

Terrestrial Environmental Sciences

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Thermo-Hydro-Mechanical- Chemical Processes in Fractured Porous Media: Modelling and Benchmarking

Benchmarking Initiatives

 Springer

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Preface

This is the third volume of the THMC benchmark book series dealing with benchmarks and examples of thermo-hydro-mechanical-chemical processes in fractured porous media:

1. <http://www.springer.com/de/book/9783642271762>
2. <http://www.springer.com/de/book/9783319118932>

Recently, the benchmark books became items of the new book series in “Terrestrial Environmental Sciences” <http://www.springer.com/series/13468>.

The book is subtitled with “Benchmarking Initiative” as we give a short outline about those activities in past and ongoing of benchmarking initiatives such as DECOVALEX, SeS-Bench (Steeffel et al. 2014), MoMaS, etc. These initiatives provide a substantial contribution to the idea of benchmarking codes and improving numerical modeling of coupled processes in porous and fractured media. Other related benchmarking activities in hydrology and carbon capture storage (CCS) are HM-INTERCOMP Maxwell et al. (2014) and CO2BENCH Kolditz et al. (2012a).

The book structure follows the “classic” scheme, first single processes and then coupled processes with increasing complexity. The list of symbols and an index can be found at the end of the book. With this book we also want to award the work of merit of distinguished scientists in the field “Modelling and Benchmarking of THMC Processes.” The contributing scientists and institutions are acknowledged in the introduction. In appendices we present new features of GINA, the OGS pre-processing tool for geotechnical applications as well as an overview of the new ogs⁶ version that is coming soon.

With this version we also provide the input files for self-exercises. This can be found at the OGS community page <http://docs.opengeosys.org/books> (figure next page) where you can also find the material of the first published OGS Tutorials on “Computational Hydrology I” (Sachse et al. 2015).

- <http://www.springer.com/de/book/9783319133348>

and “Introduction to Geothermal Processes”. Enjoy reading and exercising.

The screenshot shows the 'Books & Tutorials' page of the OpenGeoSys website. At the top, there is a navigation bar with 'OpenGeoSys' on the left and 'Releases', 'Download', 'Books', and 'Documentation' on the right. The main heading is 'Books & Tutorials'. Below this, there are three book entries:

- Computational Energy Systems I: Basics of Geothermal Processes** (beginner): This tutorial presents the introduction of the open-source software OpenGeoSys (OGS) for geothermal applications. The material is based on several national and international training courses (e.g. Korea 2012 and China 2013). The book contains general information regarding heat transport modeling in porous and fractured media and step-by-step model set-up with OGS and related components such as the OGS Data Explorer. Five benchmark examples are presented in detail. This book is intended primarily for graduate students and applied scientists, who deal with geothermal system analysis. It is also a valuable source of information for professional geoscientists wishing to advance their knowledge in numerical modelling of geothermal processes including thermal convection processes. As such, this book will be a valuable help in training ...
- Thermo-Hydro-Mechanical-Chemical Processes in Fractured Porous Media: Modelling and Benchmarking** (beginner, intermediate, advanced): The second book in the OpenGeoSys benchmarking series provides guidance to understanding complicated coupled processes based on the experimental data available and implementation of developed algorithms in numerical codes. Results of selected test cases in the fields of closed-form solutions (e.g. deformation processes), single processes (such as groundwater flow) as well as coupled processes are presented. It is part of the OpenGeoSys initiative - an open source project to share knowledge and experience in environmental analysis and scientific computation with the community. The second volume mainly is dedicated to "closed form solutions" developed and provided by Dr. Peter Vogel (BGR). You will find the packed input files for Chapter 2 as an attachment. Inside take a look at the file ...
- Computational Hydrology I: Groundwater Flow Modeling** (beginner): This tutorial on the application of the open-source software OpenGeoSys (OGS) in computational hydrology is based on a one-week HIGRADE-course at the Helmholtz Centre for Environmental Research in Leipzig, Germany. The book contains general information regarding hydrological and groundwater flow modelling and the pre-processing and step-by-step model set-up of a case study with OGS and related components such as the OGS Data Explorer. In addition, it also illustrates the application of pre- and post-processing tools such as ArcGIS or ParaView for the preparation of input data as well as the optimal presentation of simulation results. This OGS tutorial is the result of close cooperation of the Helmholtz Centre for Environmental Research (UFZ) with partner universities (Technische Universität Dresden, Christian-Albrechts ...)

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Happy Birthday—Dear Wenqing



We would like to take this opportunity—your 50-ties birthday—to appraise your tremendous contributions to the scientific community dealing with THMC (thermo-hydro-mechanical-chemical) processes in porous media. Wenqing started his scientific education at the Department of Mathematics and Mechanics of Lanzhou University, China (1983–1987). Lanzhou is the capital and the largest city of Gansu province in Northwest China (<https://en.wikipedia.org/wiki/Lanzhou>). At this beautiful place, we recently started cooperation activities with the Cold and Arid Regions Environmental and Engineering Research Institute of the Chinese Academy of Sciences CAEERI (<http://english.careeri.cas.cn/>) concerning the water resources of the Heihe River Basin. Then Wenqing moved to Xi'an and obtained his ME from the Department of Engineering Mechanics of Xi'an Jiaotong University (1987–1990). Then he did a big step becoming a Ph.D. student of an international exchange program and joined the Faculty of Engineering Mechanics, Shinshu University (Nagano, Japan) (1995–1996). He finished his Ph.D. study at the Department of Engineering Mechanics, Tongji University in Shanghai in 1997 and continued working as lecturer there until 1999. He returned to Japan and worked from 1999–2000 as a research associate at the Department of Mechanical Engineering and Intelligent Systems, University of Electro-Communications in

Tokyo. Again Wenqing decided to make another big move (to Germany) and became a post-doc in the Numerical Analysis Group, Department of Mathematics, University of Tübingen (Prof. Hiptmayr). This was a nice coincidence as Wenqing's and my ways crossed each other when I started as a Professor for Geohydrology/Hydroinformatics at Tübingen University exactly at the same time. It took one meeting (at least for me) to recognize that Wenqing is the right person for launching the OpenGeoSys idea, he is a brilliant mathematician, dedicated to numerical and computational methods and most of all he is the personal loyalty to the open-source initiative. Meanwhile he supported so many young scientists in their academic career never asking "what is my personal benefit out of this"—this is just extraordinary. Wenqing is one of the finest persons I have ever met and which I consider a tremendous personal gift to me. I was very lucky that Wenqing followed the OGS route to UFZ Leipzig into the eastern part of Germany. He became a staff scientist with the Helmholtz Centre for Environmental Research UFZ (tenured in 2008). Wenqing did very important scientific contributions to numerical modeling of THM processes in porous media (his most cited works see below). He received several awards during his career as a young scientist, Kwang-Hua Award for Ph.D. student, Tongji University, Scholarship of International Student Exchange Program between China and Japan. In 2014 Wenqing received the "OpenGeoSys Award" for his outstanding contributions to the scientific community in open-source developments—he is a real a pioneer in this regard.

Dear Wenqing: We wish you all the best for you personally and your family in the future and—of course—we count on you in the future of ogs⁶⁺⁺ developments ...

Wenqing's publication list (links to papers and citations):

- Research ID: www.researcherid.com/rid/B-9702-2008
- ResearchGate: www.researchgate.net/profile/Wenqing_Wang2