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Spatial and Temporal Distribution of Facies in Process-based Stochastic Fluvial Reservoir Modeling

Due to its own nature, fluvial sedimentation is highly heterogeneous, making the estimation of the distribution of facies and the choice of model difficult. While fully stochastic models only try to reproduce a given heterogeneity of facies, lacking realism and genetic consistency, fully process-based models often lack flexibility. Here, we combine both approaches to model meandering channelized reservoirs, allowing the generation of several equiprobable and genetically consistent realizations. To keep the approach operational, the model depends only on a limited number of key parameters, and these must be inferred from available information, such as vertical proportion curves (VPC) of facies (derived from wells or seismic data). Consequently, our first concern is the influence of the model parameters on the spatial and temporal distribution of facies, in order to choose conversely the parameters that reproduce given VPC. For instance, quick channel migration or varying accommodation space are linked with the global VPC computed at the whole field. At smaller scales (e.g. VPC computed from well data), local VPC are clearly influenced by the successive locations and morphologies of the channel belt, and can be used to constrain the location of deposits. The advantage of our approach is to model not only this variability but also to link it with sedimentary processes and then provide a better geological knowledge of the oil reservoir.

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