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Outcrop Modeling Using a 3-D Conceptual Approach: Applications to Deep-Water Reservoir Uncertainty Studies

Outcrop information and interpretations can be used as templates for creating 3-D conceptual reservoir characterizations that try to predict ranges in possible reservoir behavior. We use the available outcrop information as a guide, not attempting to capture all the geologic details, and add 3-D heterogeneities that we believe may be of importance for flow simulation or seismic studies.

An example of this process is applied to the Eocene Ainsa II Channel Complex of Spain. Eleven models were built to characterize the Ainsa II Channel Complex.

Origins of volumetric uncertainty in deep-water reservoir developments up to several hundred percent are discussed using the Ainsa II outcrop models as examples. Aspects of volumetric uncertainty and their ranges are channel fill net to gross, water saturation, porosity, and channel geometry. Origins of uncertainty in recovery efficiency for deep-water reservoir developments are also discussed for the Ainsa II outcrop models. Key features we recognize that influence reservoir recovery efficiency are variance in permeability distributions, continuity of intra-channel mudstone layers, and presence or absence of mudstone drapes that were deposited on channel walls. Presence or absence of continuous impermeable mud drapes on channel walls can affect recovery efficiency by 100%, but are poorly characterized in nature. Reservoir connectivity, number of geobodies and degree of heterogeneity measured in terms of Differential Path Length are compared with, and partially predict, waterflood simulation results.