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MULTIPLE-POINT GEOSTATISTICS: INTEGRATING GEOLOGICAL AND SEISMIC DATA IN THE DEEPWATER ENVIRONMENT

The largest impact in reservoir uncertainty modeling and data integration in deepwater reservoirs occurs at the appraisal and pre-development stage. The sheer cost of developing in deepwater environments forces a thorough understanding of geological complexity, important factors affecting uncertainty on OOIP and information provided by seismic. In this paper we present an entirely new approach to modeling such reservoirs for the purpose of reserves assessment and for assessing flow performance. Multiple-point geostatistics is presented as a robust and flexible method for integrating fine-scale complex geological features/structures with coarser resolution seismic data. Multiple-point (mp) geostatistics goes beyond the traditional variogram-based geostatistics, which is known to produce over-simplistic reservoir models. mp-Geostatistics relies on the concept of a training volume/image. These analogs contains important geological features, such as facies bodies and associations, know to exist in the subsurface. The training volumes may be derived from outcrops and generated with a Boolean technique. However, the training volumes need not be constrained to the seismic or well data, it is merely conceptual. A practical, cell-based algorithm is presented borrowing structure from the training image and generates geological realistic reservoirs constrained by actual well and seismic data. Using Monte-Carlo simulation various uncertainty aspects can be evaluated on both reserves estimates and flow performance. The paper presents an approach for handling key uncertainty questions, such as net-to-gross uncertainty quantification. Using mp-Geostatistics one can investigate the impact of geological model uncertainty and seismic data interpretation/calibration on calculating risk associated with development in the deepwater environment.