

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

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Principles of Reservoir Characterization and Geostatistical modeling; Applications for Early and Late Stage Field Development

Reservoir characterization technology has dramatically changed over the last decade. The application of 3D seismic interpretation and sequence stratigraphic principles, coupled with geostatistical modeling has not only improved strategies for development of mature fields, but also for field development during the early stages where limited data are available. Both situations require different workflows, particularly when implementing geostatistical methodologies. Characterizing mature reservoirs generally requires the use of larger data sets (more wells and production data) and capturing more subtle observations resulting from a long history of analysis and production. In such cases, geostatistical methods can be used to accurately capture the observed complexity (heterogeneity) and provide appropriate upscaled models to be used in flow simulation. During early development stages, it is necessary to rely more heavily on remote data such as seismic, which generally supplies accurate information regarding horizontal continuity, but lacks critical vertical information. Under these conditions, geostatistical methods can be used to integrate data whose volume support are inherently different, and predict vertical detail throughout the reservoir. Both cases represent different levels of uncertainty that may be measured using stochastic principles and allow for more accurate development strategies. This presentation describes the basic workflows for each case and how geostatistical techniques are integrated into the reservoir modeling process.