

## Petroleum Systems in the Volga - Ural Basin, Russia

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The Volga-Ural sedimentary basin is the second largest hydrocarbon province in Russia after Western Siberia. The first oil discovery was made in 1929 in a small Permian age reef. The first large field was discovered in 1944 when a wildcat penetrated the giant Devonian reservoir of Tuymazi field. It was followed by the discovery of a supergiant Devonian pool of the Romashkino field in 1948. The province was the largest producing region of the Soviet Union until the late 1970s, when it was surpassed by Western Siberia. Today, it is still the second producing region, accounting for about 22% of Russia's total output and 16% of reserves. The majority of the fields in this region have been depleted by 70%, the output is decreasing and companies constantly need to invest in EOR/IOR techniques and exploration to support the declining production.

It is widely accepted across the industry and academia that all the Volga-Ural accumulations belong to one petroleum system with a single source rock. The single Devonian Domanik source-rock unit is responsible for productivity of the entire sedimentary section and separates the sedimentary section into two petroleum subsystems - one in underlying Devonian clastics and the other in overlying Devonian to Permian clastic and carbonate rocks.

However, in the recent years a number of geochemical studies have been published demonstrating significant variability in petroleum composition across the region. A number of major geochemical types of oils could be distinguished in the basin including the Domanik genetic type, the Devonian terrigenous (sub-Domanik) genetic type, the mixed Domanik-sub-Domanik genetic type and the Proterozoic genetic type, restrictedly distributed in Volga-Ural north-east.

The source rocks for the oils from the Devonian families are marine and contain Type II kerogen with the predominantly marine algae-bacterial organic matter and an insignificant input of the terrigenous organic matter (Figure 1). However, the oils are different in level of thermal maturity and lithology of source rocks (Figure 2).

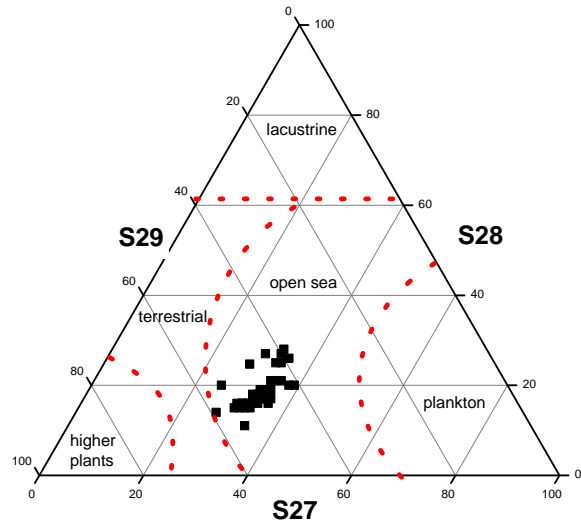


Figure 1. Sterane ternary diagram

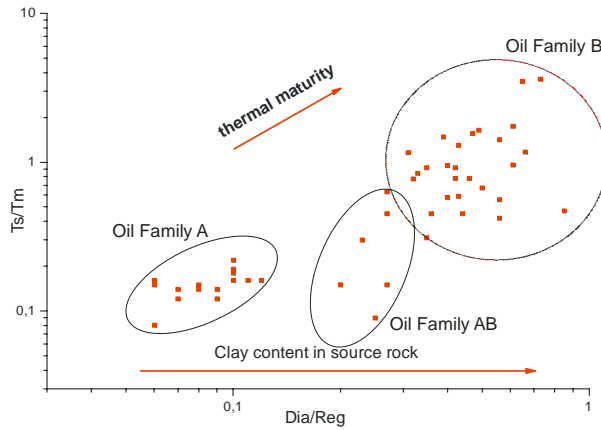


Figure 2. Variations in source rock lithology and maturity

The paper provides an overview of the studies in the regional geological context and data indicating the presence of several source rocks and independent petroleum systems in the Volga-Ural basin.