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Title **Geologically Oriented Geostatistics: an Integrated Tool for Reservoir Studies**
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Preview
Abstract

Geostatistics has entered a new age. Until few years ago, geostatistics could still be considered a leading-edge technology, developed and applied by a handful of specialists. Today, geostatistics is routinely applied to most of the reservoir characterization projects worldwide, providing the 'quantitative geology' support needed in the reservoir simulation phase.

This paper describes how a geostatistical model can be built by integrating all the information generated in the individual disciplines, namely Geophysics, Petrophysics, Sedimentology, Stratigraphy and basic Reservoir Engineering. This approach guarantees the internal consistency of the reservoir study and provides a robust model to be upscaled in the forward simulation phase. The information contained in the 3D geological model can also be averaged and exported to a conventional mapping algorithm, thus providing a consistent set of traditional 2D maps of reservoir properties (Net to Gross, net sand, porosity, permeability).

A case study is presented, relevant to a Venezuelan oil and gas condensate field. The geostatistical model uses almost 400 wells and includes a stratigraphic section almost 3000 feet thick, with 60 productive sands and about 500 reservoirs. In this field, where a conventional map-based approach would have been a long and cumbersome job, the complete geostatistical model has been built and input to the simulator in less than 6 months. In such a context, geostatistics represented a fast and efficient tool for the integrated study.

Introduction

Reservoir geologists became familiar with geostatistics starting at the end of the eighties, when several key papers1,2,3,4 demonstrated the potential of this technique when applied to petroleum reservoirs. However, for some years, geostatistics remained a sophisticated technology, accessible only to specialists. The theoretical development was driven by the quest for new algorithms, while less importance was given to the integration of the method within the routine work process of reservoir studies.

In recent years, however, it became evident to most geoscientists that geostatistics, or stochastic modeling, not only could provide better distributions of the geological parameters, but also has a tremendous potential for integrating data coming from different sources5. In particular, general geological knowledge (lithological and depositional models), geophysics and structural geology, petrophysics and basic reservoir engineering can provide useful inputs to the geostatistical model, which in turn become the real heart of the modeling process.

The possibility of integrating data coming from different sources and relevant to different support volume (scale), makes stochastic modeling the most powerful technique currently available for reservoir characterization. When such integration is achieved, we could talk about geologically oriented geostatistics.

This paper discusses the practical issues related to the use of geologically oriented geostatistics for geological modeling, as well as the results that have been obtained in the integrated study of the Zapatos-Mata R field (Eastern province, Venezuela).