Gas Hydrate Deposits In A Complex Geologic Province (GOM): Linkage To Fluid-Gas Expulsion

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The northern Gulf of Mexico continental slope is now covered with overlapping tracks of high quality 3D-seismic data. Analysis of these data by industry, government (MMS), and academic geoscientists underscores the extreme geologic complexity imposed on this province by the interaction of sediments and salt. In this framework, faults concentrated along intraslope basin margins function as conducts for the migration of fluids and gases to the modern seafloor from deep petroleum-generating horizons. Within the gas hydrate stability zone, this vertical flux produces gas hydrate composed largely of thermogenic gases (structure II). Flux rate is linked to hydrate formation in that rapid fluid systems may transfer heat which eliminates the gas hydrate stability zone. In contrast, moderate-to-slow flux results in massive gas hydrate deposits that fill veins and fractions within faulted zones. These faults frequently extend to the seafloor where gas hydrate mounds occur in a spectrum of sizes. Observable gas seeps and larger gas plumes representing the composite effect of many small seeps occur over areas where hydrates are exposed. Such plumes suggest that fault-supplied gas is consistently bypassing the surface and near-surface gas hydrate deposits and entering the water column. This process provides a constant supply of gas for hydrate formation. Results of field experiments show that slight changes in water temperature can cause surface exposures of hydrate to decompose. A constant fault-related supply of subsurface water and gas causes surficial hydrate deposits to regenerate after a thermal decomposition event.