

Experimental Simulation of Migration Along Unconformity: A Case Study of the “S” Shape Reservoir-controlling System from the Northern Part of Dongying Depression of China

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Physical experimental simulation is a very important way to study oil and gas migration and accumulation, especially in stratigraphic and lithologic reservoirs exploration. Based on analyzing the “S” shape reservoir-controlling system in the northern part of Dongying depression of China, the experiment was designed to simulate the double channel structure of unconformity and investigate how hydrocarbon to migrate and accumulate along unconformity. The experiment showed that basal conglomerate bed above the unconformity and semi-weathering eluvial horizon below the unconformity were two kinds of efficient carrier beds. Hydrocarbons migrated more efficient within the semi-weathering eluvial horizon than in the basal conglomerate. The “S” shape paleo-relief controlled the occurrence of stratigraphic traps. The gradient of unconformity determined oil and gas migrating ability and the favorable accumulating locations. When the landform slope was relatively steep, the scarcity of weathering clay layer led to lack of seals between the double channels, so oil and gas could migrate across the two layers, and formed stratigraphic or stratigraphic-lithologic accumulation on the top of unconformity. Moreover, the experimental results also demonstrated that hydrocarbon migration behaved nonhomogeneity and jumping characteristics, which were closely related to the change of driving force and resistance of migration.