Abstract

Building geologically realistic reservoir models that honor well data and seismic-derived information remains a major challenge for Geostatisticians. Conventional variogram-based modelling techniques typically fail to capture complex geological structures while object-based techniques are severely limited by the amount of conditioning data. This talk presents new reservoir facies modelling tools developed at ChevronTexaco in collaboration with Stanford University that improve both model quality and efficiency relative to traditional geostatistical techniques.

Multiple-Point Statistics (MPS) simulation is an innovative depositional facies modelling technique that uses conceptual geological models as training images to integrate geological information into reservoir models. Replacing the variogram with a training image allows MPS to capture complex spatial relationships between multiple facies, and model non-linear shapes such as sinuous channels. In addition, because MPS is not an object-based, but still a pixel-based algorithm, it can account for very large numbers of wells, seismic data, facies proportion maps and curves, variable azimuth maps, and interpreted geobodies, reducing dramatically uncertainty in facies spatial distribution.

Facies Distribution Modeling (FDM) is a new technique to generate facies probability cubes from user-digitized facies depocenter maps and cross-sections, well data, and vertical proportion curves. Facies probability cubes generated by FDM are used as soft constraints in geostatistical modelling. They are critical, especially in sparse well environments, to ensure that the spatial distribution of the simulated facies is consistent with the depositional facies interpretation of the field.

A workflow combining MPS and FDM has been successfully used for the last two years to model prominent ChevronTexaco assets in both shallow and deep-water environments. In this talk, the reasons for this success are discussed, and future developments are proposed.