Recent Advancement in Stratigraphic Forward Modeling Workflow for Reservoir Prediction

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With the rapid growth of computer based geologic modelling and computing power in recent years, the capability to perform stratigraphic forward modeling has been steadily growing. Stratigraphic forward modeling is a quantitative computational technique to simulate the processes involved in transportation, erosion and deposition of sediments, resulting in geological formations and their sequences. This forward modeling technique mainly focuses on sedimentary processes, but it may incorporate other aspects such as syn-depositional tectonics and chemical processes like meteoric diagenesis. It is based on the numerical simulation of physical processes: sedimentary transport by rivers, turbidity currents, waves and wave induced currents and provides a quantitative basis for concepts of evolution of sedimentary system through geologic time.

The sedimentary controls typically include paleogeography and paleoclimate processes such as sea-level change, shelf slope, sediment provenance, supply and type. The results do not automatically adjust to present observations such as seismic data and well profiles, so input parameters must be calibrated by comparing the results with observed data. The results are usually 3D models of geologic formations and sequences such as reservoir describing the sequence stratigraphic architecture and lithology.

This iterative process can lead to several plausible models that are consistent with the original sedimentary processes. These models may be used for a variety of purposes, for example in basin analysis or analog facies architecture for reservoir models. The set of results can be used to evaluate the uncertainty of sedimentological and paleoenvironmental factors which is not covered by traditional geostatistical and other approaches.

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