

SIGNIFICANCE OF MICROBIAL PROCESSES IN GASES OF THE SOUTH CASPIAN BASIN

Barry J. Katz¹; Akif Narimanov²; and Rafiqa Huseinzadeh³

¹ *Texaco EPTD, USA*

² *SOCAR, Baku, Azerbaijan*

³ *AZLAB, Baku, Azerbaijan*

The South Caspian basin has been a major petroleum-producing province for more than century. While the basin's oil has been the focus of a number of studies the region's gas has been largely understudied. This study examines 31 gas samples from 14 fields with the primary purposes of determining their mode(s) of formation and role that microbial activity has had in their alteration.

The basin's natural gas accumulations display significant differences in both molecular and isotopic composition. Gas wetness ranges from less than 1% at Apsheron to greater than 12% at Guneshli. Methane carbon isotopic composition ranges from -57 to -37‰ . The stable carbon isotopic composition of the wet gas (C_{2+}) components also displays a very broad range (e.g., C_2 ranges from -37 to -20‰ ; C_3 ranges from -31 to -10‰ ; and nC_4 ranges from -30 to 11‰). No strong depth-related trends were observed in any of the geochemical attributes. The absence of a trend implies that the gases have not been generated *in situ* but have migrated vertically. Mixing is also suggested by the differences in the calculated thermal maturity levels between the C_{2+} components and methane. In some accumulations (e.g., Karabagly) as much as 55% of the methane may have a biogenic origin. These data also indicate that among the gas samples studied those from Bakhar appear to be the most mature, with thermal maturity values consistent with the "condensate-window".

In several fields, including Guneshli and Neftchala, the wet gas components display evidence for microbial alteration. This is largely manifested in anomalously heavy isotopic compositions of propane, *n*-butane, and *n*-pentane.

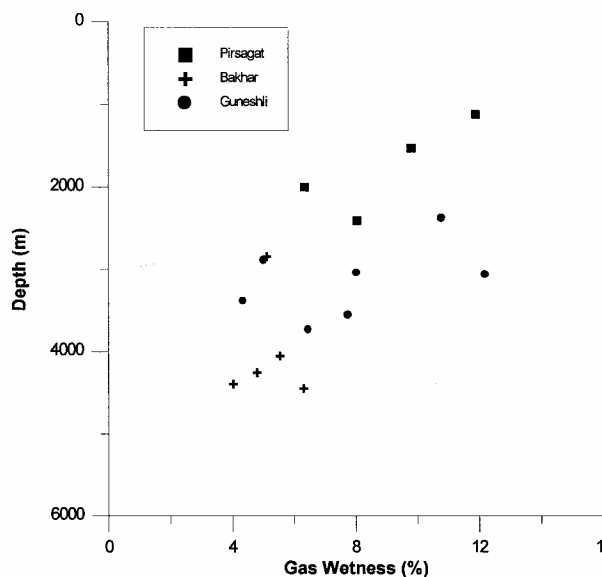


Figure 1. Relationship between reservoir depth and gas wetness in Pirsagat, Bakhar, and Guneshli fields.

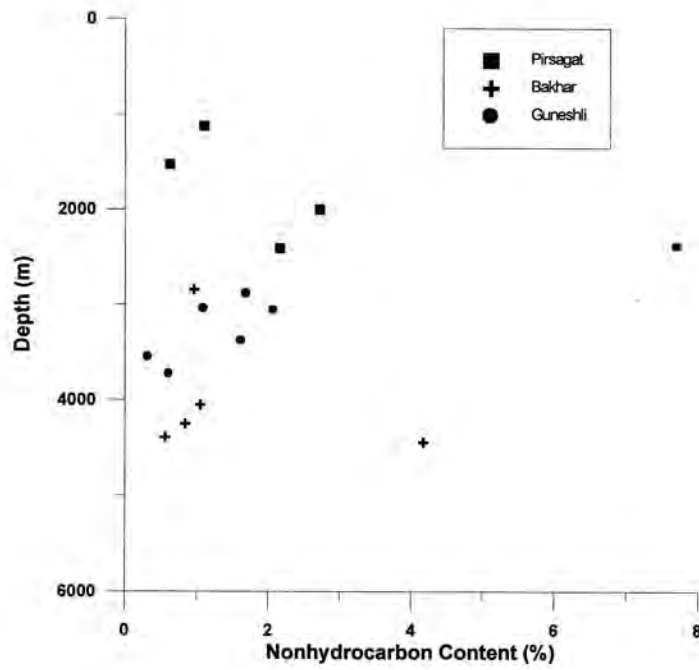


Figure 2. Relationship between reservoir depth and nonhydrocarbon content in Pirsagat, Bakhar, and Guneshli fields.

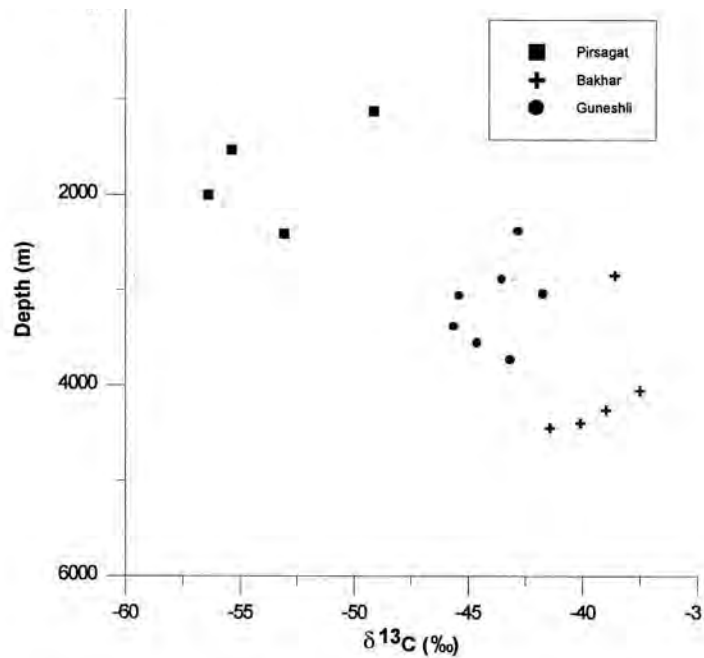


Figure 3. Relationship between reservoir depth and methane stable carbon isotope composition in Pirsagat, Bakhar, and Guneshli fields.

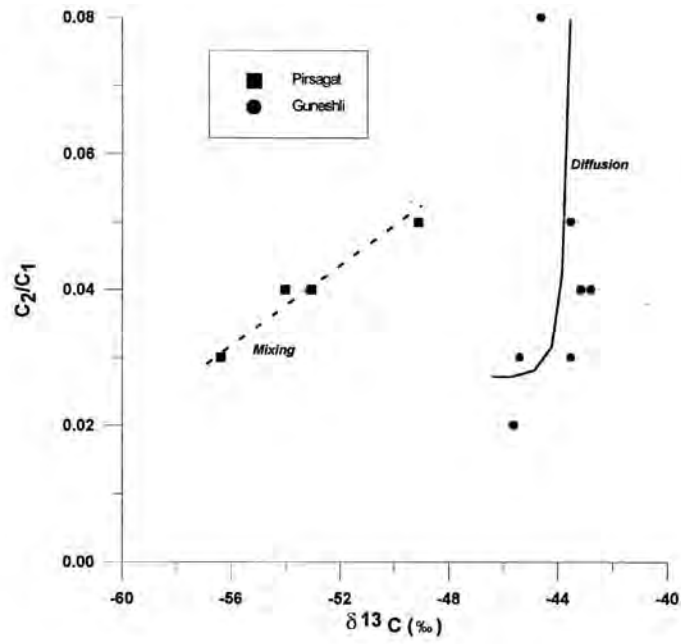


Figure 4. The relationship between the C_1/C_2 ratio and methane stable carbon isotope composition.