The Application of Oil Reservoir Geostatistical Techniques for Aquifer Property Determination -An Example Workflow

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Abstract

We have established an effective workflow to characterize a Paleocene-Eocene carbonate aquifer using a geostatistical method. The geostatistical method employed has long been an established practice for describing oil and gas reservoirs. Groundwater modelers typically use quicker, simpler processes such as kriging mainly due to the non-availability of detailed geophysical data. Such data are routinely collected in the Oil and Gas industry.We compare wireline log data with existing estimates of hydraulic conductivity derived from aquifer pump tests and find geophysical properties (deep induction resistivity and porosity) with usable correlations with these estimates. Collocated co-simulation allows us to supplement the primary data (pump tests) with these secondary variables. Sequential Gaussian simulation was used to generate the spatial variation in hydraulic parameters used in the numerical model.Testing of the model shows that this workflow successfully reduced the scaled root mean squared error on the calibration points. It produces a depiction of anisotropy in hydraulic properties that is a better representation than the one produced by pump test data alone. We have found that the complete procedure can be a worthwhile addition to standard model building practice when permitted by the availability of suitable data.