

The search for new hydrocarbon resources is becoming increasingly complicated and expensive. Conventional geophysical methods, such as seismic, continue to focus on finding traps in deeper and more complex structures. To save significant amounts of both time and money, hydrocarbon microseepages may dramatically change the way we carry out hydrocarbon exploration by focusing more on searching petroleum deposits and by tracking their near-surface expressions. Hydrocarbon microseepages result in predominantly vertical long-term migration and it can be manifested with a number of near surface alterations such as formation of ferromagnetic minerals and modification of radioactive element concentrations in soil (potassium depletion and increase of the uranium concentration, in relation to the thorium content).

In this study, airborne gamma ray spectrometry and magnetic data have been used in Hassi R'mel region (Algeria) to identify subtle variations in radioactive element concentrations and shallow magnetic anomalies induced by hydrocarbon microseepages. A Bayesian classification algorithm has been applied to characterize the residual magnetic and radiometric anomalies that occur above the known hydrocarbon reservoirs within the study area. Weights of evidence method was used to provide a quantitative measure of the spatial association between these anomalies and the mapped hydrocarbon accumulations. Most hydrocarbon areas were confirmed by the concurrent presence of the characteristic attributes of magnetic and radiometric anomalies, and those occurring outside the known hydrocarbon occurrences may point to yet unproven underlying hydrocarbon accumulations. The wells and drill core data, together with the blind wells available in the study area, validate the final results