

5th EAGE Well Injectivity & Productivity in Carbonates Workshop (WIPIC 2025)

Doha, Qatar
14-16 April 2025

ISBN: 979-8-3313-1943-4

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2025) by the European Association of Geoscientists & Engineers (EAGE)
All rights reserved.

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact by the European Association of Geoscientists & Engineers (EAGE)
at the address below.

European Association of Geoscientists & Engineers (EAGE)
PO Box 59
3990 DB Houten
The Netherlands

Phone: +31 88 995 5055
Fax: +31 30 634 3524

eage@eage.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

SESSION 1 - USE OF DATA ANALYTICS, MACHINE LEARNING AND OTHER ARTIFICIAL INTELLIGENCE APPLICATIONS FOR OPTIMIZING OIL AND GAS FIELD DEVELOPMENT AND RESERVOIR MANAGEMENT

End-to-End GANs and TimeGPT for Multidimensional Reservoir Characterization	1
<i>A. A. Al-Fakih, A. Koeshidayatullah, S. Kaka</i>	
Waterflooding Optimization using ANN Proxies and Mean-Standard Deviation Objective Function with a Sharpe Ratio	6
<i>D. Guérillot</i>	
Machine Learning-Based Prediction of Throat Clogging by Fine Migration in Porous Media.....	11
<i>A. Elrahmani, R. Al-Raoush</i>	
Full-Field Proxy Development using Neural Operator-Based Machine Learning Approach for Reservoir Simulation	16
<i>K. Mukundakrishnan, S. Ranjan, K. Wiegand, D. Tishechkin, D. Kahn, V. Ananthan, V. Natoli</i>	
Advancing Data Management and Innovation in the Energy Industry - Shell Journey.....	20
<i>I. Khan</i>	

SESSION 2 - ENHANCED/IMPROVED RECOVERY MECHANISMS

Evaluating Liquid Polymers for EOR: Injectivity Challenges in Low Permeability Reservoirs.....	23
<i>E. Ghodsi, M. Tahir, R. E. Hincapie, D. Steineder, T. Clemens, A. Farzaneh, D. Marx, N. Baric, R. Kharrat</i>	
Effects of Solubility Modeling on Fluid Flow in Natural Gas Fields with Presence of Aquifers.....	27
<i>A. S. Abd, A. Abushaikha</i>	
Offshore Oil Field Holistic WAG Injection Review.....	32
<i>R. Bertrand</i>	

SESSION 3 - RESERVOIR CHARACTERIZATION

Carbonate Total Pore System Integration Across Characterization, Modelling, Surveillance and Reservoir Management.....	35
<i>V. Nzerem, S. Fullmer, J. Kolvoord, H. Alqassab</i>	
Panoptic Segmentation for Microcrystalline Calcite in SEM Petrographic Images for Carbonate Reservoir Characterization	38
<i>M. Ishaq, M. Yaqoob, I. S. A. J. Jayachandran, T. D. Seers</i>	
Breakthrough in Reservoir Characterization and Well Conformance using Multi-Physics and Multi- Dimensional Measurements	43
<i>R. Al Lawati, A. Mukherjee, A. Donald, M. Ibrahim, A. Embaireeg, K. Suzuki, V. Kramar, C. Jyoti Keot, F. Ben Amor, P. Shukla, A. Singh Bisain, A. Morad, M. Viandante, R. Bedoya, M. Nashaat, M. Nassar</i>	

Depth Surface Generation Workflow for a Stack Carbonate Reservoir.....	48
<i>G. Berthureau</i>	

SESSION 4 - RESERVOIR SIMULATION

A Sparsified Multiscale Preconditioner for Fractured Porous Media	52
<i>O. Chaabi, M. Al Kobaisi</i>	
EoS-Based Equilibrium Model for Simulation of Geological Carbon Sequestration.....	55
<i>A. Ferrari, P. Panfili, G. Rivolta, L. Patacchini, K. Esler, A. Cominelli</i>	
QASR Reservoir Simulator: From Research Proposal to the Road of Commercialization	59
<i>A. S. Abushaikha, A. Abd</i>	
Six Stage Integrated Subsurface Modelling of a Complex Fractured Reservoir in Offshore Oilfield.....	63
<i>A. Mukherjee, C. Darous, K. Ghorayeb, F. Ben Amor, E. Lenskaya, S. Subbiah, M. Ibrahim, M. Nashaat</i>	
Application of Nonlinear Probability Models to Mature Infill Risk Assessments and Opportunity Screening.....	66
<i>O. Akuanyionwu</i>	

SESSION 5 - RESERVOIR MANAGEMENT STRATEGIES

Reduced-Order Modeling Framework for Water Injection Optimization and Efficient Reservoir Management	71
<i>A. P. Singh, B. Wang, K. Kostro</i>	
Vision Transformers Based Pore Type Classification for Carbonate Reservoir Characterization	74
<i>Y. Qaiser, I. Ansari, Y. Ansari, M. Y. Ansari, I. Sujay, T. Khan, H. Rabbani, J. C. Laya, T. Seers</i>	
Brownfield Opportunities Identification using an Integrated Approach.....	79
<i>K. Aissaoui</i>	
Value of Deep Injection &utilization of Multizone Completion in Solving Nonconformance Problem in Fractured Carbonate Reservoir	83
<i>H. Makhlof, G. Jayanto, A. L. Memon, F. U. Rehman, R. Senoputra, R. Sharda, P. Kumar, C. Chike Odukwe</i>	

SESSION 6 - GEO-MECHANICS

GReS: A Novel Multi-Physics Multi-Domain Computational Tool for Geomechanical Simulations	85
<i>M. Ferronato, A. Franceschini, D. Moretto</i>	
GEOS: A Multi-Physics Simulation Framework for Subsurface Applications.....	88
<i>N. Castelletto</i>	
Thermal Induced Fractures in Moho: Field Management & Well Analysis	91
<i>C. Castano Uribe, Y. Schildberg, J. Ochi, T. Dieuzeide</i>	
Coupling Flow and Geomechanics to Model Fault Reactivation in CO ₂ Storage Operations	94
<i>S. Nardean, A. Ferrari, S. Monaco, S. Mantica, A. Cominelli</i>	

Role of Rock Fabric in Mechanical Failures at Reservoir: Laboratory Test Results and Its Engineering Implications.....	97
<i>M. E. S. Ho, R. R. Kumar; S. K. Subbiah</i>	

SESSION 7 - ENHANCED CORE ANALYSIS AND DIGITAL ROCK PHYSICS

Digital Rocks in the Energy Transition	100
<i>M. Blunt</i>	
U-Net-Based Semantic Edge Detection for Carbonate Reservoir Characterization.....	103
<i>M. Yaqoob, M. Ishaq, T. D. Seers</i>	
Synchrotron Microtomography of Vugs and Microfractures Formation Within Sediments Due to Fines Migration via Multiphase Flow	108
<i>J. Hannun, R. Al-Raoush</i>	
Improving Core Value by Implementing a Combination of Improved and Innovative Coring Methods.....	112
<i>S. Finlay, K. Baggley, R. Slootweg, M. Faraz Khan, D. Cross, P. Lazic, S. El-Beshbishi, A. Thompson</i>	

SESSION 8 - EMERGING RESERVOIR MANAGEMENT APPLICATIONS

Simulation of Geologic Carbon Sequestration in Faulted Poroelastic Media.....	115
<i>M. Cusini, M. Frigo, N. Castelletto, R. Settgast</i>	
Integration of Time-Lapse Saturation Logging and 4D Seismic to Successfully Monitor Waterflood Performance in Chalk Reservoir.....	118
<i>S. Datta, A. Singh, N. B. Frandsen, K. Kostro</i>	
Use of 4D Seismic in Reservoir Management.....	121
<i>R. Brahmantio, A. Urakov, F. Aljanahi, G. Berthereau, A. O'Connell, B. Marir</i>	
OBN Hybrid Concept and 4D Used in Carbonates Middle East Environment	124
<i>F. Achilli, Y. Ellabad, O. Lamerain, Z. Yu, L. Junchao</i>	
Assessment of Acoustic Reservoir Pressure Measurements at the Well-Head	128
<i>A. Mohsin, K. Palop, S. Al-Emadi</i>	

SESSION 9 - DRILLING OPERATIONS AND COMPLETION / WELL INTERVENTION TECHNOLOGIES

Utilizing Clay Minerals for Efficient Treatment of Oilfield Wastewater.....	132
<i>A. Hamza, A. Ben Ali, R. Elaf, S. Saeed, I. Hussein, M. Nasser, M. Hassan, M. Gamal El-Din, S. Ahmed</i>	
Ultrasonic Cement Evaluation in Corrosion Resistant Alloy Casing	136
<i>R. Mulyanto, A. Stephens</i>	
Evaluating Khuff Formation Time Dependency Utilizing LWD High-Resolution Ultrasonic Imager.....	139
<i>R. Soelem, S. Al Sawafi</i>	
Acoustic Oil-Water-Fines Separation for Sustainable Oil Production Operation.....	144
<i>A. Abdel-Fattah, M. Alsoraya, A. Alghiryafi</i>	

Optimizing Fracture Control in Thin Multilayer Carbonate Reservoirs with Surgifrac Stimulation.....	147
<i>M. Elwahsh, G. Ibrahiim, B. Pignot, C. Virdarie, A. Alyafei, T. Hamza</i>	

POSTER SESSION 1: LIGHTNING SESSION

Investigation of Reinforced Machine Learning for History Matching	150
<i>K. Mohammadi, A. Abushaikha, J. Schneider</i>	
Temporal Extrapolation and Reliable Generalization via Temporal Neural Operator (TNO) for Geologic Carbon Storage	154
<i>W. Diab, M. Al Kobaisi</i>	
Gradient-Based Optimization Techniques for Automatic History Matching in Reservoirs.....	157
<i>H. Shakir, A. Abushaikha</i>	
Machine Learning in Well Placement Optimization: A Comprehensive Review	162
<i>A. Eltayeb, O. Massarweh, A. Abushaikha</i>	
Using ML-Supervised Learnings Based-Algorithms to Create a Relative Permeability Model	167
<i>A. Aggarwal, S. Kumar, S. K. Subbiah, P. Bajpai</i>	
AutoSum for a Generic CO ₂ Storage Project.....	170
<i>K. M. Leong, J. Limbeck, A. Ananad</i>	
Formulating Smart Proxy Models for a Mature Asset's Production Forecasting Under Uncertainty	175
<i>O. Akuanyionwu, K. Aissaoui</i>	
Multiphase Production Logging in Long Horizontal Well to Optimize Multizone Production in a Complex Carbonate Reservoir.....	178
<i>S. Sen, A. A. Stephens, B. Marir, R. Marizal, M. Laurie, C. Pointer, C. Perrin, F. Nurrachman, C. Boekhorst, F. U. Rehman, M. Podoplelov, A. L. Memon</i>	
Use of Water Injector as Gas Shield for Reservoir Management	181
<i>A. Sukapradja, B. Marir, A. O'Connell, P. Hutson, R. Brahmantio</i>	
Leveraging Dashboards for the History Match of Giant Carbonate Field	184
<i>O. Fraute, F. Clement, M. S. Fakhroo, A. O. Fadipe</i>	

POSTER SESSION 2: LIGHTING SESSION

Efficiency and Accuracy of Linearization Methods for Multi-Phase Flow in Porous Media.....	188
<i>A. Asif, A. S. Abd, A. Abushaikha</i>	
Applying Controlled Mud Level to Open Hole Gravel Pack	193
<i>S. Lutnes</i>	
FSAI Preconditioner for Reservoir Simulations	197
<i>A. Mavliutov, A. Franceschini, C. Janna</i>	
Pipe Diagnostic using Innovative Water Flow Log Techniques	200
<i>F. Al-Mutawa, K. Gzara</i>	
Improved Geothermal Drilling Solutions Utilizing Nanomaterials and Graphene Oxide as Additives to Overcome HPHT Challenges	203
<i>M. Bouhssas, J. James Abraham, M. Amani</i>	

Geostatistical Modeling and Optimization of Subsurface Reservoir Properties: A Permeability Estimation Example.....	208
<i>S. Aloui, A. S. Abushaikha, A. Elomri</i>	
Prediction of Reservoir Permeability and Porosity using a Deep Learning Technique	213
<i>M. Moussa, A. Abuskaikha</i>	
Enhanced Reservoir Management by Optimizing Multilateral Drilling and Sidetrack Planning, Leveraging 1D-3D Reservoir Mapping Technologies	217
<i>C. J. Keot, A. Morad, V. Kramar, J. Naumann, A. S. Bisain, M. Viandante, R. Bedoya, F. Ben Amor, S. Dasgupta, A. Mukherjee</i>	
4D (Seismic on Demand): Providing Insights for Reservoir Management and Field Development	220
<i>C. Odukwe, F. Rehman, A. L. Memon</i>	
Advanced Geological Characterization of Karst Morphologies Utilizing Integrated Drilling and 3D Seismic in Production Optimization Strategies	222
<i>G. Gangatharan, M. A. Al-Jaber, R. Hussain</i>	

POSTER SESSION 3: LIGHTING SESSION

Limestone Dissolution in CO ₂ -Rich Environments for Carbon Sequestration in Carbonate Reservoirs.....	225
<i>O. Massarweh, M. Alherbawi, T. Al-Ansari, A. Abushaikha</i>	
Coupling Geomechanics with Flow Models using Advanced Hybrid Discretization for Carbon Sequestration Simulation.....	230
<i>C. H. Liu, A. Abushaikha</i>	
Experimental Investigation of Pore-Scale Processes in Surfactant Flooding in Heterogeneous Carbonate Reservoirs.....	235
<i>H. M. Alzahrani, B. Bijeljic, M. J. Blunt</i>	
Innovative Preformed Particle Gels for Effective Water Control in Oil and Gas Reservoirs	239
<i>A. Hamza, A. Ben Ali, R. Elaf, A. Almakimi, M. Saad, I. Hussein, B. Bai</i>	
Reconstruction of 2D Images from 3D micro-CT Rock Images for Numerical Simulations and Reservoir-on-a-Chip Applications	243
<i>A. Tariq, S. Pavuluri, H. Rabbani</i>	
A New Numerical Method to Investigate Capillary End Effects in Coreflooding.....	246
<i>X. Bu, A. Moataz</i>	
SCAL, Saturation Modeling and Model Initialization in Complex Carbonate Reservoirs with Paleo-Conditions and Wettability Dependent Saturation.....	249
<i>A. R. Shah, K. Ghorayeb, C. Darous, M. Nashaat, H. Monfared</i>	
Multidisciplinary Approach for Successful Stress Measurements and Mapping Completion Quality	254
<i>M. E. Sanchez Ho, R. R. Kumar, S. K. Subbiah</i>	
An Integrated Case Study on Utilizing Digital Initiatives on Permanent Downhole Gauge Pressure Fixing Campaigns.....	257
<i>A. Al-Subaie</i>	

Use of Multi-Zones Smart Completions for Reservoir Management in an Extremely Complex Carbonate Reservoir Offshore Qatar	260
<i>M. N. Abu Talib, N. Abdelsamea, B. Marir, A. L. Memon, A. P. Djumriadi, R. Brahmantio</i>	

Author Index