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Rapid Hydrocarbon Venting From A Seafloor-Piercing Mud Diapir on SS 286, Gulf of Mexico Continental Shelf

A mud diapir pierces the seafloor on Ship Shoal (SS) Block 286 located at the northern Gulf of Mexico continental shelf ~80 km south of Louisiana coast at water depth ~60-75 m. A comprehensive multidisciplinary study of this feature implies that hydrocarbons rapidly vent from diapir sediments, escape to the atmosphere, and may contribute to global warming. Side-scan sonar images and echo-sounder profiles show the wide distribution of expulsion features (pockmarks) around the base and on the seafloor mound itself. One anomalous reflection in the water column is observed and is likely to represent gas bubbles venting from the mound sediments. A natural oil slick was observed at the sea surface above the mud mound. Concentrations of the C_1-C_{6+} hydrocarbons and crude oil from the SS 286 mud diapir sediments are the highest reported in surficial sediments of the GOM continental shelf. The occurrence of abundant C_{2+} hydrocarbons, chromatographic signatures of C_{15+} saturated hydrocarbons, and CPI, Pr/Phy, Pr/n-C_{17}, and Pr/n-C_{18} ratios suggest that the effects of biodegradation are not significant. Hydrocarbons rapidly vent from the subsurface petroleum system such that bacterial oxidation cannot keep pace. Only a small fraction of hydrocarbons reside in seep sediments, and most hydrocarbons bypass the sediment. Thermogenic methane, which is the main gas venting from the diapiric mound sediments, may be an important greenhouse gas with a large global warming potential. Given wide distribution of hydrocarbon seeps in the GOM, it may be prudent to include venting thermogenic gases in models of global change.