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Salt Morphology and Hydrocarbon Trapping at Eugene Island 188 Field: Detailed Salt Surface Mapping Yields New Opportunities in an Old Field

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Increased reserves, attic wells, a substantial increase in production rates and more efficient field depletion have resulted from detailed mapping of an irregular, rugose salt surface at Eugene Island 188 Field. Forty salt penetrations (of 175 total wells and sidetracks), time and depth migrated versions of a 3–D seismic survey, salt proximity surveys, gravity data, and 3–D visualization were used in the study.

The EI 188 dome is part of a counter–regional fault/salt withdrawal basin complex which began forming in the Miocene. A series of sub–regional interval isopachs used to reconstruct the mini–basin evolution indicate that basin shape changed through time. Dome growth, continuous since the middle Miocene, reached a maximum growth rate during the Late Miocene.

The gross salt morphology is a north dipping tear-drop shape from a depth of about 25,000 feet to 700 feet from the sea floor. The salt body is severely overhung to the south and east with salt noses extending out to the northeast and west. The noses, which become more extensive with depth, are related to the counter–regional fault system (and associated antithetic fault system) along which the dome appears to have grown. Tangential faults cut into, offset, and extend out from the salt creating a very irregular, rugose surface. Radial faults are not present. Numerous sills and salt intrusions, defined and mapped by closely tying the well and seismic data, were probably formed as extensive salt flows on or near the sea floor and were later covered by sediments.

Hydrocarbons are found in 60 hydropressured deltaic sands ranging in depth from 5,000 to 16,000 feet and in age from Late Miocene to Pliocene. Trap types are nearly all related to closure against salt, whether it is closure within concave recesses in the salt, beneath salt sills, or between faults and the salt. Vertical segregation of hydrocarbons is present, shallow sands tend to be oil–bearing and deeper sands gas–bearing. Areal segregation of hydrocarbons is also evident. Within a given sand the structurally lower western flank of the dome tends to be wet, the northern flank oil–bearing and the structurally higher eastern flank, gas–bearing even though faults separate the sand into numerous reservoirs.

Biographical Sketch – Erik Mason

Erik Mason is a geologist in the Production Department, Shelf Division, at Shell Offshore Inc. He received his Bachelor and Master degrees in Geology from Principia College and Oklahoma State University, respectively. He then spent five years with Phillips Petroleum where he worked in both production (Gulf Coast and offshore Gulf of Mexico) and International Exploration (Indo–Pakistan). Since coming to Shell in 1988, he has focused on large, fully integrated field studies (incorporating seismic, well, and production data) at Eugene Island 188, South Pass 62, and South Timbalier 295 Fields, as well as primary development of Eugene Island Block 30 Field. He is a member of NOGS and HGS, and an active member of AAPG and the AAPG Development Geology Committee.