

## PERSONAL DETAILS

NAME: Maria Elenius

ORGANIZATION: SMHI

GENDER: F

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H-index: 7

## WORK EXPERIENCE

### **SENIOR RESEARCHER HYDROLOGY AND WATER QUALITY, SMHI, SWEDEN, 2019 - PRESENT**

Hydrology and water quality assessments using the hydrological model HYPE, with focus on droughts, wetland restoration and the relation to ecological impacts. Scientific leader *Water for Biodiversity* from 2023.

### **HYDROLOGY CONSULTANT, SMHI, SWEDEN, 2018 - 2019**

Consultancy for hydropower production, drinking water quality and soil stability. Assessments using hydrological simulations with HBV and HYPE

### **SENIOR RESEARCHER, UNI RESEARCH, NORWAY, 2015 - 2018**

Modeling geological carbon storage, focus on large-scale impacts

### **POSTDOC IN GROUNDWATER QUALITY, TUFTS UNIVERSITY, USA, 2013 - 2015**

Development of upscaled models for contaminant groundwater transport in heterogeneous soil

### **SENIOR RESEARCHER, UNI RESEARCH, NORWAY, 2011 - 2013**

Developments for modeling geological carbon storage, focus on convective mixing at small scales

### **PHD STUDENT, BERGEN UNIVERSITY, DEPT. OF APPLIED MATHEMATICS, NORWAY, 2008-2011**

Developments for modeling geological carbon storage, focus on convective mixing of CO<sub>2</sub> in brine

### **WSP, CONSULTANT SUBSURFACE HYDROLOGY, SWEDEN, 2001 - 2008**

Risk assessment and solutions for contaminated soil, groundwater and sea sediments; group leader

## EDUCATION

UGL leadership training, Gällöfsta Perlan Ledarskap, October 24-28, 2022

Readership course (Docentkurs), Lund University, 2021

PhD in Applied Mathematics, Bergen University, 2008 - 2011

MSc in Environmental Technology, Uppsala University, 1995 – 2001

## PUBLICATIONS

### Journal publications

1. Elenius, M.T., E. Uzeirbegovic, J. Näslund and A. Lavenius (in review) No support for using brown trout as an indicator species for ecological impacts of low flow in Swedish rivers.
2. Lykke Sørensen, J., ..., Elenius, M.T., ... (submitted) Decision Support Indicators (DSIs) and their role in hydrological planning.
3. Elenius, M.T. and G. Lindström (2022) Introduced flow variability and its propagation downstream of hydropower stations in Sweden. *Hydrology Research*, 53(11), 1321-1339. <https://doi.org/10.2166/nh.2022.138>
4. Elenius, M.T. and S.E. Gasda (2021) Convective mixing with non-monotonic density. *Transport in porous media*, 138:133-155. <https://doi.org/10.1007/s11242-021-01593-3>
5. Photiadou, C., B. Arheimer, T. Bosshard, R. Capell, M. Elenius, I. Gallo, F. Gyllensvärd, K. Klehmet, L. Little, I. Ribeiro, L. Santos and E. Sjökvist (2020) Designing a climate service for planning climate actions in vulnerable countries. *Atmosphere*, 12, 121. <https://doi.org/10.3390/atmos12010121>
6. Elenius, M.T. and L.M. Abriola (2019) Regressed models for multirate mass transfer in heterogeneous media. *Water Resources Research*, 55. <https://doi.org/10.1029/2019WR025476>
7. Elenius, M.T. et al. (2018) Assessment of CO<sub>2</sub> storage capacity based on sparse data: Skade formation. *International Journal of Greenhouse Gas Control*, 79:252-271. <https://doi.org/10.1016/j.ijggc.2018.09.004>
8. Gasda, S.E., M. Wangen, T.I. Bjørnarå, M.T. Elenius (2017) Investigation of caprock integrity due to pressure build-up during high-volume injection into the Utsira formation. *Energy Procedia*, 114:3157-3166, <https://doi.org/10.1016/j.egypro.2017.03.1444>
9. Elenius, M.T., D.V. Voskov and H.A. Tchelepi (2015) Interactions between gravity currents and convective dissolution. *Advances in Water Resources*, 83:77-88. <http://dx.doi.org/10.1016/j.advwatres.2015.05.006>
10. Elenius, M.T., J.M. Nordbotten and H. Kalisch (2014) Convective mixing influenced by the capillary transition zone, *Computational Geosciences*, 18:417-431. <https://doi.org/10.1007/s10596-014-9415-1>
11. Elenius, M.T. and S.E. Gasda (2013) Convective mixing in formations with horizontal barriers, *Advances in Water Resources*, 62:499-510. <http://dx.doi.org/10.1016/j.advwatres.2013.10.010>
12. Elenius M.T. and K. Johannsen (2012) On the time scales of nonlinear instability in miscible displacement porous media, *Computational Geosciences* 16:901:911. <https://doi.org/10.1007/s10596-012-9294-2>
13. Elenius, M.T., J.M. Nordbotten and H. Kalisch (2012) Effects of a capillary transition zone on the stability of a diffusive boundary layer, *IMA J Appl Math*, 77:771-787. <https://doi.org/10.1093/imamat/hxs054>

### PhD Thesis

1. Elenius, M.T. Convective mixing in geological carbon storage, University of Bergen, 2011. [https://bora.uib.no/bora-xmlui/bitstream/handle/1956/5540/41952%20Elenius%20main\\_thesis.pdf?sequence=1&isAllowed=y](https://bora.uib.no/bora-xmlui/bitstream/handle/1956/5540/41952%20Elenius%20main_thesis.pdf?sequence=1&isAllowed=y)

### Reports (selection of recent)

1. Schützer, S., M. Elenius, K. Isberg and J. Temnerud (2023) Nedströmseffekter från återvätning av dikad skog på torv (Downstream impacts of rewetting drained forest on peatland). SMHI Hydrologi Rapport Nr 130.  
<https://www.smhi.se/publikationer/publikationer/nedstromseffekter-fran-atervatning-av-dikad-skog-pa-torv-1.193300>
2. Orsholm, J. and M.T. Elenius (2022) Effects of hydrology on wetland biodiversity. A literature study and development of hydrological indicators. SMHI Hydrology Report No 22.  
<https://www.smhi.se/publikationer/publikationer/effects-of-hydrology-on-wetland-biodiversity-a-literature-study-and-development-of-hydrological-indicators-1.180948>
3. Strömquist, J., E. Johansson, M. Elenius, E. Bölenius, M. Bertrand and C. Hayer (2020) Förbättrad vattenbalansberäkning genom inkludering av jordbruksbevattning (Improved water balance calculations by accounting for agriculture irrigation). SMHI Hydrologi Nr 124. ISSN 0283-7722  
<https://www.smhi.se/publikationer/publikationer/forbatttrad-vattenbalansberakning-genom-inkludering-av-jordbruksbevattning-1.165938>

### Conference proceedings

1. Gasda, S.E., M.T. Elenius and I. Aavatsmark, Numerical Solution of CO<sub>2</sub>-Hydrocarbon Convective Mixing, XXII International Conference on Water Resources, 2018.
2. Gasda, S.E., M.T. Elenius and R. Kaufmann, Field-Scale Implications of Density-Driven Convection in CO<sub>2</sub>-EOR Reservoirs, EAGE Fifth CO<sub>2</sub> Geological Storage Workshop, 2018.
3. Tveit, S, S.E. Gasda, H. Hægland, G. Bødker and M.T. Elenius, Numerical Study of Microbially Induced Calcite Precipitation as a Leakage Mitigation Solution for CO<sub>2</sub> Storage, EAGE Fifth CO<sub>2</sub> Geological Storage Workshop, 2018.
4. Elenius, M.T., J.M. Nordbotten and H. Kalisch, Efficiency of dissolution trapping in geological carbon storage, 13th European Conference on the Mathematics of Oil Recovery (Ecmor), 2012.
5. Elenius, M.T., and S.E. Gasda, Impact of tight horizontal layers on dissolution trapping in geological carbon storage, XIX International Conference on Water Resources (CMWR), 2012.
6. Elenius M.T., H. Tchelepi and K. Johannsen, CO<sub>2</sub> trapping in sloping aquifers: High resolution numerical simulations, XVIII International Conference on Water Resources (CMWR), 2010.

## INTERNATIONAL CONFERENCES

Dr Elenius has presented her work at more than 20 international conferences, such as International Association of Hydrological Sciences (IAHS), European Geophysical Union (EGU) General Assembly, American Geophysical Union (AGU) Fall meetings, Computational Methods in Water Resources (CMWR) and SIAM conferences on Mathematical and Computational Issues in the Geosciences.

## GRANTS AND SCHOLARSHIPS

2023 Awarded contract “Rewetting of drained forest wetlands: strategies for implementation and adaptation to future climate” from the Swedish Environmental Protection Agency, 22 MSEK. Co-PI

2022-2023 Awarded contracts for downstream effects of rewetting of drained forest from the Swedish Environmental Protection Agency. PI

2017 Awarded contract “Efficient models for microbially induced calcite precipitation as a seal for CO<sub>2</sub> storage” from the Research Council of Norway, 2.8 MSEK. PI

2014 Awarded contract “Interaction between convective mixing, the capillary transition zone and mineral reactions” from Stanford University. Lead investigator

2012 Awarded grant Geological Storage of CO<sub>2</sub>: Mathematical Modelling and Risk Assessment, with the Research Council of Norway and Statoil. Co-investigator

2001-2008 Awarded a large number of contracts as consultant; from industry, municipalities and the country administrative board. PI and co-investigator.

2000 Awarded scholarship for hydrological field study in Chile

1998 Awarded scholarship for undergraduate studies in Spain

## PROFESSIONAL ACTIVITIES AND SERVICE

Reviewer for *Ambio*, *Advances in Water Resources*, *Water Resources Research*, *Transport in Porous Media* and *Journal of Porous Media*

Scientific project reviewer for the Swedish Environmental Protection Agency

Board member of the Swedish hydrological council (Svenska hydrologiska rådet), 2023-present

Member of expert group supporting Swedish research council Formas’ European research program and missions, 2024-

Chair of Gordon Research Seminar in Flow & Transport in Permeable Media, 2016

Member of hiring committees for research staff

Member of European Geosciences Union

## EXPERIENCE IN TEACHING AND ADVISING

Guest-lecturer in university courses:

- Runoff, Uppsala University, 1TV443, Feb 2022.
- Groundwater, Uppsala University, 1TV442, Feb 2022.
- Introductory class in climate change engineering, Tufts University, ES0093-09, Nov 2013.
- Numerical Methods for Partial Differential Equations, Tufts University, Math 250, March 2015.

Other lectures:

- Trial lecture during PhD, Bergen University, Convective mixing
- Trial lecture during PhD, Bergen University, Discretization of hyperbolic partial differential equations.

Student adviser:

- PhD adviser, Hugo Rudebeck (2023-) Climate adaptation to hydrological extremes in Sweden. SMHI and Lund University.

- Main adviser for master thesis in Environmental Engineering, Stina Perman (2021) Modeling the microbial fate and transport in rivers of South Africa. Uppsala University. <https://www.diva-portal.org/smash/get/diva2:1580847/FULLTEXT01.pdf>

Other experiences in teaching and advising:

- Adviser for recently graduated temporary staff at SMHI in 2021/2022
  - Anna Engman, Modeling alkalinity transport to the sea using the NET model
  - Sara Schützer, Prioritization of peatland rewetting based on downstream effects including brownification, HYPE model developments
  - Karin Lindqvist, Development of irrigation modeling in Sweden
  - Axel Lavenius, Machine-learning for evaluation of trout dependence on flow
  - Johanna Orsholm, Effects of hydrology on wetland biodiversity, literature study and development of indicators
  - Aida Esmailzadeh Davani, Rewetting of drained wetlands for reduced greenhouse gas emissions, literature study
- Lecturer in SMHI's course on hydrological modeling with HYPE
- Adviser for individual course projects within "The advanced international training program on Climate Change – Mitigation and Adaptation", SMHI, sponsored by the Swedish International Development Cooperation Agency
- Sensor for courses in mathematics (University of Bergen).

## OTHER QUALIFICATIONS

Proficient in programming languages: R, Python, Fortran, MATLAB and LaTeX.

Proficient in software on surface hydrology: HYPE and HBV.

Proficient in software on porous media flow (solving partial differential equations): AD-GPRS, MODFLOW, MT3D.

Fluent in Swedish, English and Spanish. Perfect understanding of Norwegian.