A decade of applied groundwater modelling in Sweden: bridging the gaps between academic advancements, industry, and higher education

Benavides Höglund, Nikolas; Sparrenbom, Charlotte J.; Barthel, Roland

A decade of applied groundwater modelling in Sweden: Bridging the gaps between academic advancements, industry, and higher education

Nikolas Benavides Höglund[1], Charlotte Sparrenbom[1], Roland Barthel[2]
[1]Lund University, Lund, Sweden; [2]University of Gothenburg, Gothenburg, Sweden

Aim & scope

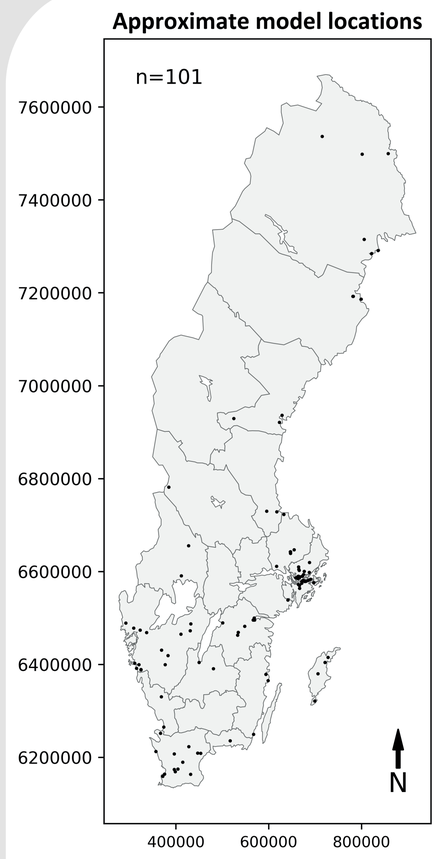
- **Explore** the presence and scope of groundwater modelling in Swedish higher education
- **Identify** industry sectors using groundwater models and their objectives and predictions
- **Evaluate** the adoption of new tools and methods in both Swedish groundwater education and applied modelling in industry
- **Discover** areas of improvement for industry practitioners, educational institutions, and environmental authority decision makers

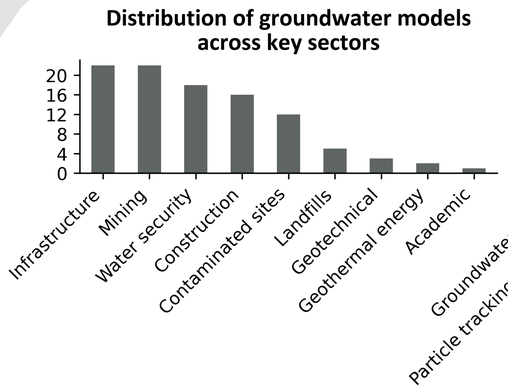
Materials & Methods

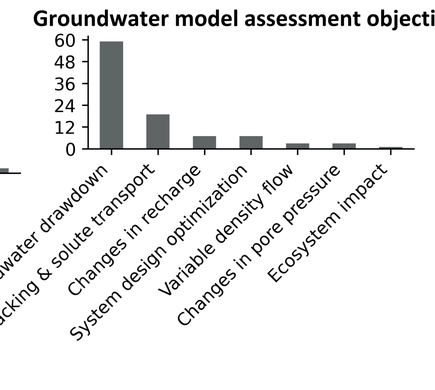
A baseline understanding of the current state of groundwater modelling education and industry application in Sweden was assessed through:

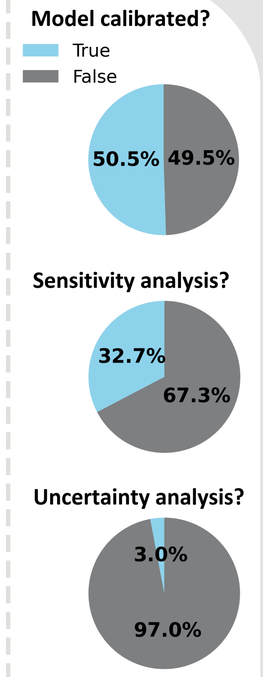
- **Analysis of syllabi**: Water-related STEM course syllabi were downloaded from Swedish higher education institutions to examine educational content
- **Survey of groundwater practitioners**: A survey was conducted among industry professionals to gather insights on practical application and sentiment
- **Collection of reports (2010-2023)**: Reports documenting groundwater models in Sweden were collected by reaching out to:
  - All 21 County Administrative Boards
  - All 209 Municipalities
  - Water producers
  - Industry practitioners
  - Conducting search engine searches

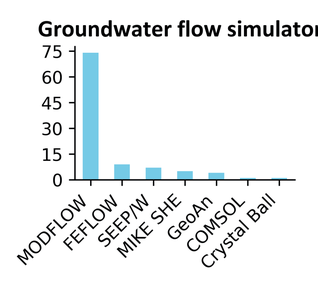
Results

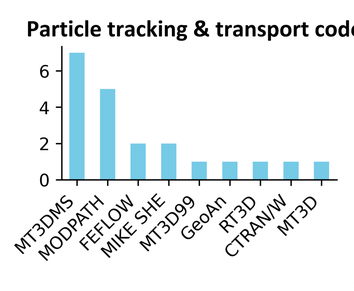


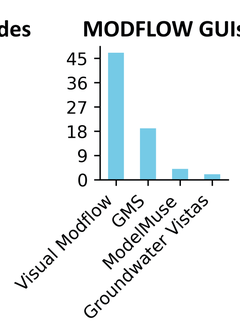


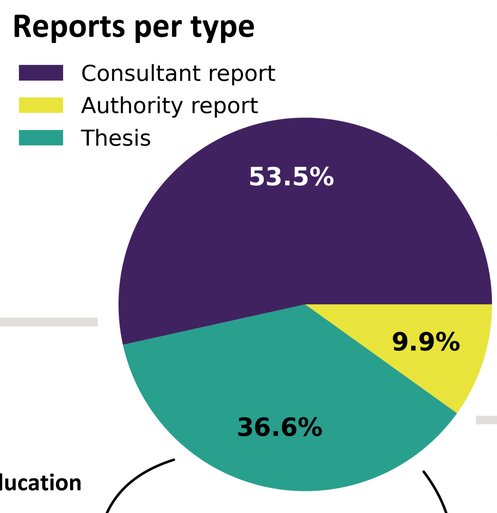


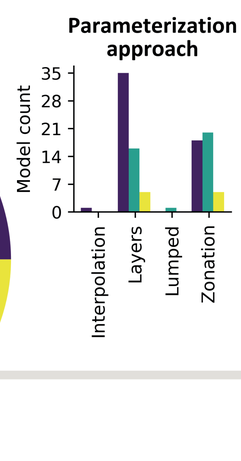


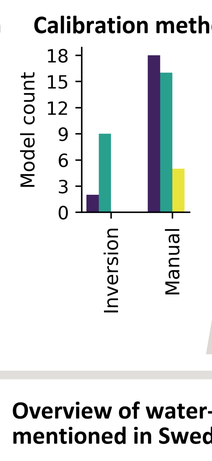




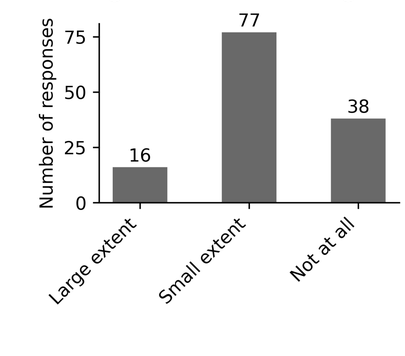


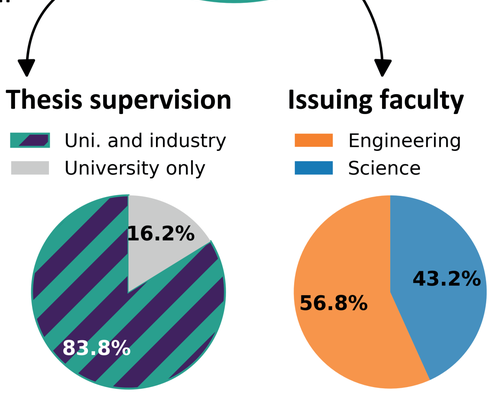


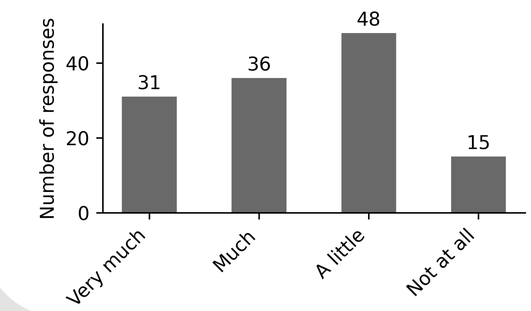




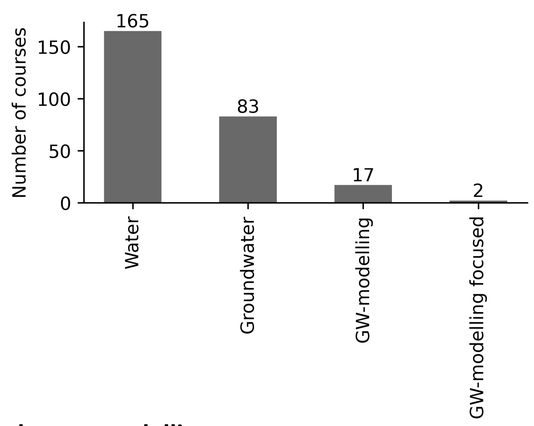
EDUCATION

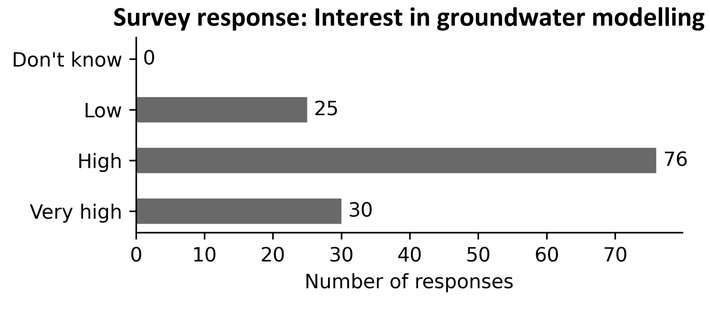






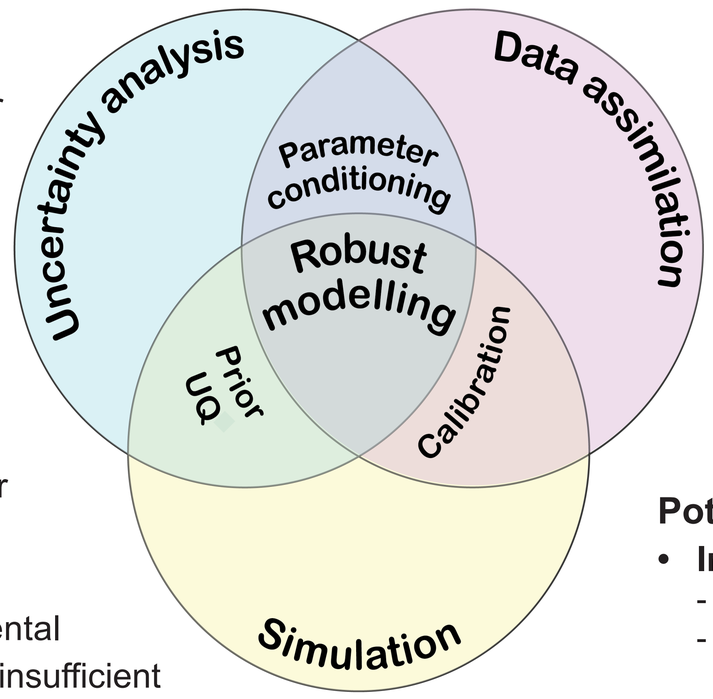
INDUSTRY





Main conclusions

- **Key koncepts missing in curricula:** Groundwater modelling is often a minor part of hydrogeology courses, focusing mainly on simulation and missing key concepts like data assimilation and uncertainty analysis
- **Positive sentiment & eagerness to learn:** Practitioners see groundwater modelling as an important tool and are interested in improving their skills and knowledge to use it effectively
- **Non-robust modelling cause issues:** Environmental authorities and local interest groups often highlight insufficient assessment of model uncertainties by practitioners, potentially leading to permit denials for clients and subsequent consequences



Learn more & connect

Paper accepted for publication. Soon available on DOI: 10.1007/s13280-024-02068-7

nikolas.hoglund@geol.lu.se
linkedin.com/in/nikolashoglund

Potential areas of improvement include:

- **Increased focus on groundwater education**
  - Hydrogeology should be a program rather than a course
  - A dedicated groundwater modelling course which includes the topics of data assimilation and uncertainty analysis
- **Implementing guideline recommendations**
  - May promote robustness, consistency and transparency
  - Should be flexible, allow deviation when justified and facilitate innovation

World Groundwater Congress
IAH2024DAVOS
Switzerland