OF-Mod - Organic Facies Modelling

A basin modelling tool for source rock prediction

- Improved input for HC migration modelling
- Predictive studies in exploration frontier areas
- Alternative source-rock models

A source rock is the basis of every petroleum system and the first prerequisite for a hydrocarbon accumulation to occur. Variations in source-rock thickness and quality are decisive for the hydrocarbon phase, volume and oil quality, but still belong to the least well known variables in petroleum systems modelling.

The organic facies/source-rock modelling software OF-Mod simulates source rock type and quality variations in basin kitchen areas during basin modelling studies. OF-Mod mimics the development and variations of organic facies along 2D basin transects, maps or in 3D grids. All main factors and their complex interactions controlling the deposition of organic carbon are considered. This makes OF-Mod to a valuable tool that enables a quantitative analysis and improves the understanding of a source rock in a given basin.

Process-based modelling of organic sedimentation

\[
CO_2 + H_2O \rightarrow CH_4 + O_2
\]

primary productivity \( PP \) (g C·m\(^{-2}\)·a\(^{-1}\))

TOM = terrestrial organic matter
MOC = marine organic carbon
OMZ = oxygen minimum zone
PF = preservation factor
ABW = anoxic bottom water
BFM = basin fill model

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OF-Mod: Input data

- Geometric surfaces for top and bottom of the modelling interval
- Palaeowater depth reconstructions
- Sea level information
- Information from calibration well(s):
  - Datings or sedimentation rates
  - Sand/shale ratio
  - Bulk density of sediment fractions
  - Total organic carbon content (TOC)
  - Rock Eval data (HI, Tmax)
- Optional
  - Biomarker (e.g. n-alkane distribution), stable C isotopes ($\delta^{13}C$) and/or microscopy data (maceral distribution or palynofacies analysis)

OF-Mod: Output data

Results can be divided into 4 source rock classes: very good, good, fair and poor source rock potential, SRP (Peters, 1986)

Export of results as a set of maps (grids) for each class and timestep:
- Total organic carbon content (TOC)
- Source rock quality (HI)
- Source rock thickness

Provides a more realistic representation for the primary generation model, especially in vertically heterogeneous rocks!

Export format:
- 3D-grid blocks (GRDECL-format)
- Average maps (ZMap+, Irap ASCII classic, xyz-format)

Pre-burial source rock potential and- type as input into petroleum systems modelling