

## GEOCHEMISTRY AND HYDROCARBON POTENTIAL OF THE MESO-CENOZOIC SEDIMENTS OF THE SOUTH CASPIAN BASIN WESTERN FLANK

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Productive series of Middle Pliocene age is the major regionally persistent reservoir containing above 80% of hydrocarbon (HC) resources in the South Caspian basin. Hydrocarbon potential and thermal conditions of occurrence of the unit, however, are insufficient to form these resources. This fact suggests upward migration of the bulk of oils from underlying deposits.

Geochemical study of HC potential of underlying deposits revealed that the main source providing oil to Productive Series is individual intervals of Oligocene-Miocene deposits. There are no significant differences in gross composition of organic matter (OM) (Fig. 1) occurring in various complexes of these deposits, being composed of marine OM with noticeable terrestrial input. At the same time reservoir capabilities of these strata are limited. In such conditions upon filling available reservoirs in the Oligocene-Miocene, remaining part of oil migrated upward through fault/fracture system into overlying Productive Series containing reservoirs superior both in quality and volume.

Isotopic-geochemical correlation lends support to this conclusion. According to the correlation, clear distinction between OM in Maykop-Chokrak (Oligocene-L.Miocene and lower part of M. Miocene) and that in Diatom Suite (upper part of M. Miocene-U. Miocene) is noted. The former has lighter carbon isotopic composition in comparison with the latter. Isotopically correlating Productive Series oils with the Oligocene-Miocene organic matter (Fig. 2) one can draw a conclusion on participation of Miocene deposits in formation of oil pools in Productive Series. Taking into consideration that oil is normally 0.5-1.5 per mil depleted in  $^{13}\text{C}$  compared to source kerogen (Omokawa, 1985; Peters & Moldowan, 1993) the dominant role of Diatom Suite OM as a source for Productive Series oils is inferred from the displayed diagrams. It should be noted that their contributions change from one part of the basin to another. In most buried portion of the basin share of Diatom Suite becomes greater, whereas share of the Lower Miocene increases in flank zones.

Vertical range of oil travel from source to trap reached as high as about 4 km, essentially facilitated by gas generated at advanced levels of OM catagenesis. Besides, alternating of layers containing Type 2 and Type 3 OM points to simultaneous formation of oil and gas, this is believed to be favorable factor in oil migration. Massive gas generation in deep subsurface is manifested on the earth surface in the form of mud volcanoes releasing huge volumes of HC gas.

High maturity of these gases is confirmed by vitrinite reflectance equivalent calculated on empirically found equation (Faber, 1987) including ethane  $\delta^{13}\text{C}$  as independent variable. According to calculations made for 8 land mud volcanoes  $R_o$  corresponding to the generation depth of these gases varies in the range 1.3-1.8%.

### References

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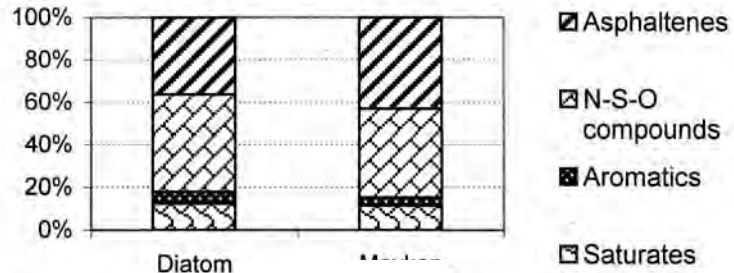


Figure 1

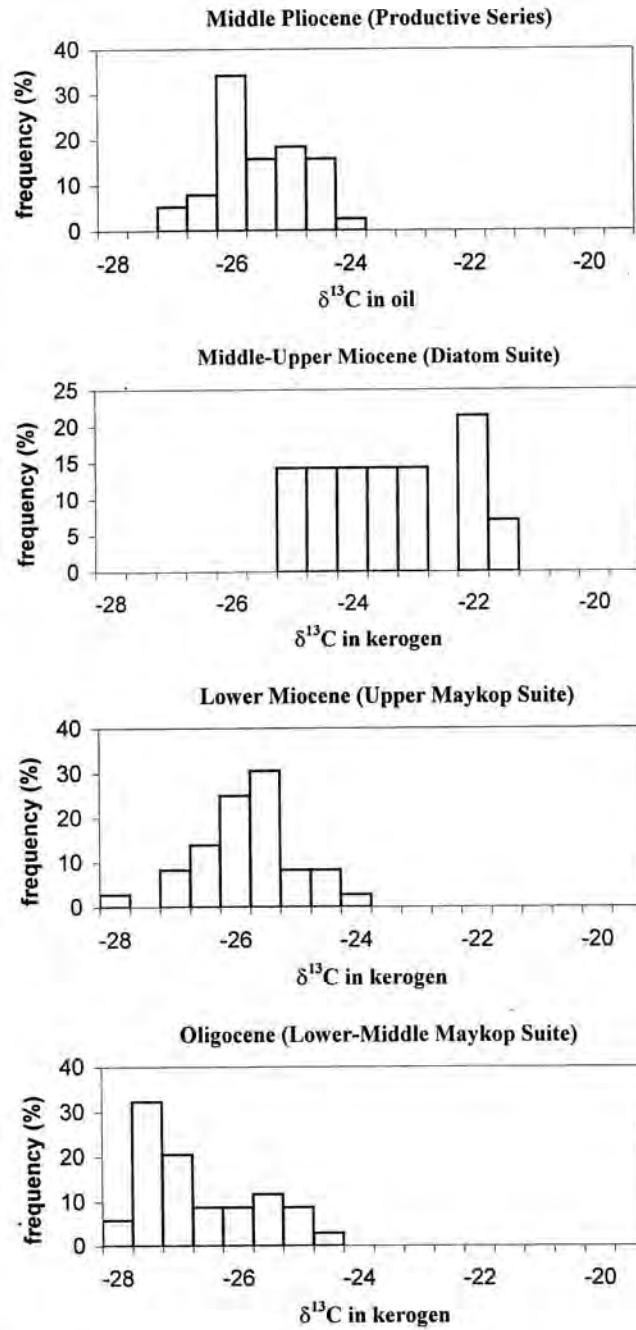


Figure 2