AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

K.K. (Adry) Bissada[1], Angel Callejon[1], Noel Holguin Quiñones[2], Ernesto Caballero Garcia[3], Hilario Ramos Gallardo[4] (1) University of Houston, Houston, TX (2) PEMEX Exploracion, Mexico City, Mexico (3) PEMEX Exploracion, Villahermosa, Mexico (4) PEMEX Exploracion, Reynosa, Mexico

Biogenic Methane in the Gulf of Mexico Basin - Significant Resource or Secondary Contaminant

A comparative analysis of the molecular and isotopic characteristics of hundreds of natural gases from numerous fields offshore Texas and Louisiana, the Macuspana Basin, and the Burgos Basin, Gulf of Mexico, was undertaken to identify regularities in their distribution and to understand their mode of origin. Two main groups of gases were observed: dry gas with less than 1% C_2+, and wet gas with about 10% C_2+. Carbon isotopic composition of methane distinguished the two groups into a biogenic end member ($\delta^{13}C_1$: -68‰ and lighter) and a thermogenic end member ($\delta^{13}C_1$: -38‰ and heavier), with many having intermediate compositions between these.

Thermal maturity of the source rocks generating the wet gases was inferred from the relationship of $\delta^{13}C_2$ vs. $\delta^{13}C_3$ and, independently, from $\delta^{13}C_1$. In those cases where the inferred maturities derived from the three data sets were consistent, the gas accumulations were classified as purely thermogenic. In cases where the maturities inferred from the $\delta^{13}C_1$ were significantly lower than those inferred from the $\delta^{13}C_2$ vs. $\delta^{13}C_3$ relationship, the occurrences were interpreted in terms of variable contributions of thermogenic gas into the biogenic methane accumulations.

Significant accumulations of purely biogenic gas do exist across the entire Gulf of Mexico Basin. However, mixed biogenic/thermogenic accumulations are prevalent, with appreciable geographic and vertical variability in mixing ratios. In multipay fields, gases of thermal origin occur generally in the lower reservoirs, whereas significant accumulations of primarily biogenic gas are restricted to the shallowest reservoirs. System plumbing appears to be the controlling factor for the mixing process.