates that the basin is a high risk exploration target for continuous gas accumulations. The sampled data indicates that the Officer Basin shale formations do not meet the minimum requirements outlined by the U.S. Geological Survey (USGS) for highly productive shale gas. However due to the limited sampling and exploration undertaken in the Officer Basin, there may exist other regions outside of those sampled that have the characteristics that do meet the USGS minimum requirements for highly productive shale gas systems.

Three key findings of this investigation include:

- The Officer Basin is a very high risk exploration target for shale gas continuous petroleum accumulations, and sampling has not been shown to meet all of the USGS minimum requirements for a highly productive shale gas system.
- The Yowalga Sub-basin and the Marla Overthrust Zone contain thrust faulting and salt piercement structures related to halotectonics, affecting the lateral distribution of any continuous accumulations that may occur in the region.

- The Officer Basin is underexplored, particularly in the Savory, Lennis, Gibson, Waigen and Birksgate Sub-basins, and should not be excluded from potentially hosting formations which may meet the USGS minimum requirements of a shale gas system.

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