Improved sampling technique to measure noble gas and hydrocarbon composition of gas hydrate reservoirs in Green Canyon, Block GC955, Gulf of Mexico

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Gas hydrates in the Gulf of Mexico (GoM) are now recognized as a potentially large natural gas reservoir of important economic and scientific interest. Yet, there is still great uncertainity within the gas hydrate community regarding the genetic source(s) of hydrocarbons (e.g., biogenic, thermogenic, mixed), the location of hydrocarbon generation, the rates of clathrate formation/dissociation, and the residence times of natural gas found in hydrate systems from the GoM. Despite recent studies that integrate hydrocarbon molecular, stable isotope, and noble gas tracers to address these questions in other petroleum systems, there there have been few attempts to evaluate this suite of tracers in gas hydrates, specifically in the GoM.

Previous studies in this region have used hydrocarbon molecular (C_1/C_{2+}) and stable isotopic composition ($\delta^{13}C$, δ^2H) of methane to determine proportions of biogenic and thermogenic gases along with noble gas goechemical compositions and reflect complex mixtures from both sources. Here, we collected two pressurized core samples and performed a quantitative degassing technique to understand how the above geochemical parameters change with sequential dissociation of GoM hydrates. Preliminary work suggests hydrocarbons are dominated by biogenic methane with quantifiable contributions from thermogneic natural gas. Similar to prevoius data from gas hydrates, we observed significant enrichments of He, Ne, and Xe relative to atmospehric values. We also attempted to determine the residence time of fluids (porewaters and natural gases) using radiogenic ^4He ingrowth techniques in two slices of pressurized cores collected as part of the University of Texas led UT-GoM2-01 drilling project. Intial ages estimates are on the timescale of ~110,000 years. Pressurized cores were extracted from coarse silt/sand reservoirs ~2,440 m below the sea surface within the GC955 block of the Green Canyon protraction area at the edge of the Sigsbee escarpment.