

## **APPLICATION OF BAYESIAN ANALYSIS IN PETROLEUM SYSTEM UNCERTAINTY-ASSESSMENT**

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The uncertainty-assessment of geological factors in petroleum exploration assumes a critical importance when investment decision-making is necessary. With the purpose of minimizing the geological uncertainties, an automated methodology based on bayesian updating is presented. The analysis of petroleum system-oriented databases is considered, in order to quantify success probabilities for new fields existence. Probability distributions are derived from logical operations among diagnostic criteria of petroleum systems and producing/dry areas. Causative mechanisms required to control the petroleum system processes are considered, integrating qualitative and quantitative approaches. The proposed methodology implies exploration modeling and statistical analysis of post-mortem data, with the evaluation including the manipulation of geographically referenced variables. The analysis uses the idea of prior and posterior probability, comparing the differences in probability density functions of producing and dry areas. The previous probabilities of the essential elements are categorized in control-areas to calculate the necessity and sufficiency conditions of each exploration guide, resulting in posterior probabilities. The discussed techniques were applied to a synthetic database, which characteristics simulate a rift basin evolving to a passive margin basin. The hypothetical model comprises oil generation in rift source-rocks, vertical migration and accumulation in rollovers of post-rift listric faults, associated with halokinetics. To a first approximation, favorable area selection shows that bayesian analysis is a sensitive technique to represent reliability of diagnostic criteria and uncertainties about occurrences of new fields.