Maria Elenius

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Scientific field of interest and expertise

Swedish hydrology and HYPE model setup
Surface and subsurface flow modeling
Water quality modeling
Geological storage of carbon dioxide (CO_2)

Education

2008-2011	University of Bergen, Department of Mathematics, Norway: PhD student, *Risk Assessment of Geological Storage of CO_2 – Numerical Investigations*. Courses in partial differential equations, finite element methods, functional analysis and theory of science and ethics.
2001-2008	WSP Environmental, Karlskrona, Sweden: Courses in project management, salesmanship and risk assessment of contaminated land.
1995-2001	Uppsala University, Sweden: Environmental Engineering incl. Master thesis *Modeling of multiphase transport in gasoline contaminated soil*.

Professional experience

2019-present	SMHI, Norrköping, Sweden: Senior Researcher in hydrology and water quality.
2018-2019	SMHI, Norrköping, Sweden: Consultant in hydrology with applications to hydropower production, drinking water supply and soil stability.
2015-2018	Uni Research, Bergen, Norway: Senior Researcher in geological CO_2 storage.
2013-2015	Tufts University, Boston, USA: Postdoctoral Research Fellow in subsurface hydrology.
2011-2013	Uni Research, Bergen, Norway: Senior Researcher in geological CO_2 storage.
2008-2011	University of Bergen, Department of Mathematics, Norway: PhD student, including a 6 month research stay at Stanford University.
2001-2008	WSP Environmental, Karlskrona, Sweden: Consultant in subsurface hydrology.

Additional formation

2000, 2 months	University of Santiago de Chile, Swedish University of Agricultural Sciences and Swedish International Development Cooperation Agency: Field study in Chile on assessment of soil infiltration capacity with report *Possibilities to improve agriculture in the dry-lands of Chile.*
1998, 6 months	University of Santiago de Compostela, Spain: Exchange program including courses in for example oceanography and environmental geology.
1998, 3 months	University of Kalmar, Sweden: Course for environmental informers.

Grants and scholarships

2017	Awarded contract *Efficient models for microbially induced calcite precipitation as a seal for CO_2 storage* from the Research Countil of Norway. PI.
2014	Awarded contract *Interaction between convective mixing, the capillary transition zone and mineral reactions* with Stanford University. Lead investigator.
2012	Awarded grant *Geological Storage of CO_2: Mathematical Modelling and Risk Assessment, II* with the Research Council of Norway and Statoil. Co-investigator.
2001-2008	Awarded a large number of contracts as consultant, with industry, municipalities and the county administrative board. PI and co-investigator.
2000	Awarded scholarship for field study in Chile.
1998	Awarded scholarship for undergraduate studies in Spain.

Other qualifications

Proficient in programming languages: C, C++, Fortran, Python, R, MATLAB, and LaTeX.
Proficient in software on surface hydrology: HYPE and HBV.
Proficient in software on porous media flow: AD-GPRS, MODFLOW, MT3D.
Fluent in Swedish, English and Spanish. Perfect understanding of Norwegian.

Professional activities and service

Reviewer for Advances in Water Resources, Water Resources Research, Transport in Porous Media, SPE (Society of Petroleum Engineers) Journal and Journal of Porous Media.
Chair of the 2016 Gordon Research Seminar in Flow & Transport in Permeable Media.
Member of hiring committees for research staff.

Experience in teaching and advising

Course: Introductory class in climate change engineering, guest-lecturer (Tufts, ES0093-09), Nov 2013.

Course: Numerical Methods for Partial Differential Equations, guest-lecturer (Tufts, Math 250), March 2015.

Trial lectures during PhD: 1) Convective mixing; 2) Discretization of hyperbolic partial differential equations (University of Bergen).

Sensor at courses in mathematics (University of Bergen).

Training of co-workers during my time as consultant.

Publications

Journal articles

[J1] Elenius, M.T. and S.E. Gasda (submitted), Convective mixing driven by non-monotonic density.

[J2] Elenius, M.T. and L.M. Abriola (2019), Regressed modelds for multi-rate mass transfer in heterogeneous media, Water Resources Research, 55, https://doi.org/10.1029/2019WR025476

[J3] Elenius, M.T. et al. (2018), Assessment of CO_2 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

[J4] 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

[J5] 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

[J6] 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

[J7] 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

[J8] Elenius M.T. and K. Johannsen (2012), On the time scales of nonlinear instability in miscible displacement porous media flow, Computational Geosciences 16:901–911, https://doi.org/10.1007/s10596-012-9294-2.

[J9] Elenius, M.T., J.M. Nordbotten and H. Kalisch (2012), Effects of a capillary transition zone on the stability of density driven convection, IMA J Appl Math, 77:771-787, https://doi.org/10.1093/imamat/hxs054

Book

[B1] Elenius, M.T. Convective mixing in geological carbon storage, PhD thesis, University of Bergen, 2011.

Conference proceedings

[C1] Gasda, S.E., M.T. Elenius and I. Aavatsmark, Numerical Solution of CO_2-Hydrocarbon Convective Mixing, XXII International Conference on Water Resources, 2018.

[C2] Gasda, S.E., M.T. Elenius and R. Kaufmann, Field-Scale Implications Of Density-Driven Convection In CO_2-EOR Reservoirs, EAGE Fifth CO_2 Geological Storage Workshop, 2018.

[C3] 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_2 Storage, EAGE Fifth CO_2 Geological Storage Workshop, 2018.

[C4] 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.

[C5] 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.

[C6] Elenius M.T., H. Tchelepi and K. Johannsen, CO_2 trapping in sloping aquifers: High resolution numerical simulations, XVIII International Conference on Water Resources (CMWR), 2010.

Invited talks

Elenius, M.T. Carbon dioxide reactive transport in presence of the capillary transition zone. Department of Earth Science and Engineering, Imperial College, March 2015.

Elenius, M.T. Carbon dioxide reactive transport in presence of the capillary transition zone. School of Earth and Environment, The University of Leeds, February 2015.

Elenius, M.T. Source zone mass depletion with multi-rate mass transfer in heterogeneous media, Uni Research, Center of Integrated Petroleum Research, January 2015.

Elenius, M.T. Convective mixing influenced by realistic capillary transition zones. Department of Civil and Environmental Engineering, Tufts University, December 2012.

Elenius, M.T. Dissolution in geological CO_2 storage. Earth Science Department, University of Bergen, November 2011.

Elenius, M.T. Capillarity and fingering in CO_2 storage. Uni Research, Center of Integrated Petroleum Research, November 2010.

Elenius, M.T. CO_2 gravity currents with residual- and solution trapping - Refined numerical simulations. Lawrence Berkley National Laboratory, December 2009.

International conferences

Dr Elenius has presented her work at approximately 20 international conferences, such as 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.