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Stratigraphic Modeling : a New Tool to Construct 3D Geological Models for Basin Modeling Purposes

The construction of detailed gridded geological models is a prerequisite for the modeling of hydrocarbon generation and migration in 3 dimensions. Each cell of the geological model have to be informed in terms of lithology, porosity and permeability, and for source rocks, TOC content. These geological models must be enough accurate to realistically restore the main pathflow geometry at the basin scale. Stratigraphic modeling is a new efficient approach to construct such geological models, upstream to basin modeling. The model is based on the simulation of simplified sedimentary processes. The facies architecture of sedimentary systems is then simulated through time, taking into account parameters such as eustasy, sediment supply, carbonate production and subsidence rate variations. The output of the stratigraphic modeling is a 3D gridded model which can be directly exported into basin modelers after upscaling or not. We will present in this paper some applications of the Dionisos stratigraphic modeling package to basin modeling both in silici-clastic and carbonate depositional settings. Fluvial and deltaic sedimentation is realistically simulated using a modified diffusion equation. Deep sea fan architecture can also be simulated with a gravity flow energy equation. Carbonate production estimation takes into account water depth, wave energy, etc.. An advection term also makes possible the simulation of fine-grained sediment decantation. In each case, a forward modeling is first performed, then, the simulations are fitted to well and seismic data through a semi-automatic inversion loop. The model also helps the geologists to test and validate different geological interpretations. Stratigraphic model will then become a very important step in the basin evaluation procedure.