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Environmental Significance of Gas and Oil Seeps, Gulf of Mexico Continental Slope

Natural hydrocarbon seeps and vents are abundant across the geologically dynamic Gulf of Mexico slope, and define broad areas with subsurface discoveries, because both are products of the same prolific subsurface petroleum system. High flux seeps of gas and oil are focused by geologic structure on the rims of intrasalt basins because salt and faults provide major conduits to the sea floor from depth where Mesozoic (mainly Upper Jurassic) source rocks are thermally mature. Some seeps and vents correlate directly to individual subsurface reservoirs on the basis of molecular and isotopic properties of hydrocarbons. However, trapping efficiency is often poor, leading to enormous loss of gas and oil at large numbers of seeps in sediment of the sea floor. Manifestations of inefficient trapping also include extremely high-flux vents that transfer gas and oil to the water column and the global atmosphere. Seeps and vents led to the evolution of unique chemosynthetic communities in which bacterial hydrocarbon oxidation and sulfate reduction perturb the carbon cycle, sequestering large volumes of carbon as authigenic carbonate rock. Stable gas hydrate vein-fillings near sea floor vents dwarf conventional subsurface reserves in volume, and sequester additional carbon, representing a viable future resource because of structural focusing. The Gulf is an important case history of a basin where natural seepage and venting of hydrocarbons may far exceed the environmental significance of exploitation and transportation of conventional subsurface hydrocarbon reserves.