

Using Plurigaussian Geostatistics and Depositional Analogues to Constrain Depositional Geometries and Spatial Evolution

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Plurigaussian geostatistical simulation (PGS) for modelling complex facies relationships accounts for vertical proportions, the vertical and lateral evolution of facies, and facies with differing anisotropies. The method can be used to explore data prior to modelling, and/or in conjunction with field analogue or a priori models.

Two western Canadian examples, one clastic and one carbonate are used to illustrate this technique. In the clastic example a generalised depositional model was developed from a study of 135m of core in 18 wells. A highly heterogeneous facies fabric was observed and interpreted to reflect deposition in an estuarine-fluviatile setting. A simple four-fold indicator scheme was derived from petro-facies, based on core observations and a modern analogue from the U.S. Oregon coast.

In the carbonate example, regional core studies and detailed information from 25 cored wells generated a model of a carbonate ramp succession, deposited in an arid climatic setting. Fifteen individual facies types were described and the tidal flats of the Trucial Coast were used as a modern analogue. The sequence was interpreted to have prograded basinward as a series of high order cycles, however no accurate visual depiction of this existed. Subjective 2D palaeogeographic maps indicated the areal position of the individual cycles. The facies scheme was simplified to 6 "indicator" facies.

In both cases the PGS results concurred with the basic depositional model. However, the PGS results provided insight into depositional geometries and improved understanding of the spatial evolution of the depositional system, which differed significantly from the a priori model.