Geovariances
Where no one has gone before

FLUMY,

Reservoir geological model for meandering channelized systems

It can be tricky to correctly perform flow simulation or history matching if the geological model does not assess correctly the continuity and heterogeneity of reservoir geological bodies.

Standard facies models fail to reproduce the depositional heterogeneity which is the result of the sand-body continuity and interconnectedness at a large scale combined with the permeability trends and grain size distribution at a smaller scale within the sand body.

Isatis, with **FLUMY**, overcomes this issue and offers the state of the art in **channel modeling driven by geological concepts**. The strength of the algorithm relies on the combination of stochastic and process-based approaches. **FLUMY** considers the specific channel depositional processes and enables the **building of various sedimentological architectures in fluvial or turbiditic environments**. It involves a reduced number of geological parameters derived from logs and *a priori* knowledge of the depositional environment, which makes it easy to implement.

No other methods than **FLUMY** has gone so far in facies modeling and offers such a meaningful input for optimum oil recovery, water supply or CO2 storage.

A one-of-a-kind model

FLUMY aims at simulating the **geometry of heterogeneous reservoirs in meandering channelized systems**.

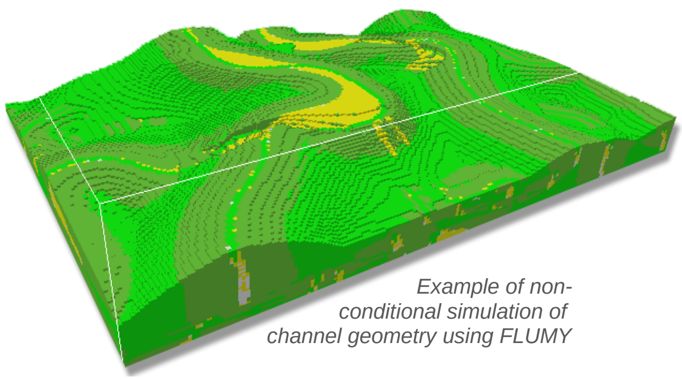
The model is based on the **evolution in time of the channel** by migration, cut-off and avulsion, and on the **deposition of sedimentary bodies** such as sandy point bars, mudplug, crevasse splays, overbank alluvium and organic matter.

The building of the model is based upon:

(1) Channel migration with deposition of sediment bodies: point bars in the inner part of the meander loops, sand and mud plugs in the oxbow lakes,

(2) Aggradation of the system caused by overbank floods with construction of levees and deposition of shales vanishing further away in the floodplain,

(3) Levee breaches resulting in new channel paths (avulsions).



Example of non-conditional simulation of channel geometry using FLUMY

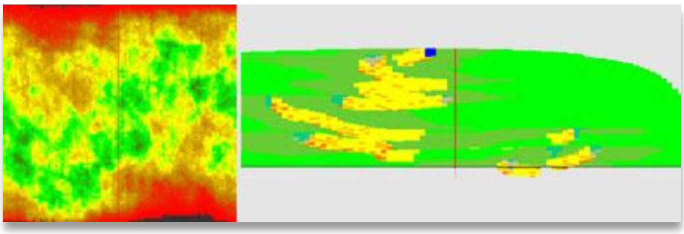
The result consists in a **detailed three-dimensional geomodel** informed with **deposit lithotype**, **age** and **grain size**. 3D lithotype proportion models may also be computed.

The high quality of the model makes it a sound input for fluid flow simulations. It also constitutes an excellent base from where to extract training images or virtual wells to be used in other modeling techniques.

This model complements **Isatis** Multiple-point Statistics (MPS) and Plurigaussian Simulations (PGS) already used to model complex geology geometries. It enriches the **exclusive range of reliable facies modeling techniques** the software already offers (including object based simulations like Boolean, Dead Leaves Dilution techniques, variogram-based simulations like SIS, TGS, PGS or training image-based simulations like the Annealing Simulations and MPS).

Fully capture the inner reservoir geometry

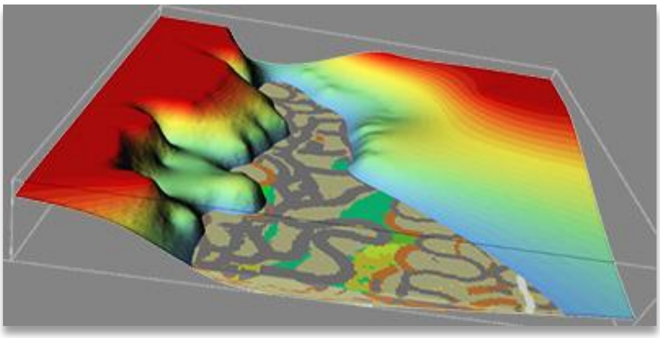
- Because FLUMY combines **process-based and stochastic approaches**, modeled sediment bodies are geologically realistic, their shapes and sizes are directly related to some 'real' parameters such as channel width, channel depth, and avulsion frequency.
- A **stochastic algorithm** allows simulating chute cutoff, channel migration (possibly driven by the erodibility characteristics of the surrounding deposits), levee breaching, avulsions and associated deposits (of wetland type for fluvial deposits and of pelagic type for turbiditic deposits).
- A **conditioning process** constrains the simulations to match the observed reservoir data (well and auxiliary data). Local conditions of deposition are reproduced at each iteration so that the process preferentially puts down what is expected at data locations.



Simulation of sand bodies conditioned to seismic time (courtesy Mines ParisTech Geosciences Group)

Easily model complex geological structures

- FLUMY generates many kinds of **fluvial or turbiditic deposit elements** including point bars, crevasse splays, overbank alluvium, sand and mud plugs as well as organic-rich deposits in low areas.
- FLUMY makes use of a **small number of key parameters** that represent the major effects of the processes involved at the scale considered. That makes the **test of different hypotheses** on architecture easy just by varying some parameters.



Turbiditic simulation - In this example, the erodibility is maximum in the central axis of the channel. This allows to constrain the migration and development of the turbiditic system inside the canyon's topography.

Get a reliable input for optimum reservoir flow prediction

- **FLUMY** is developed by **Mines ParisTech Geosciences Group** and benefits from a decade of research in meandering channelized system modeling. Using the model, you apply a methodology which has proven its performances on reservoirs from companies sponsoring the research project.
- FLUMY implements **physical equations derived from hydraulic studies** which have proven to generate realistic two-dimensional shapes.
- FLUMY enables the **quality control of the model in real time**. Isatis 3D Viewer lets you see the model being built and updated as the process goes on.
- FLUMY is stochastic parameter-based. It provides you with a set of possible geological models that can be used for a **sound risk analysis**.

Advantages

- State of the art in facies modelling
- Model consistent with the geological structures and the physical processes
- Model conditioned to well and seismic data
- Sensitivity tests made possible based on simulation statistical analysis
- Non-expert user mode provided for facilitated parameter setting
- Fully integrated in Isatis

Benefits

- Realistic model responding like the oilfield
- Realistic production estimation based on more realistic reservoir volumes
- Sound input to flow tests
- Produces reliable training image for other modelling techniques