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The Use of Fieldwork to Constrain the Petroleum System in Mozambique and Madagascar

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Summary

Mozambique and Madagascar have large hydrocarbon reserves, although in both cases the source of the accumulations is enigmatic. As part of reconnaissance fieldwork undertaken in Mozambique and Madagascar ground surface oil seeps were sampled. The location of the seeps were recorded using a handheld GPS and the data gathered processed and organised in a geodatabase.

The oil seeps were analysed and graphs produced of the oil properties. Such information when integrated with the regional geology helps to reducing exploratory risk in the search for new discoveries

Introduction

In the age of the workstation, traditional fieldwork skills are still proving to be advantageous in frontier areas. Oil seeps in Mozambique have attracted interest as providing evidence of oil generation and a possible source rock age. This paper discusses recent fieldwork undertaken in Madagascar and Mozambique and the seeps visited.

Method and/or Theory

ERCL have carried out a number of reconnaissance field trips in recent years to both Mozambique and Madagascar. Fieldwork tasks have included geological mapping, GPS surveying of well locations and seismic tracks, ground magnetometry, rock sampling for palaeontology, sedimentology and source rock geochemistry and finally seep identification and sampling. Reconnaissance fieldwork locations have included Southern Rovuma, Angoche and Nampula provinces in Mozambique was carried and the Central Morondava and Tsimiroro regions of Madagascar.

Oil seeps were sampled from the Pemba, and Ponte Uifundo areas in the southern Rovuma Basin, Mozambique (Figure 1). Geochemistry data from the seeps indicate that they are from a similar source even though they are geographically positioned approximately 60km apart. Analysis of these seeps suggests a Jurassic, marine, Type II source rock, deposited in a hypersaline environment.

A recent reconnaissance trip carried out to Angoche-Nacala region of Mozambique tried to locate and sample an oil seep reported by BP. Potential sites were investigated and a number of samples were taken from water wells near to the reported location but unfortunately, no evidence of water contamination and no evidence of the oil seep was found.

During fieldwork in Madagascar hydrocarbon seeps were visited at Tsimiroro (Figure 2). These seeps are evidence of a working hydrocarbon system and can be seen to flow during the summer months. Analyses of these seeps indicates a different oil family, thought to be sourced from the Lower Triassic Middle Sakamena. Outcrops of this rock at the edge of the basin have also been sampled but are a non-source facies at outcrop.

All field observations and interpretations were recorded using Geographic Information System (GIS) software on the tablet PC.

Conclusions

Oil seeps indicate not only the presence of source rocks, but also the occurrence of an active petroleum system with thermal maturation and migration of the hydrocarbons. The precise location of seeps adds valuable knowledge of the petroleum system of an area and can be used to refine basin models, reducing exploratory risk in the search for new discoveries

Example 1



The Pemba-Wimbi Beach Oil Seep.

Example 2



An example of a hydrocarbon seep in Madagascar.