# Constraining the Barremian/Aptian Source Rock Facies of the Walvis Basin, Offshore Namibia – Integration of Seismic Inversion and Petroleum Systems Modeling

**Christian Niño-Guiza[1], Martin Zubiri[1], Teresa Martins[1], Bernardo Teixeira[2], João Afonso[1], Miles Legget[1], and Sergio Cersosimo[1]**

[1]Galp Energia
[2]Consultant

## ABSTRACT

The drilling of the Wingat-1 and Murombe-1 wells (2013) offshore Namibia, has confirmed the presence of an oil prone source rock across the Walvis basin. Four oil samples were recovered on MDT from a thin sandstone layer within the source rock interval in the Wingat-1 well, suggesting an active petroleum system in the study area. Analysis of these samples revealed light oil of 41° API and moderate GOR.

Geochemical analysis on both cuttings samples and RSWC show the presence of a good quality source rock interval of Barremian / Aptian age, with over 70 meters of thickness, and TOC values of up to 3.5%. Although present in both wells, source rock quality and maturity show significant variations. TOC content decreases eastwards as source rock thickness becomes thinner. On the other hand, maturity increases to the east due to increased overburden. This defines a narrow corridor along which the Kudu equivalent source rock is predicted to be generating hydrocarbons.

On 3D data, the source rock signature can be clearly traced across the basin. A constrained sparse spike inversion was run and the inverted P-Impedance volume was used as input for generating TOC distribution maps within the survey. Sampled TOC values were plotted against P-Impedance values from wireline logs (Løseth. et al, 2011), to find a relationship between these two properties. The estimated %TOC map gives an indication of the regional variation of the source rock's organic content in the area covered by 3D data. The map reproduces the decrease in %TOC observed between Murombe-1 and Wingat-1 (from distal to more proximal basin positions), but interestingly it also suggests the presence of a wider band of high %TOC values increasing northwards towards the basin depocenter.

The % TOC map was used as an input for the source rock properties in the petroleum systems modeling of the Walvis basin. Different Organic Facies scenarios were considered in the modeling to account for the predicted increase in %TOC toward the north, where higher maturities are also expected.

Results of this workflow were compared with results from traditional modeling using generic assumptions for the source rock interval. The results obtained using the %TOC map from the seismic inversion are quite positive and have a significant impact on the prospectivity of the block and the basin. The workflow allowed identifying basin sweet spots where the risk of encountering a rich and mature source rock expelling hydrocarbon has been significantly reduced.