
SBEDStudio™ - An integrated workflow solution for multi-scale geomodeling

SBEDStudio is an integrated software solution for multi-scale reservoir heterogeneity modeling in reservoir characterization. We use a process-oriented approach to model geological processes that result in reservoir heterogeneity at three scales: bedding structure scale (mm to cm), internal stratification scale (~ 1 m), and reservoir architecture scale (> 1 m). Reservoir heterogeneity at these three scales must be modeled in an integrated manner in order to improve the prediction of production profiles.

SBEDStudio simulates reservoir stratigraphic grids at sub-seismic scales, based on different geological scenarios defined by the user. Reservoir property grids, such as porosity and permeability, are simulated by conditioning on facies and trends related to simulated stratigraphic surfaces. Since the effects of geological processes are explicitly included in the heterogeneity models as both stratigraphic and property grids, SBEDStudio provides much more realistic heterogeneity models for reservoir simulation.

At the bedding structure scales we have developed a suite of templates for all major bedding structures, such as different cross beds, flaser, wavy, lenticular, HCS, parallel and bioturbation. The bedding surface grids are simulated by model bedform migration, deposition and erosion processes.

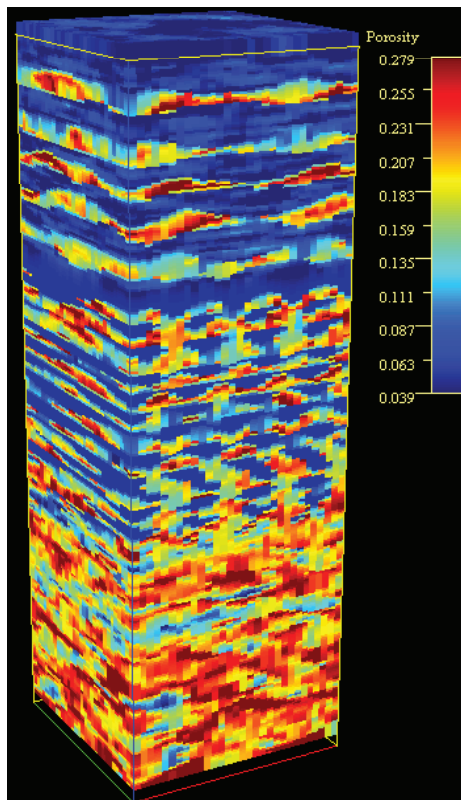
Depending on depositional environments, SBEDStudio models the internal stratification based on different genetic processes. For example, the lateral accretion surfaces are simulated by migration and truncation of channel surfaces. The internal sur-

faces within deposition lobes are simulated by considering progradation, retrogradation, and stacking.

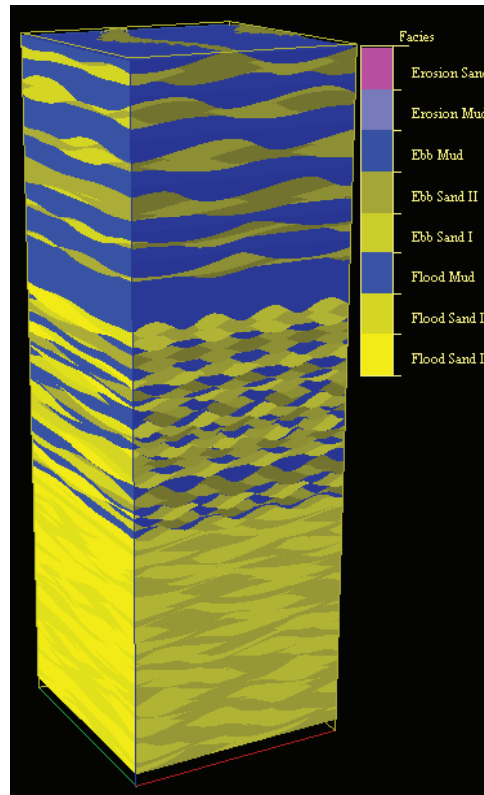
At the reservoir architecture scale, SBEDStudio includes channelized turbidite, channel infill, channel levee and channel-lobe modules. Boundary surfaces at the architecture scale are also simulated by migrating and truncating deposition surfaces through geological time. The internal stratigraphic surfaces can be simulated at the same time, depending on selection of simulation parameters.

The fluid flow effect of reservoir heterogeneity at the above three scales are linked through a built-in upscaling module inside SBEDStudio. The effect of centimeter scale heterogeneity observed at core plug scale can be efficiently and effectively carried to the full field scale through the SBEDStudio upscaling module. The built-in link with 3DSL reservoir simulation program in SBEDStudio which allows user to quickly evaluate the impact of geological heterogeneity at different scales to reservoir recovery processes and identify geological scenarios for detailed analysis.

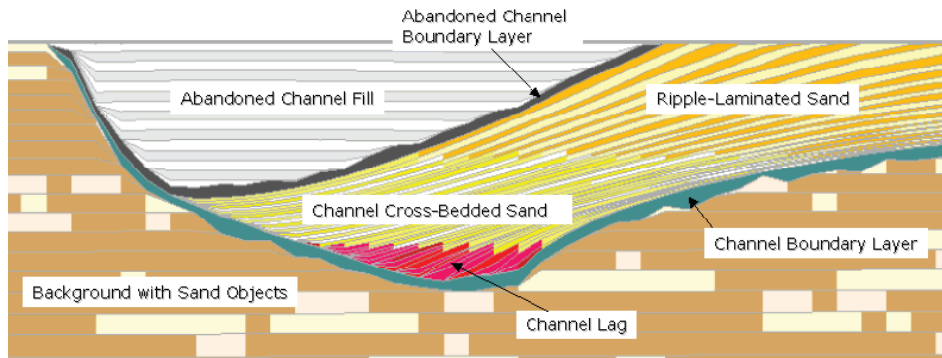
In the simulated study we have observed a large impact (up to 50%) in the estimated recovery factor for channelized reservoirs by including multi-scale reservoir heterogeneity, compared with conventional heterogeneity models that are more statistically driven. The major reason for the big difference is due to the fact that SBEDStudio has modeled sub-seismic boundary surfaces which can be important permeability barriers.



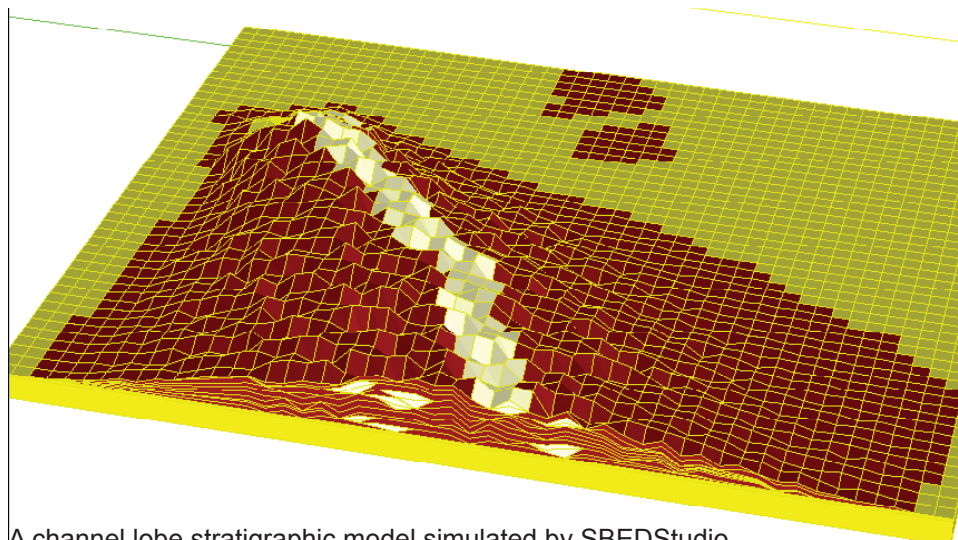
Porosity Model



Bedding Structure Model



A cross section illustrating the internal stratification in a channel infill SBED model



A channel lobe stratigraphic model simulated by SBEDStudio.