

**Bachelor thesis
for
Mr./Miss Name/Surname**

FAKULTÄT FÜR BAUINGENIEURWESEN
UND GEODÄSIE

**Institut für Strömungsmechanik und
Umweltphysik im Bauwesen**

Date of issue:	01.01.2026	Editing scope:	750 hours
Last possible date for handing in:	01.07.2026	Processing time:	6 months
First examiner:	Name		
Second examiner:	Name		
Supervisor:	Name		

edited by:
Gergely Schmidt
Tel. +49 511 762 4205
Fax +49 511 762 3777
E-Mail: mail@hydromech.uni-hannover.de

02.06.2025

**Topic: Parameter Upscaling für ein künstliches Reservoir mit Matlab
Parameter Upscaling of an Artificial Reservoir with Matlab**

Project description:

Due to the rapidly increasing demand and fluctuating supply/production of gaseous energy sources, scalable gas storage facilities are required, of which underground storage is a particularly cost-effective, safe and resource-saving option. Numerical transport models expand the understanding of risks and costs of newly planned storage sites, but cannot usually be carried out with the high grid fineness of geological models [1]. Therefore, an upscaling of petrophysical fields is often necessary, for which two different methods will be tested in this work. Both upscaling methods are demonstrated in the example script "upscalingExample3" within the open-source code Matlab Reservoir Simulation Toolbox (MRST) and are to be reproduced with parameter distributions based on real data. Finally, the different upscaling results will be tested using DuMuX flow simulations.

The following points are to be dealt with within the frame work of the project work:

- familiarization with reservoir modeling [1,2] and literature research on upscaling methods
- Adaption of the MRST script upscalingExample3.m regarding a provided parameter distribution
- Upscaling to two different grid finenesses (with/without averaging beyond layer boundaries) with two different methods for permeability
- Simulating hydrogen injection into the reservoir model using all generated grids
- Evaluation of differences with Paraview
- Description, plausibility check and critical discussion of the results
- Recommendations for future studies (outlook)

At the beginning of the project, a binding milestone plan with the most important steps and intermediate goals of the thesis must be agreed upon and written down in consultation with the supervisor. The milestone plan is binding for further work. In justified cases, it can be changed by mutual agreement in during the project. The thesis must be preceded by an abstract in German and English. In addition, five keywords describing the content of the thesis are to be stated in each case.

In the preparation of the thesis, particular importance shall be denoted to explanatory comments on the parameters considered, the concise presentation of theoretical principles and the clear presentation of the results obtained. Additional questions that arise during the work can be addressed in consultation with the supervisor. The scope of the individual subtasks is to be coordinated with the supervisor during the course of the thesis. The results of the thesis are to be compiled in a written report and presented in a colloquium. All data (e.g. numerical models, experimental data, drawings, presentation slides etc.) must be submitted digitally.

The following aids are provided for the processing:

- Fine-grid porosity and permeability distribution
- DuMuX model

The following literature is recommended as an introduction to the topic, which should be supplemented with further sources in the course of the work:

- [1] Lie, K.-A. (2019): An Introduction to Reservoir Simulation Using MATLAB/GNU Octave: User Guide for the MATLAB Reservoir Simulation Toolbox (MRST)
- [2] Ringrose, P. & Bentley, M. (2021): Reservoir Model Design: A Practitioner's Guide

For the successful completion of the thesis, the student will be given the following documents, the contents of which the student will discuss with the supervisor and the transfer of which will be confirmed by both signatures:

- ☐ I have received the *project description* (this document).
- ☐ I have received the *evaluation form* and I understand the standards by which the ISU evaluates.
(archiv\Lehre\Abschlussarbeiten\forms)
- ☐ I have received the document *ISU scientific writing* and I understand its content.
(archiv\Lehre\Abschlussarbeiten\guidelines)
- ☐ I have received the document *declaration of independence* and I understand its content.
(archiv\Lehre\Abschlussarbeiten\guidelines)
- ☐ I have received the word and/or Latex template.
(archiv\Lehre\Abschlussarbeiten\templates)

Date, Name Surname

Date, Prof. Dr.-Ing. Name Surname