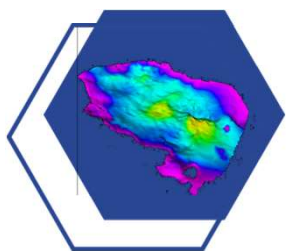**PM**

30 AUG – 1 SEP

Novotel Aachen City,
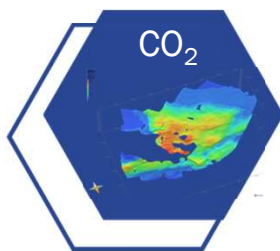Aachen, Germany

PetroMod and Petroleum System TechDays 2022

CO_2

Recent PSM features

We will showcase the latest advances in our software portfolio and do a recap of the previous PetroMod releases

PetroMod beyond PSM

We will talk about the current status of the carbon storage workflows in PetroMod and their future vision

External presentations

Get to know basin modelers from all around the globe showing their work using PetroMod for different applications

This event is free of charge.
Meals, travel and accommodation costs must be covered by the participants.

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PetroMod and Petroleum Systems Techdays 2022 Program

Tuesday Aug 30

	Speaker	Topic
08:00-08:45		Registration
08:45-9:00	Schlumberger management	Welcome
09:00-09:45	Carlos Sanchez (Schlumberger)	Organization, Opening surveys. PetroMod 2021/2022 recap. What is coming in 2023
09:45-10:45	JC Hidalgo (Schlumberger)	The CO2 storage story in PetroMod & PetroMod roadmap
10:45-11:15	Coffee break	
11:15-12:00	Volker Reichelt (Schlumberger)	PetroMod usability improvements 2021-2023
12:00-12:30	Rolando di Primio (Lundin Energy)	Petroleum System Analysis from Exploration to Production: Solveig Field
12:30-13:30	LUNCH	
13:30-14:15	Karsten Kroeger (GNS)	Modelling the gas hydrate petroleum system with PetroMod, examples from the New Zealand continental margin
14:15-15:00	J. O. W. Grimmer (Cepsa)	Tar modelling – a case study offshore Abu Dhabi
15:00-15:30	Coffee break	
15:30-16:15	Rüdiger Lutz (BGR)	Petroleum resource assessment in the European Arctic, Northern Barents Sea and Northeast Greenland
16:15-17:00	Bjorn Wygrala	Truth or Consequences – The Global Energy Transition and the E&P Industry

18:00	Depart from Novotel to the dinner
22:00	Depart from the restaurant to Novotel

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Wednesday Aug 31

	Speaker	Topic
08:30-09:00	Nicole Masurek (Schlumberger)	Knowledge Shared = Knowledge^2, A workflow on how to boost your productivity
09:00-09:45	Henrique Lopes (Eneva)	Atypical Petroleum System Modelling. Implementing Intrusion Emplacement Mechanisms into PSM flow.
09:45-10:30	Gustavo Camelo (Ecopetrol)	High resolution models application in near field exploration
10:30-11:00	Coffee break	
11:00-11:30	Per Salomonsen (Schlumberger)	TOC modelling in GPM
11:30-12:00	Juraj Francu (Czech GS)	Basin modeling of a pilot CO2-storage in a dolomite reservoir
12:00-12:30	Daniel Palmowski (Terranta)	Mineral Systems Modeling: Opportunities and Chances
12:30-13:30	LUNCH	
13:30-14:15	Armin Kauerauf (Schlumberger)	Liberation of IP simulator
14:15-15:00	Hans Axel Kemna (Ucon Geoconsulting)	Application of PSM in Frontier Exploration - Examples from the South Atlantic Margins
15:00-15:30		
15:30-15:50	Thomas Fuchs (Schlumberger)	Nested Models Introduction
15:50-16:25	Clayton Painter (Conoco Phillips)	Nested Models case study in Neuquén basin, Argentina
16:25-17:00	Clayton Painter (Conoco Phillips)	Transforming the Assessment of Risk and Volumetrics for Carbon Capture and Sequestration through the Application of Basin Modeling Technology
17:00-17:30	JC Hidalgo (Schlumberger)	Closure and surveys

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Thursday Sep 1

08:15 - 09:00	Bus transfer to Energeticon
09:00 - 10:30	Field trip - part I at Energeticon
10:45 - 11:45	Bus transfer to Valkenburg
12:30 - 14:00	LUNCH
14:00 - 14:15	Walk from the restaurant to the caves
14:15 - 16:00	Field trip - part II at the Velvet cave and the castle ruins in Valkenburg
16:15 - 17:00	Bus transfer from Valkenburg to Novotel

PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Tuesday, Aug 30

Time: 09:00

Presenter: Carlos Andrés Sánchez Torres

Company: Schlumberger

Title: Introductory presentation

Key words: what is new, last releases recap, PetroMod team.

Abstract:

This introductory presentation will cover organizational topics, a recap of the last PetroMod releases, and a preview of what is coming in the next release 2023.

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Title: The Role of Basin Modelling in CCS Applications – Play to Prospect Workflows

Key words: carbon storage, component injection, dissolution, carbonatization, mass balance.

Abstract:

This presentation shows the status of the application of PetroMod in the prediction of CO_2 migration in saline aquifers. This dynamic set of processes start with the injection and subsequent transport of CO_2 considering several elements such as the evaluation of the top & fault seal to be able to estimate the CO_2 storage capacity.

PetroMod has been adapted to model the migration of CO_2 from present day to the future thanks to the following newly implemented features: component injection table, year time step resolution, IFT table for CO_2, improvement of IP algorithm and IP-related capillary pressure & saturations.

A case study will be used to demonstrate the different CO_2 physical and geochemical trapping mechanisms and the CO_2 mass balance considering the CO_2 plume, the CO_2 masses dissolved in water, the amount of carbonatized CO_2 and the migration losses.

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Tuesday, Aug 30

Time: 11:15

Presenter: Dr. Volker Reichelt

Company: Schlumberger

Title: PetroMod usability improvements

Key words: Project Browser, User Experience, Usability, Command Menu, PetroBuilders, Viewers, Editors.

Abstract:

This presentation covers the usability improvements implemented in PetroMod 2021 and 2022 as well as the status of the current 2023 development version.

In the last years, the PetroMod development and portfolio teams put a stronger emphasis on improving the user experience to reduce the time for model building and managing, so the users can focus on the analysis of results and scenario modeling. Our goal is to achieve a more friendly, intuitive, and rapid user experience by simplifying some cumbersome processes and adding new functionalities that enhance the interaction with different PetroMod tools.

A key feature of the effort to simplify project management is the Project Browser that we present. Its various functionalities centralize most of the processes and information in one window so the user can always have a quick overview of all the models contained in the project.

We will also cover selected improvements for model building in applications like the PetroBuilders, Viewers and Editors.

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Tuesday, Aug 30

Time: 12:00

Presenter: Dr. Rolando di Primio

Company: Lundin Energy

Title: Petroleum System Analysis from Exploration to Production: Solveig Field.

Key words: Charge history, biodegradation, tar mats, Reservoir Geodynamics, field development.

Abstract:

This presentation describes the use of basin modelling and organic geochemistry in the understanding of exploration results and further into the development of Solveig Field, Norway. We highlight the importance of understanding well results and integration of these with the basin evolution and petroleum charge history.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Tuesday, Aug 30

Time: 13:30

Presenter: Dr. Karsten Kroeger

Company: GNS Science

Title: Modelling the gas hydrate petroleum system with PetroMod, examples from the New Zealand continental margin

Key words: unconventionals, gas hydrate modelling, microbial and thermogenic gas, convergent margins, New Zealand.

Abstract:

Gas hydrates house vast amounts of gas, predominantly methane. In the USA alone, in-place resources have been estimated to be >300,000 Tcf. Although recoverability of this resource remains an issue, gas hydrates have a vast potential as a future energy resource. If production technologies using replacement of methane hydrate with CO_2 hydrate can be successfully developed, gas produced from gas hydrate will also have a much smaller carbon footprint than conventional gas.

In many regards, the gas hydrate system behaves analogous to conventional petroleum systems in its dependency on gas generation, migration and presence of suitable reservoirs. Hence basin modelling is a suitable approach to predict gas hydrate resources. Gas hydrates have been introduced in to PetroMod almost 10 years ago, as part of a collaboration between Schlumberger and Geomar and uses the modelled pressure/temperature as well as thermodynamic constraints to predict gas hydrate formation.

In this presentation I will summarize insights from 10 years of government-funded research on gas hydrate systems in New Zealand. Gas hydrate petroleum system modelling has been an integral component of these programmes and has led to significant advances in understanding the impact of the thermal regime and the tectonostratigraphic architecture of sedimentary basins on gas hydrate occurrence and distribution. I will focus on gas hydrate modelling at the convergent Hikurangi Margin, New Zealand's largest gas hydrate province and illustrate the approaches we have taken and the insights we have gained. PetroMod modelling has significantly contributed to the understanding of how generation and

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migration of thermogenic and biogenic gas in the basin controls gas hydrate occurrence. Deep migration of thermogenic gas through buried channel sands leads to concentrated gas hydrate occurrence in the trench basin, where suitable reservoirs are present. Due to the cool thermal regime, a significant proportion of microbial gas generation also occurs beneath the methane hydrate stability zone, leading to upward migration of free gas and concentration of gas hydrate near the base of the stability field. In the deforming accretionary wedge, concentrated gas hydrates form in folded turbidite sandstones. Migration into these reservoirs occurs through inclined carrier beds and along thrust faults. PetroMod modelling has been used to estimate the amount of gas hydrate along the margin and has been elemental in understanding formation processes and to identify concentrated gas hydrate reservoirs. It has also helped to better understand the dynamic behaviour of the gas hydrate system during the evolution of the accretionary wedge.

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Tuesday, Aug 30

Time: 14:15

Presenter: Dr. J.O.W. Grimmer

Company: Cepsa

Title: Tar modelling – a case study offshore Abu Dhabi

Key words: Tar modelling, nested model

Abstract:

This study demonstrates first time in Abu Dhabi the capacity of tar modelling, intending to indicate locally the tar presence in the Arab formation reservoir of an operating oil field offshore Abu Dhabi. It gives insights on the most likely process of tar formation and allows to a certain extent a prediction of tar presence away from well control. To achieve such a predictive tar model, an extensive sampling and multi-study program has been undertaken. Latest geochemistry, petrography and fluid inclusion analyses with PVTX-modelling lay the base of the hereby presented latest state-of-art petroleum systems modelling and the used study-specific tar module of PetroMod to obtain the most probable process of tar formation. The charge modelling was essential to give a realistic scenario for the volumes accumulated in the stacked reservoirs, where after oil charge, the tar has deposited. After a reliable calibration of the accumulated hydrocarbons, it was possible to succeed with the unique tar modelling. This study clearly reveals first time in Abu Dhabi that the Arab Formation is an active source rock based on newest analyses of this study. The tar flocculation process as indicated in Wilhelms & Larter (1994) is uniquely modelled in such an extent on an operating field in Abu Dhabi. This tar modelling used a specific adapted source rock and tar kinetics to allow a realistic asphaltene flocculation process and the results will support the future field development.

PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Tuesday, Aug 30

Time: 15:30

Presenter: Dr. Rüdiger Lutz

Company: BGR

Title: Petroleum resource assessment in the European Arctic, Northern Barents Sea and Northeast Greenland

Key words: Resource assessment, frontier basins.

Abstract:

BGR conducted 2-D Basin and Petroleum Systems Modeling (BPSM) of two frontier areas in the European Arctic, the northern Barents Sea and the Northeast Greenland margin. Both study areas lack deep wells for stratigraphic age control or petrophysical properties. Therefore, we used published information from outcrops onshore East Greenland and Svalbard as well as information from cored shallow boreholes. Additionally, we conducted four marine surveys and acquired seismic and potential field data as well as geochemical and microbiological data from shallow sediment analyses. All data were used for interpretation of the geo-dynamic evolution and parameterization of the basin and petroleum system models. We calculated the minimum and maximum petroleum generation for each structural element in the 2D models with various scenario runs. The scenarios include changing amount of burial and erosion, heat flow evolution and number of source rocks. The range of petroleum generation was used for a subsequent Monte Carlo simulation to calculate the probability density function of petroleum generation and trapping for the whole study area. Our methodology differs from previous assessments by the U.S. Geological Survey (USGS), the Norwegian Petroleum Directorate (NPD) and the Geological Survey of Denmark and Greenland (GEUS).

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Tuesday, Aug 30

Time: 16:15

Presenter: Dr. Bjorn Wygrala

Title: Truth or Consequences – The Global Energy Transition and the E&P Industry

Key words: Energy transition, E&P industry trends

Abstract:

In the Introduction, definitions are followed by examples of common pitfalls and misrepresentations in discussions of the Global Energy Transition.

In the first part of the Regional Overview, examples of energy transition strategies and results from Europe will be presented with an emphasis on the Energiewende in Germany, one of the largest and most ambitious programs to transfer energy supplies from fossil fuels to renewable energy resources. In the second part some key points regarding China's role as the largest user of fossil fuels and especially of coal will be presented. China is by far the largest single source of carbon dioxide emissions, however China is also the largest and most aggressive developer of renewable energy technology and resources.

New Energy Systems are being developed and examples of new 'energy hubs' will be presented to illustrate the scale of ongoing transition efforts and the role of solar, wind and hydrogen. Recent examples of strategies and investments by E&P and mineral resource companies in these developments are presented.

Summary and conclusions are given together with some recommended references

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 08:30

Presenter: Nicole Masurek

Company: Schlumberger

Title: Knowledge Shared = Knowledge^2, A workflow on how to boost your productivity

Key words: ExplorePlan, Knowledge Management, Data integration

Abstract:

Knowledge sharing is the process of creating space for collaboration and open communication. A central place is needed to curate, share and consume knowledge across the organization. By the time you produce a new piece of content, it is already out of date. The presentation shows how common challenges of knowledge management can be overcome using ExplorePlan. ExplorePlan helps to identify new questions, the old answers, and the missing content you need to get ahead of constant changes in projects and as part of the energy transition. A workflow will be presented showing the advantage of knowledge transfer, project-, portfolio management, data integration and QA / QC to improve your team efficiency and transparency to remain competitive.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 09:00

Presenter: Henrique Lopes

Company: Eneva

Title: Atypical Petroleum System Modelling. Implementing Intrusion Emplacement Mechanisms into PSM flow

Key words: Atypical Petroleum System; Igneous Rocks; Workflow Improvements

Abstract:

The maturation process on Atypical Petroleum Systems is increased or trigged by the heat input caused by the emplacement of igneous rocks into or nearby source rock intervals. In addition, all other petroleum system processes and elements may also be affected such as migration, charge, preservation, seal, trap and timing. The heat input, geochronology, emplacement mechanism, stacked sills settings, and cross-cutting layer geometry of transgressive sills add an extra complexity to modelling in comparison with typical petroleum systems. Considering the above-mentioned topics, this work will be divided into two parts. The first is about how sensible atypical petroleum systems are to igneous rocks input data showing an example of how high-resolution geochronological data can affect the source rock maturation modelling. The second is a diagnosis of the impact of using geologically oversimplified workflows to atypical petroleum systems. This work suggests new Petromod workflows to better comprise magmatic emplacement mechanisms on layer-cake models and the challenges to apply them on real cases studies of atypical petroleum systems of Paleozoic on basin in Brazil. Combining the layer-transgressive geometry of igneous intrusions with the overburden geometry change due to the jack-up during the emplacement on little time-consuming workflows are still a challenge. The aim of this work is to shed light on Atypical Petroleum Systems modelling and discuss the next steps to improve Petromod Modelling workflows on this topic.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 09:45

Presenter: Gustavo Camelo

Company: Ecopetrol

Title: Calibration of fluid compositions in 3D basin modeling based on PVT data

Key words: 3D-PSM, Fluid calibration, Nested model, CO2, PVT

Abstract:

Petroleum systems modeling is increasingly becoming a fundamental tool in risk analysis of exploration opportunities and in VEX - ECOPETROL ranking of portfolio prospects. Therefore, it is important to maximize its performance to calibrate it to obtain predictions on fluid quality as close as possible to the geological context. One of the determining factors in the volumetric evaluation of the prospects is the definition of the type of fluid that is expected, as well as the prediction of its physical properties, depending on the depth, temperature, and pressure at reservoir conditions. These factors have an impact on the volumes of expected gas and liquid. Consequently, the most suitable or acceptable conceptual development model for the accumulation is designed, and the predictions related to the fluid should reflect the highest degree of certainty.

State of the art tools were used in the execution of the petroleum systems model in this project. A new module within the Petromod software called "Nested" was used for the construction of a local high-resolution model focused on the study area.

The construction of this "Nested" model with the support of the Petromod expert, allowed us to understand the fluid system in the reservoir from a work hypothesis supported by the source rock kinetic model. Based on the evidence from the PVT data, the model calibration was made from the fluid to the source rock (top to down). This methodology provides greater confidence to the results that aim to estimate the distribution of the different fluids in the pre-salt of the Santos basin, and can be applied to other basins, even in different geological contexts.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 11:00

Presenter: Per Salomonsen

Company: Schlumberger

Title: Geological Process Modeling - Total Organic Carbon modelling

Key words: Stratigraphic modeling, diagenesis modeling, forward geo-mechanical modeling, clastic, carbonates, basin scale to reservoir scale, workflow integration, TOC

Abstract:

GPM geological process modeling software is a simulator for forward modeling of stratigraphic and sedimentary processes that works with the Petrel E&P software platform. It provides a methodology to model siliciclastic and carbonate reservoirs based on the principle of mass and energy conservation.

GPM software enables users to create stratigraphic models showing the expected sediment geometries and to predict the lithology distributions as well as gain insights into the composition and deposition of the sedimentary sequences. Specifically, GPM software models the erosion, transport, and deposition of clastic and carbonate sediments—either independently or concurrently—in different geological settings (for example, channels, rivers, turbidity flows, and shoreline systems) along with related geological processes such as carbonate growth, meteoric diagenesis, and sediment compaction.

Tightly integrated with the Petrel platform (therefore with PetroMod), GPM software makes true cross-domain collaboration and workflow standardization in the same canvas a reality.

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 11:30

Presenter: Juraj Franců

Company: Czech Geological Survey

Title: Geochemical modeling of a pilot CO2- storage in a dolomite reservoir, Bohemian Massif, Czech Republic

Key words: Co2, geochemical modelling, depleted fields, carbon storage.

Abstract:

Conversion of a nearly depleted oil and gas field Zar-3 in SE Czech Republic to a pilot CO2 storage site is under preparation in a joint project of the Czech Geological Survey, MND company, VSB Technical University in Ostrava and NORCE research institute in Norway. First, an updated geological static 3D model is being built using Petrel (Slb). The reservoir consists of Upper Jurassic dolomites of the Vranovice Fm., which is underlain by L. Carboniferous siliciclastics and overlain by U. Jurassic marls and M. Paleogene shales and silts acting as cap rocks. The secondary seal is formed by the shaly overthrust plane of the West Carpathians. Microscopy under PPL, XPL and fluorescence light reveal major seaward shoral depositional environment of the reservoir rocks and cavernous to fracture porosity. Dolomite and Fe-dolomite are the dominant rock building minerals based on XRD. The pore space and their mutual connections estimated by image analysis is compared with Hg porosity distribution and well log results. The data are used as calibration parameters for the 3D reservoir model. Chemical and mineralogical composition of the reservoir and seal rocks enter the CO2 – water – rock interaction model, which aims at predictions of what will happen after the CO2 injection. The most challenging objective is to extend the thermodynamic and kinetic predictions to the 3D storage model.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 12:00

Presenter: Dr. Daniel Palmowski

Company: Terranta

Title: Mineral Systems Modeling: Opportunities and Chances

Key words: Mineral Systems Modeling, Reactive Flow Simulations

Abstract:

Mineral systems analysis has become an established methodology in both, greenfield and brownfield exploration. Understanding the mineral system enables us to de-risk exploration investment decisions and to better predict the economic potential of an area under exploration. Only when we consider and quantify the processes over geological time, a complete description and validation of your mineral systems hypothesis is possible. Additionally, it allows us to define the key risk factors for an effective resource assessment.

Most mineralization events have occurred within a relatively small time frame but yet require a working mineral system over a specific time period to enable economic metal concentrations. We combine "basin modeling", the quantification of the thermal, pressure and stress evolution within the subsurface through geological time, with "reactive transport modeling". Modeling the fluid flow and the rock-fluid interactions allows us to define and simulate mineral systems in order to quantitatively assess their limiting factors, the impact of key uncertainties and the effectiveness of the metal concentration processes.

We present 2D and 3D case studies, illustrating how Mineral Systems Modeling quantifies the mineral systems elements and how it can de-risk exploration projects.

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 13:30

Presenter: Dr. Armin Kauerauf

Company: Schlumberger

Title: Liberation of the Invasion Percolation algorithm 3D

Key words: Fluid migration, Invasion percolation, performance, seismic volumes, carbon storage.

Abstract:

The invasion percolation algorithm has been widely used in basin modelling to simulate the fluid migration from the source rock to the reservoir. This method has been used as a pure migration modeling method or in combination with Darcy flow to achieve a proper physical approximation of the migration processes. The Invasion Percolation method delivers results at a very fine resolution within a reasonable timeframe, which makes it the algorithm of choice for high-resolution models with complex geometrical structures.

For a long time, this algorithm has been liberated in 2D as the IP Tester application to allow quick migration tests using 2D PetroMod models or images. In the upcoming PetroMod 2023 version this algorithm will be liberated in full 3D to allow instantaneous migration modelling on data structures describing seismic 3D volumes. This extends the capabilities of the Invasion Percolation algorithm which before were restricted to basin modelling for interactive 3D modeling without applying the full environment and modelling multiple events of a basin model.

The liberation of the IP algorithm can be particularly interesting for fluid modelling scenarios where the geometry of the area of study remains unchanged during the migration processes and the transient flow effects are negligible. One of the potential applications of this tool is the quick analysis of carbon dioxide injection and its subsequent migration within the volume of interest. This analysis can now be done at seismic resolution without the need of sampling the model and within a very short time frame, which can make it a powerful tool for carbon storage site quick assessment.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 14:15

Presenter: Dr. Hans Axel Kemna

Company: Ucon geoconsulting

Title: Application of PSM in Frontier Exploration - Examples from the South Atlantic Margin

Key words: Petroleum systems modeling, Frontier exploration, South Atlantic, Namibia, Santos Basin, Pre-salt, Sergipe-Alagoas Basin.

Abstract:

Exploration in frontier areas, e.g., along the South Atlantic margin, is naturally hampered by scarcity of data. In such environments, PSM studies have to rely on probabilistic approaches based on simple models, carried out via extensive sensitivity testing using, a.o., multi-scenario approaches. In addition, highly integrated teams applying multi-disciplinary approaches are required. Under such circumstances, even assessments on the prospect/lead inventory level can benefit from results obtained via PSM.

The presentation discusses a variety of studies in which the author had the pleasure of contributing, including basin-screening offshore Namibia, 3D PSM of a part of the Pre-salt area in Santos Basin, Brazil, as well as an integrated study of the deep-water realm of Sergipe-Alagoas Basin, Brazil.

This presentation will be shared as a pdf file after the event.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 15:30

Presenter: Dr. Thomas Fuchs

Company: Schlumberger

Title: Nested Models Introduction

Key words: Nested Models, LGR.

Abstract:

The talk will give an introduction and overview over the Nested Models technology that had been introduced in PetroMod 2021.1. Answers to the questions "What is a nested model?, "How does it work?" and "How is it done?" are given. Temperature and pressure results of nested models are shown.

This presentation will be shared as a pdf file after the event.

PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Date: Wednesday, Aug 31

Time: 15:50

Presenter: Clayton Painter

Company: Conoco Phillips

Title: Nested Models case study in Neuquén basin, Argentina

Key words: Nested Models, volume of interest, regional basin model.

Abstract:

This presentation describes the concept and the application of the "Nested Model" PetroMod development and workflow. The Nested Model" workflow is similar to sector modeling in the reservoir engineering world and was invented by ConocoPhillips and co-developed with Schlumberger. At the core is the ability to "nest" volume-of-interest (VOI) or a sector model into a framework or regional basin model. Nested Models are independent but have full spatial and temporal awareness, which allows modeling at genuine prospect and well scales without the need to "carry" tens of millions of unnecessary cells. This novel workflow allows a realistic assessment of appraisal, development, and carbon sequestration with the benefit of dynamic basin modeling techniques.

An evaluation of a part of the unconventional Neuquén basin in Argentina is a suitable example highlighting this new workflow's possibilities and impact. Calibrating a basin model using this workflow reduced the turn-around time from weeks to days. The well-scale resolution of the nested model provides the opportunities to calculate realistic hydrocarbon saturations and fluid characterization. The example highlights the strengths and weaknesses of an exemplary area of interest. It further helps to understand the optionality from a subsurface point of view, ultimately aiding in sound business decisions and communicating challenges.

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PETROMOD AND PETROLEUM SYSTEMS TECHNOLOGY DAYS 2022

Title: Transforming the Assessment of Risk and Volumetrics for Carbon Capture and Sequestration through the Application of Basin Modeling Technology

*The original authors are Robert Tscherny from ConocoPhillips and Thomas Hantschel from Schlumberger (now Terranta)

Key words: Carbon dioxide, Carbon capture, Basin modelling, Nested Models,

Abstract:

The recent oil and gas industry focus on Carbon Capture and Storage (CCS) projects require two integrated assessments; (1) the volume of carbon dioxide (CO_2) that can safely be stored in the subsurface, and (2) the containment risk and leakage rate over the subsequent decades or centuries. The presented proof-of-concept study illustrates how utilizing basin modeling techniques can impact selecting the best storage sites, outline expectations around monitoring, and most importantly, ensure containment & storage safety.

The starting point for this study is a basin screening followed by an in-depth analysis of potential storage sites. The proposed screening workflow is straightforward. Use a basin model's ambient pressure and temperature, and perform a ray-tracing / flow path analysis of a geological reservoir-seal coupling by injecting and migrating CO_2. This analysis calculates the maximum storage volume and phase using trap characteristics (fill and spill), dynamic constraints of capillary seal capacity, and ambient CO_2 density. Integrating these results with surface constraints, such as distance to an emission source, pipeline, etc., helps high-grade potential storage sites for further analyses with high-resolution asset scale 3D geocellular models.

These asset scale 3D models use the PetroMod's "Nested Model" workflow coupled with the percolation migration method. The Nested Model" workflow is similar to sector modeling in the reservoir engineering world and was collaboratiively developed and realized by

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Schlumberger

Schlumberger and ConocoPhillips. At the core is the ability to "nest" volume-of-interest (VOI) or a sector model into a regional basin model. It is an independent model that allows modeling at genuine prospect and well scales, maintaining the boundary conditions of a regional model without the need to "carry" tens of millions of unnecessary cells.

This novel workflow results in an interactive and fast-paced evaluation of the sequestered CO_2 volume (free and in water phase), the containment risk, and the injection and monitoring wells placement. The models in this study have 2 to 5 million flow cells and run fully coupled within minutes to hours while capturing all fundamental physical and chemical processes influencing storage efficiency and containment within a saline aquifer. These include the injection and migration of CO_2 in saline aquifers, dynamic leakage through top- and lateral seals during the plume migration, dissolution (and diffusion) within the water phase, the impact of the injection pressure on the seal integrity, and mineral trapping of CO_2 as carbonate minerals.

In summary, examples from the study illustrate how the basin modeling technology and techniques improve CO_2 storage site assessment. The workflow is by design a complementary precursor to assetspecific reservoir models. It highlights the strengths and weaknesses of the storage sites. It further helps to understand the optionality from a subsurface point of view, ultimately aiding in sound business decisions and communicating challenges.