

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

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Biodegradation vs. Thermal Maturity in Type IIS Crude Oils of Northern Cuba

A series of crude oils and associated gases in Cuban carbonate sediments have been recently sampled and analyzed in the objective of understanding the petroleum system. A correlation of source rocks and crude oils between Upper Jurassic and Lower Cretaceous sediments and offshore DSDP cores samples originating from the same sedimentary units was attempted. Possible secondary alterations such as biodegradation were investigated (ranking and quantification) in view of the high viscosity, low API gravity (10-25), the metal content and high sulfur percentages in the oils. Results show that they are not affected by biodegradation as was previously thought and reported. The odd GC traces, showing unusual peaks with low n-alkanes content can be interpreted as alkylated thiophenes from an precocious generation of hydrocarbons characteristic of Type IIS organic matter. On the other hand neighboring wells with producing oils drilled in Serpentinite and Siliclastic formations are very much affected by biodegradation. Gases are wet (C_1/C_2-C_5 ratio) except for two, and contain H_2S and CO_2 . Methane does not appear to be biogenic, and carbon isotopic data point to thermogenic produced gas with minor biodegradation affecting the nC_3 and nC_4 isotopes. The Cretaceous and Jurassic reservoirs are believed to be acting as source rock & reservoirs explaining the short migration distances. A positive correlation was possible with a DSDP-535 upper Cretaceous core on one level. This could mean an extension of the organic-rich sediments that generate hydrocarbons in the onshore northern Cuba area and which at present are of low maturity level.