P123-TU

SOURCES OF HYDROCARBON GASES IN MUD VOLCANOES FROM THE SOROKIN TROUGH, NE BLACK SEA, BASED ON MOLECULAR AND CARBON ISOTOPE COMPOSITIONS

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Hydrocarbon gas (methane through pentanes) from mud breccias and associated gas hydrates collected from five mud volcanoes (MVs) in the Sorokin Trough (NE Black Sea) have been studied to reveal their sources and to identify the post-depositional processes affecting their molecular and stable carbon isotope properties. The data obtained show that hydrocarbon gases from all studied mud volcanoes and gas hydrates can be defined as the result of oil cracking and/or biodegradation in the deep subsurface. The "dry" characteristics of the hydrocarbon gases and the compositional variations in C_{2+} appear to result partially from (i) a chemical and isotopic fractionation during fluid leakage from redeposited accumulations during shallow migration; (ii) "secondary microbial gas" resulted from oil biodegradation; (iii) a combination of both.

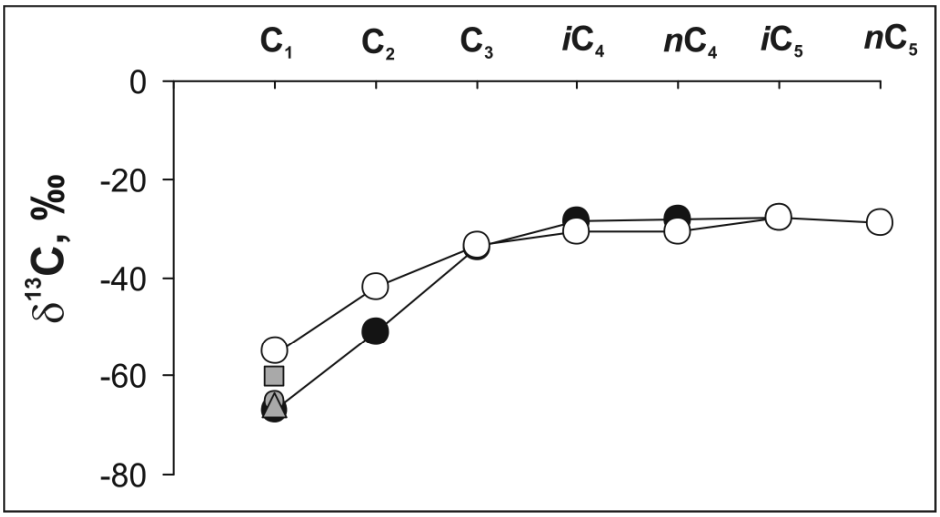

Figure 1. Isotope type curve for a gas hydrate sample (black circles) and average $\delta^{13}C$ values of methane through pentanes hydrocarbon gases from one of the studied mud volcanoes (white circles). Grey geometrical figures are $\delta^{13}C$ values of methane from other gas hydrate samples collected from the studied mud volcanoes.

Despite the first evidence for different maturity properties, the wet gas components in all mud volcanoes and gas hydrates are related to each other (Figure 1). Gases from mud volcanoes associated with up-doming diapiric structures, possess a mixture of mature and probably secondary microbial methanes with wet gases from the same sources. Analysis of the hydrocarbon gas data was complemented with maturity characteristics of organic matter from the rock clast related to the Maycopian Shale Formation (Oligocene-Early Miocene) and with lipid biomarker studies from mud breccia matrixes from the same mud volcanoes. The obtained results imply that the original source of gases is derived from the deep subsurface, perhaps from the lower part of the Maycopian Shales or more probably below this sedimentary unit.