
Geologic Hazards Associated with Exploration in Deep Water and around Salt Structures in the Gulf of Mexico

John R. Dribus

Schlumberger, 126 Century Oaks Ln., Mandeville, Louisiana 70471

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ABSTRACT

With the recent leasing activity in the deepwater offshore Mexico, it is expected that prospects will be generated in areas where massive oil slicks and sea bottom oil seeps have been detected. The presence of these hydrocarbons at the sea floor and in the water column of the Gulf of Mexico testify that leakage features are occurring at the sea floor, and that hydrocarbons have moved through the sea-floor surface and to the open ocean. This presentation reviews the various geohazards associated with these out-of-place hydrocarbons and their leakage features, and with hazards associated with subsurface salt bodies. The talk begins with an examination of the geologic origin of various hazards in deep water by reviewing the geologic creation, characteristics, and behaviors of two deep water hazard types including (1) sea-floor hazards such as pockmarks, mud volcanoes, and mass sediment movement including slides, slumps, and debris flows; and (2) subsurface geologic hazards including shallow-water flows, reactivated faults, gas chimneys, gas hydrates, and lateral pressure transfer effect. Then the talk addresses various potential drilling hazards that may be encountered when drilling massive salt and layered evaporates. These challenges may occur when drilling into the top of an allochthonous salt canopy (cap rock issues), through massive salt and layered evaporite complexes (including sediment inclusions, salt-to-salt sutures, and mobile layered evaporates), and emerging from salt or evaporate complexes (including rubble zones, feeders, and mobile bitumen).