

# Multiple-Point Statistics (MPS)/Facies Distribution Modeling (FDM) of Carbonates – an Isolated Platform Example

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We have explored the use of MPS/FDM modeling in a carbonate reservoir. We have modeled the platform top of an isolated platform example and tested various scenarios for the distribution of grainstone facies. The training image is a 3-D conceptual model of the reservoir, containing information about facies dimensions and relationships among facies. Five facies were considered: Bar crest = best reservoir quality due to sorting in “highest energy” setting; Bar flank = good reservoir quality between bar crests, includes flanks of bars and intervening tidal channels; Island = localized areas where permeability is enhanced by dissolution during meteoric diagenesis; Deeper platform = poorer reservoir quality in platform areas away from bars and channels; and Background = “tight” intervals due to muddier facies or to porosity-plugging cementation.

The facies probability cube allows controlling the spatial distribution of the facies in the MPS model. First, facies depocenter maps were generated for deeper platform, bar flank, bar crest and island. Then, the stratigraphy of the reservoir was modeled by digitizing a vertical proportion curve reflecting the variations of facies proportions with depth. Three alternative vertical proportion curves were created, representing respectively a gradual trend, cyclicity at the scale of composite sequences, and high cyclicity at the scale of individual sequences. Corresponding alternative facies probability cubes were generated for these three cases.

Several scenarios were run: the gradual, cyclic and highly cyclic cases; both narrow and wide bar crests and bar flanks; and with constant and variable azimuth. The wide bar crest/bar flank and very cyclic simulation produce results that qualitatively appear most reasonable in both cross section and map views. Flow simulation of the various models highlights their significant differences.