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Maikopian Group - Source Rock Deposits of Azerbaijan

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SUMMARY

The Oligocene-Miocene Maikop Series as the source rock for much of the petroleum produced from the Caspian region and are made up of dominantly organic-rich claystone in the area of Eastern Azerbaijan, with minor amounts of coarser clastic material. It serves is a regionally continuous, up to 3000 m thick package of largely organic rich, fine-grained clastic sediments.

8 sections in Eastern Azerbaijan were measured, described, and sampled for bulk elemental and stable isotopic geochemistry, and micropaleontology Sections were sampled on a dm to m scale for the purpose of broad spatial and temporal characterization of a large number of localities

Introduction

The Oligocene-Miocene Maikop Group as the source rock for much of the petroleum produced from the Caspian region (Guliyev, Tagiyev et al., 2001) and are made up of dominantly organic-rich claystone in the area of Eastern Azerbaijan, with minor amounts of coarser clastic material (Gubkin, 1916). It serves is a regionally continuous, up to 3000 m thick package of largely organic rich, fine-grained clastic sediments (Inan, Yalcin et al., 1997).

Materials and metod

8 sections in Eastern Azerbaijan were measured, described, and sampled for bulk elemental and stable isotopic geochemistry, and micropaleontology Sections were sampled on a dm to m scale for the purpose of broad spatial and temporal characterization of a large number of localities. (Figure 1).

Figure 1 Research areal.

Geochemistry characterizing Oligocene-Early Miocene

144 samples were analyzed, the majority of which are from the Oligocene - Lower Miocene Maikop Group (Fig.2). Samples were collected from 8 measured sections, with an attempt to represent the variety of strata present and maintain a fairly close spacing of samples. All analyzed for $d^{13}C$ and $d^{15}N$ samples were isotopic ratios, bulk composition, trace metal abundances, and TOC. Selected samples were analyzed using Rock-Eval pyrolysis.

Figure 2 Stratigraphic columns measures the six sampling localities.

TOC values range from 0.3 to 6.3%, with Oligocene-Miocene Maikopian samples showing average values of 1.4%. C-S-Fe associations, along with relatively lower concentrations of redox-sensitive trace elements (V, Ni, Mo, U) indicate dominantly oxic environments of deposition during . A pronounced geochemical shift occurred near the Eocene–Oligocene boundary. These changes suggest that a shift away from unrestricted marine conditions and toward more variable salinity conditions occurred coincident with the initial collision of the Arabian plate and partial closure of the Paratethys ocean.

Rock-Eval pyrolysis samples shows that the majority of strata are organic lean, immature, and mixed oil/gas to gas prone, with a smaller group of latest Eocene-Early Miocene samples having better oil prone source potential. The majority of strata, even within the Oligocene-Miocene Maikopian interval, are not classic Type II oil-prone source rocks. The majority of oil generation appears to come from thin, discrete intervals of good oil-prone source character, while the large remaining volume of organic-lean, Type II/III to Type III source rock facies makes it a potentially significant gas source (Hudson, Johnsons et al., 2008, Vahabov, Johnson et al., 2011).

Discussing

From an economic standpoint, TOC and RE data show the heterogeneity of the Maikop Group as a source rock. The majority of samples appeared to be gas prone based on RE data, with a portion of these samples being lean in organic material. Yet studies show (Abrams and Narimanov, 1997) that a large majority of oils in the region are sourced from the Maikop. It follows, then, that the majority of the oil is being generated in relatively thin, organic-rich intervals with abundant marine material.

Figure 3 Tectonic configuration of the South Caspian basin (SCB) during a) the Eocene, b) Oligocene – Miocene (Maikopian deposition) (on Hudson, Johnson et al., 2008).

Based on the data collected, likely divisions can be seen within the Maikop strata of eastern Azerbaijan. But do these variations reflect global processes or regional, tectonically-influenced events? Comparison with global events in the form of global and Tethyan sequences helps to determine the nature of these variations.

Conclusions

Results from this study Maikop Group into three members based on consistent shifts in trace metal concentrations, nitrogen isotope values, and %Corg. Trace metal and stable isotope analysis are complementary to organic geochemical characterization of this source rock interval (such as HI values) which also suggest the recommended subdivision of Maikopian strata. All of these results give a more detailed insight into depositional conditions affecting preservation of organic material.

Bottom water conditions were suboxic to anoxic throughout the majority of Maikopian deposition, with the basin becoming less anoxic through time according to trace metal abundances. Carbon isotopic ratios suggest that terrestrial input was greatest during the Chattian. It appears that global oceanic events had a large effect on the South Caspian Basin during deposition of the Maikop Group (Figure 3).

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