Geostatistical Approaches for Quantifying Facies Relationships
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Much progress has been made in the recent years in the geostatistical modelling of clastic reservoirs. The progress has not been as significant for reservoirs with less well-defined geometries, such as aeolian, shoreface or carbonate deposits. The goal of this paper is to discuss the most-promising geostatistical methods for quantifying geology - and in particular facies transitions - in these kinds of environments.

Transiograms quantify the probability of finding a given facies at a distance h from another measured facies. Transiograms are much more intuitive than variograms to the geologist and they also provide more flexibility for representing specific geological patterns such as assymetrical facies transitions (ie transition from A to B has a different probability from that from B to A). This cannot be done with the indicator variogram. Carle and Fogg, 2006 provide convincing applications using “Markovian” transiograms, which are internally consistent and are rather simple to model. However the use of Markovian transiograms is quite restrictive for many geological situations.

Indicator Variograms are used in Sequential Indicator Simulations (SIS) or Pluri-Gaussian Simulations (PGS) (Armstrong et al, 2011). SIS usually treats indicator variograms independently from each other, which results in an unrealistic independence between the occurrence of different facies. PGS has been specifically designed to account for facies transitions, and is currently experiencing renewed interest from the industry. PGS appears quite complementary to the transiogram-based approach.

It is stressed that, far from being a statistical black-box, geostatistics should be used as an interpretation technique, for which the best quantification tool to use must be derived from geological considerations.

Biography

Olivier was seconded by Total to Imperial College in November 2014. Before this he managed the Total Geosciences Research Centre (Aberdeen, UK) and the Total Research Centre – Qatar (Doha, Qatar). He was also VP of Total Geosciences Training and Technical Image in Pau (France) just before joining Imperial College.