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Geologic Model for the Giant Hugoton and Panoma Fields.

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The Hugoton and Panoma Fields, North America's largest, produce from thirteen fourth-order marine-nonmarine sequences of the Wolfcampian Chase and Council Grove groups, respectively. The degree of heterogeneity, large volume to be modeled, and an immense data set made developing a geologic model by conventional methods impractical. Geostatistical methods (artificial intelligence and modern modeling software) and automation facilitated building a finely detailed 3D cellular geomodel using a four step workflow: 1) define lithofacies in cores and correlate lithofacies to electric log curves (training set), 2) train a neural network to predict lithofacies, 3) predict lithofacies at non-cored wells with trained neural network, and 4) predict lithofacies between wells using stochastic methods to populate a three dimensional cellular model. A fifth step is to populate the cellular model with lithofacies associated petrophysical properties and fluid saturations for volumetric analysis and numerical simulation.

The lithofacies spectrum was split into eight marine and two nonmarine lithofacies primarily based on texture and grain or pore size. Marine carbonates and sandstones are the principal reservoir facies in both the Chase (Hugoton) and Council Grove (Panoma). Two lithofacies unique to the Chase, dolomitized coarse-grained grainstones and fine-grained marginal marine sandstones, are the dominant storage and flow lithofacies in the Chase. Grainstones, packstones, wackstones and fine-crystalline dolomites are the dominant reservoir lithofacies in the Council Grove and contribute significantly in the Chase as well. Other marine lithofacies, siltstones and mudstones, and nonmarine lithofacies, coarse siltstones and shaly siltstones, provide some storage especially when high in the gas column.