Applied Multidimensional Geological Modelling: 
Enabling the Sustainable Use of the Shallow Subsurface

EDITORS: A.K. TURNER, H. KESSLER, M. VAN DER MEULEN

CONTACT: kturner@mines.edu

5th European Meeting on 3D Geological Modelling
Bern, Switzerland – 21-21 May, 201
BOOK HAS 26 CHAPTERS IN 5 PARTS

1 – INTRODUCTION AND BACKGROUND
  ▪ 4 CHAPTERS

2 – BUILDING AND MANAGING MODELS
  ▪ 11 CHAPTERS

3 – USING AND DISSEMINATING MODELS
  ▪ 2 CHAPTERS

4 – CASE STUDIES
  ▪ 8 CHAPTERS

5 - FUTURE POSSIBILITIES AND CHALLENGES
  ▪ 1 CHAPTER
There are FOUR Chapters - they describe the economic, technological and institutional factors that influence geological modeling projects:

- **CHAPTER 1: Introduction**

- **CHAPTER 2: Geological Survey Data and the Move from 2-D to 4-D**
  The GSO viewpoint – from several GSO’s

- **CHAPTER 3: Legislation, Regulation and Management**
  Explains how modeling affects, and is affected by, laws and regulations.

- **CHAPTER 4: The Economic Case for establishing Subsurface Ground Conditions and the Use of Geological Models**
  The Economic value of modeling – the viewpoint of the geotechnical industry
There are ELEVEN Chapters covering the entire spectrum of scientific, technical and economic issues that influence the creation of models:

**A) FOUR CHAPTERS ON INITIAL TOPICS**

- **CHAPTER 5: Overview and History Of 3-D Modeling Approaches**
  History of 3-D modeling; Mahomet Aquifer model sequence; overview Chapters 9-12.

- **CHAPTER 6: Setting Up Effective and Efficient Workflows**
  Custom 3-D modeling workflows produce significant gains in modeling efficiency, reliability, and meet goals.

- **CHAPTER 7: Data Sources for building Geological Models**
  Data source review: legacy vs new, elevations, surface vs subsurface, geophysics

- **CHAPTER 8: Data Management Considerations**
  Data management methods: managing data & models, properties, integrated models, transboundary issues
There are ELEVEN Chapters covering the entire spectrum of scientific, technical and economic issues that influence the creation of models:

**PART 2: BUILDING AND MANAGING MODELS**

**B) FOUR CHAPTERS ON ALTERNATIVE MODEL-BUILDING APPROACHES**

- **CHAPTER 9:** Model Creation Using Stacked Surfaces  
  Using GIS-related data & methods (ArcGIS etc.)

- **CHAPTER 10:** Model Creation Based on Digital Borehole Records and Interpreted Geological Cross-sections  
  Subsurface data from Boreholes & cross sections (GSI3D, SubsurfaceViewer, and similar products)

- **CHAPTER 11:** Models Created as 3-D Cellular Voxel Arrays  
  Techniques and uses of cellular models – examples from GEOTOP from the Netherlands

- **CHAPTER 12:** Integrated Rule-Based Geomodeling – Explicit and Implicit Approaches  
  Modeling with surface fitting and implicit methods (GOCAD, GOCAD-SKUA, GeoModeller, etc)
PART 2: BUILDING AND MANAGING MODELS

There are ELEVEN Chapters covering the entire spectrum of scientific, technical and economic issues that influence the creation of models:

C) THREE CHAPTERS ON MODEL APPLICATION & EVALUATION

• CHAPTER 13: Discretization and Stochastic Property Modeling
  Identifying User Needs & Linkages to Current Decision-making Processes
  Time-dependent (4-D) models for groundwater, geothermal, geotechnical applications, assessing

• CHAPTER 14: Linkage to Process Models
  Geophysical models for groundwater, geothermal, geotechnical applications, assessing

• CHAPTER 15: Uncertainty in Geological Models
  Identifying and assessing all sources of uncertainty in models – how to communicate uncertainty
There are TWO Chapters - they include information derived from the COST SUB-URBAN project:

• CHAPTER 16: Emerging User Needs in Urban Planning
  Overview of urban planning, resilient cities, challenges for urban modeling, New Orleans example

• CHAPTER 17: Providing Model Results to Diverse User Communities
  Visualization, static printed products, data distribution, animations, interactive digital models, interactive physical models
PART 4 – CASE STUDIES

Each Chapter has 2-5 (average 3) Case Studies related to Theme.

• CHAPTER 18: Application Theme 1: Urban Planning
• CHAPTER 19: Application Theme 2: Groundwater Evaluations
• CHAPTER 20: Application Theme 3: Geothermal Heating/Cooling
• CHAPTER 21: Application Theme 4: Legislative and Regulatory Support
• CHAPTER 22: Application Theme 5: Geohazard Identification
• CHAPTER 23: Application Theme 6: Infrastructure
• CHAPTER 24: Application Theme 7: Construction Resources
• CHAPTER 25: Application Theme 8: Archeology & Historical Preservation
CHAPTER 26: Anticipated Technological Advances

Final Chapter summarizes the status quo and future possibilities.
Applied Multidimensional Geological Modelling: 
Enabling the Sustainable Use of the Shallow Subsurface

SUMMARY:

- Book will total around 450 pages
- It will be published as both hard copy and E-book (digital)
- Individual chapters may be selected/purchased for university courses
- Manuscript is 98% complete – in process of being transferred to JOHN WILEY (publisher)
- Copyright approvals being completed (please sign if asked!)

GOAL: to see book available in 2019!