SIMULATING THE UNDISCOVERED PETROLEUM POOL SPATIAL DISTRIBUTION

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Pool location, geological properties, and history information, parameterized as a set of marked-points, are the input data for a recently proposed pool-based simulation of the undiscovered petroleum resource spatial distribution. A distribution function is specified for the pool combination that comprises the marked-points associated with all the pools in a play. Pool combination numerical models are generated using a Hastings independence chain algorithm. Since petroleum pools are frequently very small compared to the available play area, much uncertainty exists in each simulated pool combination model. As a result, an individual pool combination numerical model is an inadequate representation of the spatial distribution of undiscovered pools. Accordingly, the simulated results are represented as a petroleum-bearing probability map calculated statistically from a large number of pool combination numerical models. An approach to predicting the locations and volumes of undiscovered pools, based on the pool combinations generated by the model, shall be discussed. Pool net-pay probability maps can be calculated from pool combination numerical models, while petroleum resource distribution may be calculated by combining the petroleum-bearing probability map, the pool net-pay probability map, and an independent estimate of the total undiscovered resource. An entropy criterion is then employed to select the optimum undiscovered pool locations and volumes using a random sampling technique that considers the petroleum resource distribution map.