

# How closed is my unconventional source rock system? A case study from the Neuquén Basin, Argentina

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## Summary

The Vaca Muerta Fm., Neuquén basin, is now a very well known upper Jurassic/Lower Cretaceous source rock, considered as one of the best unconventional play outside the US. Its thickness (up to 300m), its organic richness (TOC consistently above 5 wt%) led to huge amounts of generated hydrocarbons. The Neuquén basin has been producing ‘conventional’ gas in overlying tight reservoirs for decades and although oil was never produced in commercially viable traps, it is fair to believe that some significant amounts of HC were expelled from the Vaca Muerta, as also evidenced by numerous bitumen veins.

This study aims at using mass balance and kinetics to roughly assess the amounts of expelled HC from the Vaca Muerta FM. Possible migration pathways are discussed based on field work and extensive investigations on cores taken at various maturities. For the later we investigated the occurrence of natural fractures and ash beds as possible HC drains in mature source rocks (Figure 1) – where and how it originates and how it is distributed within a basin. Moreover, because horizontal bedded natural fractures are linked to fluid overpressures on the geologic time scale, thus possibly linked to the generation and expulsion of the hydrocarbons. It combines core analyses and field studies with a particular focus on beef veins, which are visible indicators of natural fractures (Figure 2).

These observations coupled with volumetric estimations helped us to propose conceptual ‘reservoir-scale’ models for hydrocarbon expulsion and retention in this particular basin.

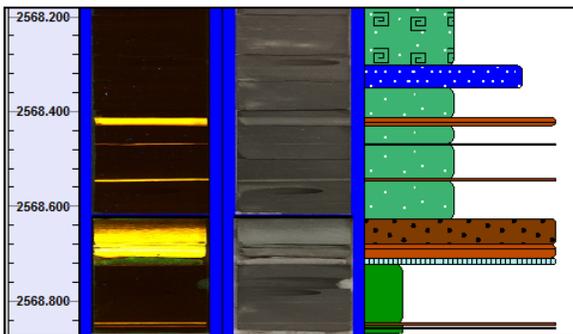


Figure 1- An example of early oil migration (primary migration within the source rock) illustrated by UV fluorescence; the host rock consists of high porosity volcanic ash layers widely distributed within the Vaca Muerta Fm.



Figure 2: Example of depositional sequence of the Vaca Muerta punctuated by numerous calcite veins (B=beefs).