

Stochastic Simulation of Vuggy Porous Media in the KT Boundary Carbonate Breccia from the Campeche Sound

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A stochastic procedure based on sequential indicator kriging and gaussian simulation is used to describe and reproduce a equivalent vuggy porous media using porosity data of the KT boundary calcareous breccia that correspond to the most important producing interval of the offshore fields in the Campeche Sound, SE Mexico.

A close association between observed scales from computed tomography and resistivity well log images is shown. Although vugs size is scale dependent, it is clear that vugs density, as captured from computed tomography images, is consistent with univariate and bivariate statistics derived from well log images. Furthermore, vugs connectivity is also established by applying indicator variables and changing the threshold from computed tomography and resistivity well log images.

In that context, vugs spatial distribution can be modeled by variograms derived from exhaustive computed tomography and resistivity well log information. The geometry of the porous media were simulated by sequential indicator algorithm and complemented by adding the corresponding petrophysical properties associated to each category by means of non conditional gaussian simulation. The methodology proposed were used to generate virtual cores and virtual blocks of rock in which the secondary porosity of touching-vugs is observed.

The simulated porous media can be modified under control in theirs matrix-vugs proportion and in their connectivity scheme. The last issue gives us the possibility to investigate the media behavior experimentally for different physical processes and scenarios. An identified application is the fluid flow analysis, which could give the possibility to investigate the effective permeability phenomena on porous media with the same characteristic of the simulated media.
