Using sedimentary process models to assist reservoir facies modeling

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We investigate how synthetic deposits generated by process-based models can be utilized in classical facies modeling workflows. The synthetic deposits were converted into training images for the Multipoint facies simulation algorithm (MPS). We enhanced the MPS algorithm to accept multiple training images, and use different process models to represent some of the variability one can expect in natural systems. Synthetic deposits are numerical analogues of geological deposits, generated by solving physical equations for sediment transport and fluid motion. We work in a shallow marine depositional setting, where a feeder channel delivers sediment to a basin with limited marine reworking under constant sea level. This leads to the development of prograding deltas with various geometries depending on input variables such as sediment properties, basin slope and hydrodynamics. We established a workflow to transfer the modelled data into the reservoir modeling framework, where we can extract information relevant for facies models, such as different facies elements and their patterns, which are of key relevance for creating training images.

The synthetic delta models contain a lot of relevant information on a readily accessible format, such as fluid velocities, sorting, grain size distribution and depositional history. However, the facies classifications based on these parameters is not trivial, as there are many possible definitions. We present a facies classification approach that gave a useful facies definition which we were able to model with MPS.