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Three-Dimensional Conditional Gaussian Simulation of Oligocene Deltaic Lacustrine Facies in the Ebro Basin (Northeast Spain)

A three-dimensional conditional gaussian simulation has been performed on the values of the sand/shale ratio (s/sh) of a volume of the distal fluvial-lacustrine oligocene sequences (Ebro Basin, NE Spain). Dimensions of the simulated volume are 300 x 170 x 20 m. Calculation of the spatial structure of the s/sh field involved the following steps:1 Choice of an outcrop that allowed for measuring of profiles and cross-sections at different angles with respect of the paleocurrents. 2 Assignation of s/sh values to the defined facies. 3 Derivation of a continuous estimate of the s/sh field by averaging the s/sh values on regular grids for each of the cross sections. The dimensions of the grid cells are 2 x 2 m..4 Adjustment of directional semivariograms for both vertical and horizontal directions for each cross section. From these semivariograms, an estimate of the three-dimensional anisotropy on the spatial structure of the s/sh field has been obtained. Several simulations have been performed, conditioned to subsets of the original data. The structural analysis indicates that the minimum anysotropy axis corresponds to the mean paleocurrent direction, whereas the maximum anysotropy axis is perpendicular to the stratification, and the mean anysotropy axis is perpendicular to the mean paleocurrent along the dip surfaces. From the five realizations carried out on the basis of the available data it can be concluded that conditional simulations that "realistic" realizations can be obtained with less than 1% of conditioning data.