Multi-scale modelling and simulation of fractured carbonate reservoirs

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Abstract
Fractured carbonate formations contain over half of the world’s remaining hydrocarbon reserves but suffer from low recovery. The conceptual model to simulate fluid flow in fractured geological formations is based on Warren and Root’s 50-year old dual-continua model, which represents the fractures as the flowing domain (with little storage) and porous matrix as the stagnant/low-permeability domain (with significant storage). A transfer function quantifies the fluid exchange between the two domains. Although many (incremental) advances have been made since Warren and Root’s original work, the “state-of-the-art” workhorses for modelling and simulation of fractured geological formations are now at least 30 years old and, perhaps not surprisingly, we continue to struggle with generating suitable static and dynamic reservoir models for carbonate reservoirs. This talk will explore how “new” model concepts and numerical discretisation techniques (some of them already have reached the mature age of 20-odd years, nevertheless) could help us to overcome these issues, and if assisted history matching and proxy models are really the answer to everything in (fractured) carbonate reservoir simulation.

Biography
Professor Sebastian Geiger is the Foundation CMG Chair for Carbonate Reservoir Simulation at the Institute of Petroleum Engineering, Heriot-Watt University, where he leads the Carbonate Reservoir Group that comprises over 20 researchers. He is also the co-director of the International Centre for Carbonate Reservoirs in Edinburgh, a joint research alliance between Heriot-Watt
University and University of Edinburgh. His current research interests include modelling, simulating, and upscaling multi-phase flow processes in (fractured) carbonate reservoirs, enhanced oil recovery processes for carbonate reservoirs, and studying the fundamental transport processes in carbonates from a pore-scale perspective. He has authored over 100 technical papers on these topics.

Sebastian received a PhD degree in Computational Geology from ETH Zurich in 2004 and worked at ETH Zurich as a postdoctoral researcher. He holds an MSc degree in Hydrogeology from Oregon State University (2000) and a Vordiplom (~BSc degree) in Geology and Mineralogy from the University of Freiburg, Germany (1997). He joined Heriot-Watt University in 2006 as a lecturer and was promoted to senior lecturer in 2009 and full professor in 2010. He also spent time at Imperial College London and Australia National University, both as a visiting researcher. He is a member of SPE, EAGE, AAPG and the Interpore Society, and an associate editor for Transport in Porous Media and Petroleum Geosciences. He serves on numerous technical committees for SPE and EAGE, including EAGE’s permanent Oil and Gas Geoscience Division committee and the newly founded EAGE Oil and Gas Reserves Committee.