

Bart Rogiers

I am a research scientist and the R community lead at the Belgian Nuclear Research Centre, and also have a seat in the board of the International Association of Hydrogeologists' Belgian chapter.


My research interests are currently focused around the introduction of probabilistic programming in radiological characterization and hydrogeology, and leveraging procedural solid texture synthesis for porous media reconstruction, targeting natural and engineered barrier materials considered in the framework of radioactive waste disposal.


I furthermore really enjoy introducing people to the modern side of R, and help them adopt it as their main workhorse for more reproducible science.




PROFESSIONAL EXPERIENCE

- Present
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2015

● **Board member**
IAH Belgium (BCH-CBH)  Brussels, Belgium
- Present
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2013




● **Research scientist**
Belgian Nuclear Research Centre (SCK CEN)  Mol, Belgium
- 2009
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2008

● **Internship**
Flanders Environment Agency  Brussels, Belgium

Topic River restoration of the Zwarte Beek between Beringen and Diest: Evaluation of the impact on the groundwater system.

Supervisor Lermytte J

CONTACT INFO

 rogiersbart.github.io
 bart.rogiers@sckcen.be
 rogiers.bart@gmail.com

SKILLS






R, RStudio, Quarto, Stan, Bash, Python, git, GitHub, MODFLOW, MT3D, SQL, markdown, CSS, HTML, LaTeX, MS Office

DOMAINS


Data science, hydrogeology, spatial data, porous media, radiological characterization



TEACHING EXPERIENCE

- 2023 ● **R: Create command line tools with {optparse}**
SCK CEN Learning & development  Mol, Belgium
- Format** 1-day course
- Topics** Environment variables, Git Bash, R in a terminal, redirections, command line arguments and options, automated execution.
- 2023 ● **R: Handle your data with the {tidyverse}**
SCK CEN Learning & development  Mol, Belgium
- Format** 3-day course
- Topics** Data reading, cleaning, manipulation and visualization, handling specific types, and iteration and nesting.
- 2023 ● **R: Get started**
SCK CEN Learning & development  Mol, Belgium
- Format** 1-day course
- Topics** Installing the required software, tweaking the RStudio IDE, managing contributed packages, binding names to values, working with vectors, subsetting R objects, using control flow
- 2021
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2020 ● **Modern R for data science: Up your data viz game**
SCK CEN Learning & development  Mol, Belgium
- Format** 1-day course, with editions in 2020 and 2021.
- Topics** More details on {ggplot2}, {scales} and extensions - Figure design principles - Data visualization types - Animation
- 2021
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2019 ● **Modern R for data science: The core tidyverse, good practices and our corporate environment**
SCK CEN Learning & development  Mol, Belgium
- Format** 4-day course, with editions in 2019, 2020 and 2021.
- Topics** Data reading, cleaning, manipulation and visualization - Iteration with functional programming - Exporting tables and figures - Literate computing - Reproducible workflow

2024
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2017

- Training course on radioactive waste management
SCK CEN Academy  Mol, Belgium

Format 45-min lecture “Characterization techniques used at SCK CEN - Uncertainty quantification” during the 1.5-week radioactive waste management course. Contributed to the editions in 2017, 2021 and 2024.

Topics Taylor expansion - Monte Carlo error propagation - Probabilistic programming - State of the art in radiological waste characterization







JOURNAL PAPERS

- 2023 ● Probabilistic radwaste characterization: findings of a multi-method, multi-mockup exercise using interpolation-based surrogate efficiencies.
Annals of Nuclear Energy  194: 110065
- Authors** Laloy E, Rogiers B, Bielen A, Borella A, Kubinski W, Carasco C, Mathonat C, Boden S.
- 2023 ● Improving Bayesian radiological profiling of waste drums using Dirichlet priors, Gaussian process priors, and hierarchical modeling.
Applied Radiation and Isotopes  194: 110691
- Authors** Laloy E, Rogiers B, Bielen A, Borella A, Boden S.
- 2023 ● Estimation of soil radioactivity-depth profiles using Bayesian inversion of borehole gamma spectrometry data.
Journal of Environmental Radioactivity  257: 107077
- Authors** Hasan MM, Rogiers B, Laloy E, Camps J, Rutten J, Huysmans M.
- 2022 ● Characterizing groundwater heat-transport in a complex lowland aquifer using paleo-temperature reconstruction, satellite data, temperature-depth profiles, and numerical models.
Hydrology and Earth System Sciences  26: 5577–5604
- Authors** Casillas-Trasvina A, Rogiers B, Beerten K, Wouters L, Walraevens K.
- 2023 ● 2D Inversion of in situ gamma-ray spectrometric measurements of ^{137}Cs for site characterization.
Journal of Environmental Radioactivity  256: 107052
- Authors** Hasan MM, Camps J, Rogiers B, Laloy E, Rutten J, Boden S, Huysmans M.

See [orcid](#), [scholar](#), or our institutional repository for more extensive and up to date overviews of my scientific output.


- 2022 ● Using helium-4, tritium, carbon-14 and other hydrogeochemical evidence to evaluate the groundwater age distribution: the case of the Neogene aquifer, Belgium.
Journal of Hydrology X 17: 100132
Authors Casillas-Trasvina A, Rogiers B, Beerten K, Pärn J, Wouters L, Walraevens K.
- 2022 ● Exploring river-aquifer interactions and hydrological system response using baseflow separation, impulse response modelling and time series analysis in three temperate lowland catchments.
Hydrology and Earth System Sciences 26: 3629–3649
Authors Lu M, Rogiers B, Beerten K, Gedeon M, Huysmans M.
- 2022 ● Soil radioactivity-depth profiles from regularized inversion of borehole gamma spectrometry data.
Journal of Environmental Radioactivity 243: 106807
Authors Hasan MM, Rogiers B, Laloy E, Rutten J, Camps J, Vidmar T, Huysmans M.
- 2021 ● Exploring the hydrological effects of normal faults at the boundary of the Roer Valley Graben in Belgium using a catchment-scale groundwater flow model.
Hydrogeology Journal 30: 133–149
Authors Casillas-Trasvina A, Rogiers B, Beerten K, Wouters L, Walraevens K.
- 2021 ● Towards a scientific-based assessment of long-term durability and performance of cementitious materials for radioactive waste conditioning and disposal.
Journal of Nuclear Materials 557: 153201
Authors Jacques D, Phung QT, Perko J, Seetharam SC, Maes N, Liu S, Yu L, Rogiers B, Laloy E
- 2021 ● Bayesian inference of 1D activity profiles from segmented gamma scanning of a heterogeneous radioactive waste drum.
Applied Radiation and Isotopes 175: 109803
Authors Laloy E, Rogiers B, Bielen A, Boden S.

- 2020 ● INSIDER UC2: the BR3 biological shield preliminary results and future work.
EPJ Nuclear Sciences & Technologies 6: 14
- Authors** Broeckx W, Rogiers B, Mangelschots N, Vandyck R, Verstrepen G, Boden S.
- 2020 ● Development of a user-friendly guideline for data analysis and sampling design strategy.
EPJ Nuclear Sciences & Technologies 6: 16
- Authors** Desnoyers Y, Rogiers B.
- 2020 ● The relation between petrophysical and transport properties of the Boom Clay and Eigenbilzen Sands.
Applied Geochemistry 114: 104527
- Authors** Jacobs E, Rogiers B, Frederickx L, Swennen R, Krooss BM, Amann-Hildenbrand A, Littke R, Bruggeman C.
- 2019 ● Nested multiresolution hierarchical simulated annealing algorithm for porous media reconstruction.
Physical Review E 100(5): 053316
- Authors** Lemmens L, Rogiers B, Jacques D, Huysmans M, Swennen R, Urai JL, Desbois G, Laloy E
- 2018 ● Metrology for decommissioning nuclear facilities: Partial outcomes of joint research project within the European Metrology Research Program.
Applied Radiation and Isotopes 134: 351-357
- Authors** Suran J, Kovar P, Smoldasova J, Šolc J, Van Ammel R, Miranda MG, Russell B, Arnold D, Zapata-Garcia D, Boden S, Rogiers B, Sand J, Peräjärvi K, Holm P, Hay B, Failleau G, Plumeri S, Beck YL, Grisa T.
- 2017 ● Bayesian inversion of a CRN depth profile to infer Quaternary erosion of the northwestern Campine Plateau (NE Belgium).
Earth Surface Dynamics 5: 331-345
- Authors** Laloy E, Beerten K, Vanacker V, Christl M, Rogiers B, Wouters L.

- 2017 ● Model-based classification of CPT data and automated lithostratigraphic mapping for high-resolution characterization of a heterogeneous sedimentary aquifer.
PLOS One  12(5): e0176656
- Authors** Rogiers B, Mallants D, Batelaan O, Gedeon M, Huysmans M, Dassargues A.
- 2017 ● Episodic activity of a dormant fault in tectonically stable Europe: The Rauw fault (NE Belgium).
Tectonophysics  699: 146-163
- Authors** Verbeeck K, Wouters L, Vanneste K, Camelbeeck T, Vandenberghe D, Beerten K, Rogiers B, Schiltz M, Burow Ch, Mees F, De Graeve J, Vandenberghe N.
- 2014 ● The usefulness of outcrop analogue air permeameter measurements for analysing aquifer heterogeneity: Quantifying outcrop hydraulic conductivity and its spatial variability.
Hydrological processes  28: 5176-5188
- Authors** Rogiers B, Beerten K, Smeekens T, Mallants D, Gedeon M, Huysmans M, Batelaan O, Dassargues A.
- 2014 ● Multi-scale aquifer characterization and groundwater flow model parameterization using direct push technologies.
Environmental Earth Sciences  72(5): 1303-1324
- Authors** Rogiers B, Vienken T, Gedeon M, Batelaan O, Mallants D, Huysmans M, Dassargues A
- 2014 ● High resolution saturated hydraulic conductivity logging of borehole cores using air permeability measurements.
Hydrogeology Journal  22(6): 1345-1358
- Authors** Rogiers B, Winters P, Huysmans M, Beerten K, Mallants D, Gedeon M, Batelaan O, Dassargues A
- 2013 ● The usefulness of outcrop analogue air permeameter measurements for analysing aquifer heterogeneity: testing outcrop hydrogeological parameters with independent borehole data.
Hydrology and Earth System Sciences  17: 5155-5166
- Authors** Rogiers B, Beerten K, Smeekens T, Mallants D, Gedeon M, Huysmans M, Batelaan O, Dassargues A.

- 2014 ● Demonstrating large-scale cooling in a Variscan terrane by coupled groundwater and heat flow modelling.
Geothermics 51: 71-90
- Authors** Rogiers B, Huysmans M, Vandenberghe N, Verkeyn M
- 2013 ● Derivation of flow and transport parameters from outcropping sediments of the Neogene aquifer, Belgium.
Geologica Belgica 16(3): 129-147
- Authors** Rogiers B, Beerten K, Smeekens T, Mallants D, Gedeon M, Huysmans M, Batelaan O, Dassargues A
- 2013 ● Efficient posterior exploration of a high-dimensional groundwater model from two-stage MCMC simulation and polynomial chaos expansion.
Water Resources Research 49(5): 2664-2682
- Authors** Laloy E, Rogiers B, Vrugt JA, Mallants D, Jacques D
- 2013 ● Determination of Cs-137 contamination depth distribution in building structures using geostatistical modelling of ISOCS measurements.
Applied Radiation and Isotopes 79: 25-36
- Authors** Boden S, Rogiers B, Jacques D
- 2013 ● A critical review of laboratory and in-situ hydraulic conductivity measurements for the Boom Clay in Belgium.
Applied Clay Science 75-76: 1-12
- Authors** Yu L, Rogiers B, Gedeon M, Marivoet J, De Craen M, Mallants D.
- 2012 ● Estimation of hydraulic conductivity and its uncertainty from grain-size data using GLUE and artificial neural networks.
Mathematical Geosciences 44(6): 739-763
- Authors** Rogiers B, Mallants D, Batelaan O, Gedeon M, Huysmans M, Dassargues A

2011

- Evaluating the impact of river restoration on the local groundwater and ecological system: a case study in NE Flanders.
Geologica Belgica  14(3-4): 265-276

Authors Rogiers B, Lermytte J, De Bie E, Batelaan O.



EDUCATION

2013
|
2009

- **PhD in Geology**
SCK CEN & KU Leuven 📍 Mol, Belgium

Thesis Conditional Stochastic Simulation of Groundwater Flow and Contaminant Transport in a Sandy Aquifer at Mol/Dessel.

Supervisory committee Batelaan O, Mallants D, Gedeon M, Huysmans M, Dassargues A

Additional members of the jury Vandenberghe N, Swennen R, Vanderborght J, Dietrich P

2009
|
2007

- **Master of Science in Geology**
KU Leuven, magna cum laude 📍 Leuven, Belgium

Thesis Interpretation of the heat-flow density in the deep wells Soumagne, Grand-Halleux and Havelange in Belgium, by means of a numerical coupled heat transport and groundwater flow model.

Promoters Vandenberghe N, Huysmans M

2007
|
2004

- **Bachelor of Science in Geology, Option Physics**
KU Leuven, cum laude 📍 Leuven, Belgium

Thesis The meaning of heat-flow density measurements in the wells Grand-Halleux, Soumagne, Meer and Havelange.

Promoters Vandenberghe N, Huysmans M

Q PEER REVIEWING

- Hydrogeology Journal (3)
- Water Resources Research (3)
- Computers & Geosciences (2)
- Journal of Hydroinformatics (2)
- Mathematical Geosciences (2)
- Toxics (2)
- Advances in Water Resources (1)
- Earth Science Informatics (1)
- Environmental Earth Sciences (1)
- Frontiers in Earth Science (1)
- Journal of African Earth Sciences (1)
- Journal of Environmental Quality (1)
- Journal of Hydrology and Hydromechanics (1)
- Vadose Zone Journal (1)

See orcid for an up to date overview.



PROFESSIONAL DEVELOPMENT

- 2024 ● **Statistics: Basic training course**
Claesen J, Amsterdam UMC, --03-01, ---08, ---15
📍 Mol, Belgium
- 2023 ● **Python: Basic training course**
Gupta S, SCK CEN learning & development, --10-19
📍 Mol, Belgium
- 2023 ● **Learning facilitator (Train the trainer)**
Ceelen N, Progress Consulting, --01-16, ---23, --02-16
📍 Mol, Belgium
- 2021 ● **Train-The-Trainer webinars**
Clarijs T & Van Puyvelde L, SCK CEN learning & development, --05-28,--06-03, ---15, ---21, ---25, ---28, ---30
📍 Online
- 2019 ● **Email - Go for 0 Inbox**
Loontjens S, Shortcuts, --06-06
📍 Mol, Belgium
- 2019 ● **Organize your time**
Loontjens S, Shortcuts, --05-06
📍 Mol, Belgium
- 2018 ● **Querying Data with transact-SQL**
RealDolmen, --11-14/15, ---27
📍 Mol, Belgium
- 2018 ● **Making 3D drawings with Sketchup | Fundamentals**
Mangelschots N, SCK CEN Learning & development, --11-12
📍 Mol, Belgium
- 2017 ● **Git version control**
Van Robbroeck K, RealDolmen, --09-27/28
📍 Mol, Belgium
- 2016 ● **MCNP - basic training course**
SCK CEN Academy, --11-08
📍 Mol, Belgium
- 2014 ● **An introduction to Bayesian computing with INLA**
Rue H, --07-08
📍 Mines ParisTech, France
- 2014 ● **Advanced stochastic simulations**
Lantuéjoul C, Romary T, --07-07
📍 Mines ParisTech, France
- 2014 ● **Short course on underlying R&D for the disposal of radioactive waste**
SCK CEN Academy, --03-19/20
📍 Mol, Belgium

Note I am using the ISO 8601:2000 standard for truncated date (interval) notation.

2013	● Version control with subversion Bex G-J, ICTS KU Leuven, --02-26	📍 Leuven, Belgium
2013	● HPC introduction Oldenhof M, ICTS KU Leuven, --02-19	📍 Leuven, Belgium
2012	● Advanced R programming topics Wijffels J, BNOSAC, --10-18/19	📍 Leuven, Belgium
2012	● Upgrade your written English Vermeire A, --04-19, --05-03/04	📍 Mol, Belgium
2012	● LaTeX - introduction ICTS KU Leuven, --03-29/30	📍 Leuven, Belgium
2012	● Data mining in practice CS KU Leuven, --02-06/07	📍 Leuven, Belgium
2011	● Speedreading Lernout B, --10-11	📍 Mol, Belgium
2011	● Scientific writing & speaking Vermeire A, --03-02, ---09, ---21, ---28	📍 Mol, Belgium
2010	● Global sensitivity analysis techniques for probabilistic groundwater modeling Mishra S, --09-21	📍 Valencia, Spain
2010	● 2nd summer school on flow and transport in porous and fractured media CNRS, --08-16/28	📍 Cargèse, France
2010	● Inverse modelling in earth and environmental sciences Vrugt J, Huisman S, --07-26/29	📍 Leuven, Belgium
2010	● Meet the expert in hydrology - Round tables among young and established scientists Carrera J, --05-05	📍 Vienna, Austria
2010	● Short course on geostatistical analysis of environmental data Goovaerts P, --03-08/12	📍 Gainesville, FL, USA
2010	● Introduction to R ICTS KU Leuven & LStat, --02-22/23	📍 Leuven, Belgium
2010	● Multivariate data analysis, with applications ICTS KU Leuven & LStat, --02-08/10	📍 Leuven, Belgium

2010



Hydrological modelling and uncertainty analysis

Buytaert W, --01-18



Louvain-la-Neuve, Belgium



GRANTS

2013
|
2009




SCK CEN PhD scholarship
SCK CEN Academy PhD program

📍 Mol, Belgium

STAYS ABROAD

2013

- CSIRO Land & Water and Flinders University
Scientific visit, --05-22/06-15  Adelaide, Australia



STUDENT SUPERVISION

Present
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2023

- Aouf A, PhD
SCK CEN & UCLouvain

Topic Deep learning for 3D porous media reconstruction of clay and cement-based materials

Supervisors *De Vleeschouwer Ch*, Laloy E, Rogiers B

University promoter in italic.

Present
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2023

- Casas Molina V, PhD
SCK CEN & Ghent University

Topic Machine learning for accurate and efficient uncertainty quantification in radiological waste characterization

Supervisors *Couckuyt I*, Laloy E, Rogiers B

2022
|
2018

- Casillas A, PhD
SCK CEN & Ghent University

Topic Assessment of unconventional state variables to constrain groundwater flow models of the Neogene Aquifer in the Campine Basin in Belgium

Supervisors *Walraevens K*, Rogiers B, Beerten K, Wouters L

Present
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2017

- Lu M, PhD
SCK CEN & KU Leuven

Topic Quantifying and predicting river-aquifer exchange in lowland floodplains (Nete, Demer and Dijle).

Supervisors *Huysmans M*, Gedeon M, Beerten K, Rogiers B

2022
|
2017

- Moudud H, PhD
SCK CEN & Vrije Universiteit Brussel

Topic In situ methods for high resolution mapping of radioactive soil contamination

Supervisors *Huysmans M*, Vidmar T, Rogiers B

Present
|
2016

- Lemmens L, PhD
SCK CEN & KU Leuven

Topic 3D Porous media reconstruction for natural and engineered radioactive waste confinement barriers – A multiresolution-multiphase approach.

Supervisors *Huysmans M*, Rogiers B, Laloy E

- 2016 ● Neyens C, MSc thesis
Faculty of Science, KU Leuven
- Topic** Analysis of pumping tests in a sandy aquifer in Northern Belgium.
- Supervisors** Huysmans M, Gedeon M, Laloy E, Rogiers B
- 2015 ● Janssens L, BSc thesis
Faculty of Science, KU Leuven
- Topic** Omzetting van digitale foto's van ontsluitingen in hydraulische conductiviteit, met behulp van beeldanalyse en luchtpermeameter datasets.
- Supervisors** Huysmans M, Rogiers B
- 2015 ● Hoedemaekers T, BSc thesis
Faculty of Science, KU Leuven
- Topic** Slug- en dilutietesten in de Neogene aquifer, in en rond de nucleaire zone te Mol-Dessel- Geel.
- Supervisors** Huysmans M, Rogiers B, Gedeon M
- 2014 ● Bennett G, MSc thesis
Faculty of Engineering, Vrije Universiteit Brussel
- Topic** Integration of detailed borehole core measurements and pump test data from the aquifers below the Boom Clay in a groundwater flow model.
- Supervisors** Huysmans M, Rogiers B, Vandersteen K
- 2014 ● Potums L, BSc thesis
Faculty of Science, KU Leuven
- Topic** Gedetailleerde karakterisatie van boorkernen uit de diepe aquifers rond de Boomse klei, met behulp van een luchtpermeameter.
- Supervisors** Huysmans M, Rogiers B
- 2012 ● Winters P, BSc thesis
Faculty of Science, KU Leuven
- Topic** Haalbaarheidsstudie voor de gedetailleerde opmeting van de hydraulische conductiviteit op boorkernen, met behulp van een luchtpermeameter.
- Supervisors** Huysmans M, Rogiers B



EXAMINATION COMMITTEES

- 2022 ● Nick Janssens, PhD
Department of Earth and Environmental Sciences, KU Leuven
- Thesis** Three-dimensional superresolution models for fluid flow simulation, developed for computed tomography (CT) scans for continental carbonates.
- 2022 ● George Bennett, PhD
Department of Geology, Ghent University
- Thesis** Hydrogeological investigation of a volcanic aquifer system on the flanks of Mount Meru, Northern Tanzania.
- 2016 ● Nhu Viet Ha, PhD
Department of Hydrology and Hydraulic Engineering, Vrije Universiteit Brussel
- Thesis** Spatio-temporal prediction of land subsidence using GIS-based 3D geological, geotechnical and groundwater flow models in Hanoi city (Vietnam).
- 2013 ● Nafyad Serre Kawo, MSc
Interuniversity programme: Master of Science in Physical Land Resources, Universiteit Gent - Vrije Universiteit Brussel
- Thesis** Model Based Evaluation of the Protection Zones around the WaterGroep Public Drinking Water Well Field in Huiskens (Korbeek-Lo), Belgium.