Recent developments in Radiometric Technique for Hydrocarbon Exploration: North Perth Basin

*Afif Arbi, Exploration Manager, Raphael Energy Group Limited*
Ronald Klusman, Emeritus Professor, Colorado School of Mines
Mahdi AbuAli, Technical Advisor, Raphael Energy Group Limited

Abstract:

A method for determining the relationship between radiometric measurements and subsurface petroleum accumulations has been established, in which subtle anomalous patterns of radiation flux are observed over subsurface hydrocarbon basins. This method is focused on the use of aerial gamma-ray spectral data in the prospecting for hydrocarbons in stratigraphic and structural traps.

The DRAD formula to process radiometric data is widely used for hydrocarbon exploration. While this technique goes back to the early 1960s, our ARAD process, based on a combination of algorithms, shows materially better results with reductions in false positives and false negatives plus better areal mapping of pressured hydrocarbon reservoirs.
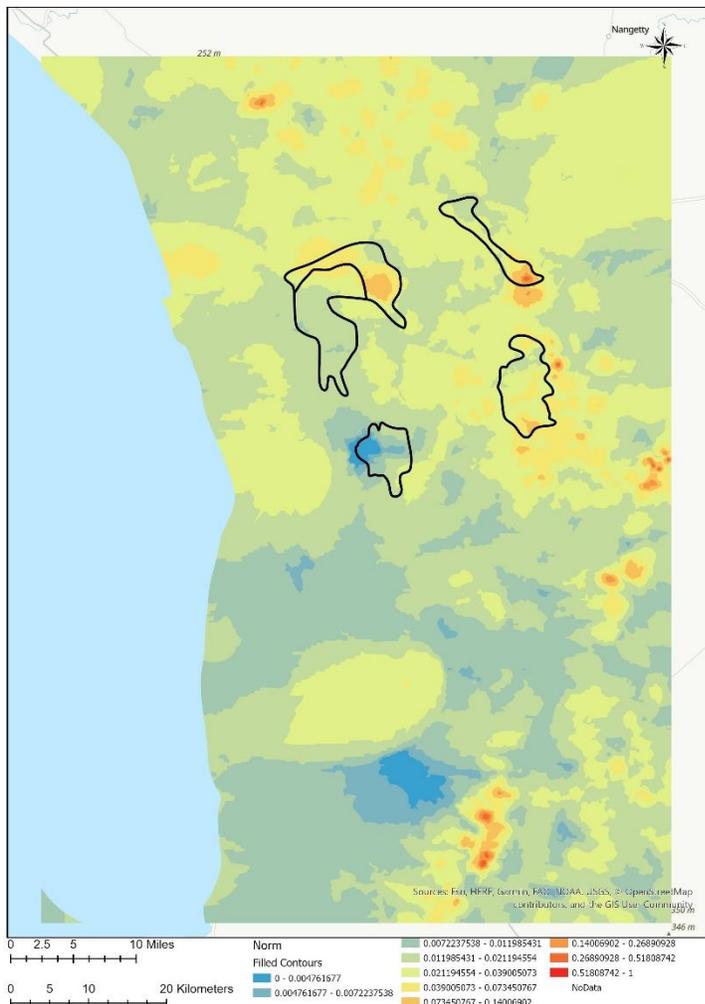
Recent testing of the ARAD mapping yielded a high success rate on drilled commercial prospects of 86%, and if RMSE (Root Mean Square Error)

interpolation is accounted for, the success rate increases to 95%.

In addition, the 2018 ARAD study targeted the 2019 Strike Energy Limited "West Erregulla trifecta" that made discoveries in the Wagina, Kingia and High Cliff sandstones. Strike reported 2C and prospective resource of 1.2 TCF gas for its trifecta of discoveries.

Possibly more significant, Strike, after incorporating post-2018 well results, recently announced a high confidence extension of the Permian reservoir fairway to the south and southeast into an area with limited petrophysical investigation that included three ARADs targeting potential hydrocarbon accumulations. Moreover, Strike's 2020 mapping of the area of the Permian gas fairway encompassed the ARADs mapped in 2018.

In addition, in March 2021, Strike was awarded a license on the southern edge of the Permian gas fairway with a lead they consider has significant potential for stacked reservoirs. The 2018 ARAD study mapped an anomaly within the area of the new license, one of the most intense anomalies in the 2018 study.

With other ARAD anomalies in the area indicating there are potentially material undiscovered hydrocarbon accumulations, we expect the ARAD method presented in this work will be credited with reliably generating highly prospective leads, further demonstrating its material contribution to markedly improving exploration efficiency.

We plan to seek permission of operators to undertake detail studies to mature several of the ARAD leads to prospects prior to drilling by the operator.