Dr. Kathrin Menberg

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Education and Research Experience

since 09/2017 **Assistant Professor**
Institute for Applied Geosciences, Karlsruhe Institute of Technology, Karlsruhe, Germany

02/2015-08/2017 **Postdoctoral Research Associate**
Engineering Department, University of Cambridge, United Kingdom

B-bem: The Bayesian Building Energy Management Portal (EPSRC funded)

- Adaption of a Bayesian calibration framework for energy system models
- Development of a detailed thermodynamic model for exergy analysis of hybrid heating and cooling system
- Improvement and adaption of statistical sensitivity analysis methods for building energy models

10/2014-12/2014 **Postdoctoral Research Associate**
Institute for Applied Geosciences, Karlsruhe Institute of Technology, Karlsruhe, Germany

- contribution to preparation of research proposal on district-scale application of geothermal energy use of subsurface urban heat islands
- involvement in collaborative work on spatial assessment of anthropogenic heat fluxes into the urban subsurface

01/2014-06/2014 **Postdoctoral Research Associate**
Department of Earth Sciences, Swiss Federal Institute of Technology (ETH), Zurich, Switzerland

GEOTHERM 2 – Geothermal Reservoir Processes: Towards the implementation of research into the creation and sustainable use of Enhanced Geothermal Systems

- employment of life-cycle assessment (LCA) to enhanced geothermal systems
- development of a novel approach to visualize LCA results as function of uncertain parameters

12/2010-12/2013 **PhD (with distinction), Applied Geoscience**
Institute for Applied Geosciences, Karlsruhe Institute of Technology (KIT), Germany

Anthropogenic and natural alterations of shallow groundwater temperatures

- first report in literature of the quantitative contribution of various anthropogenic heat sources to urban groundwater warming
- identification of anthropogenic effects on the subsurface thermal environment by employing analytical modelling techniques and geostatistical methods
- revelation of the effect of climate change on rural groundwater temperatures

10/2007-04/2010 **Diploma (MSc. -level), Hydrogeology and Engineering Geology**
Institute for Applied Geosciences, Karlsruhe Institute of Technology (KIT), Germany (Grade: 1.5, on 1 to 4 scale)

Diploma-Thesis: *Influence of specific subsurface parameters on the Thermal Response Test (TRT)* (in German)

- involved in collaborative project (KIT, Bavarian Center for Applied Energy Research & European Institute for Energy Research) on quality assurance of borehole heat exchangers
- monitored geothermal drilling activities and thermal field tests
- characterization of rock samples with various laboratory tests

10/2004-09/2007 **Pre-Diploma (BSc. -level), Geology**
Institute for Applied Geology, Karlsruhe Institute of Technology (KIT), Germany (Grade: 1.5)

Collaborations

2016- Prof. Masanori Shukuya (Tokyo City University, Japan) and Prof. Ryozo Ooka (Tokyo University)

- Collaborative work on exergy modelling and performance analysis of hybrid ground source heat pump systems
- Joint journal and peer-reviewed conference paper

07/2015-08/2015 Visiting Research Scholar, Georgia Institute of Technology (US), Prof. Patricio Vela (School of Electrical and Computer Engineering), and Prof. Godfried Augenbroe (School of Architecture)

- Collaborative work on sensitivity analysis and Bayesian calibration methods
- Joint peer-reviewed conference paper

11/2011 Visiting Student, University of Saskatchewan (Canada), Prof. Grant Ferguson (Department of Civil and Geological Engineering)

- Collaborative work on analytical modelling of subsurface heat flux

Awards and Scholarships

2014 Young Research Scientist Award, Urban Environmental Pollution Conference, Toronto, Canada

2013 Winner Energy Campus 2013, Energy and Climate Protection Foundation Baden-Württemberg (out of 40 contributions).
Title: *Elevated temperatures beneath cities: A sustainable energy source*

2011 Travel scholarship from the Karlsruhe House of Young Scientists of the KIT
Grant for a visiting stay at a university abroad

2010-2013 PhD scholarship from the German Environmental Foundation (DBU)

Teaching Experience

2017 **Supervisor** (small group teaching): Building Physics (3rd Year Engineering)

- Two-to-one supervisions on papers with example questions
- Explain underlying physical concepts and applied mathematical approaches

2015 **Advisor** for final year graduate dissertation (2)

- One-to-one meetings with graduate Engineering student
- Advise on planning dissertation and relevant literature
- Provide constructive feedback on drafts

2011-2013 **Supervisor** for graduate dissertation (2) and undergraduate projects (2)

- Introduce project background and advise on relevant literature
- Explain theory behind experimental and methodological approaches
- Assist students with data analysis and interpretation
- Provide constructive feedback on drafts

2012 **Tutor**: Engineering Geology Field course (4th Year Applied Geoscience)

- Demonstrate geotechnical field techniques
- Marking of reports

2008 **Tutor**: Engineering Geology Laboratory course (4th Year Applied Geoscience)

- Demonstrate geotechnical laboratory techniques
- Marking of reports

2005-2007 **Teaching Assistant**: Introduction to Rock Identification (1st Year Applied Geoscience)

- Explain geological and mineralogical classification concepts
- Demonstrate identification techniques

Personal Development

2016 Masterclass on Leadership Skills for Postdocs, Teaching for Postdocs

2015 Introduction to Lecturing, Lecturing Performance, Supervising Graduate Students, Introduction to Leadership

2013 Time and Self-management

IT, Research Skills and Languages

IT Skills	MS Office, MATLAB, STAN, TRNSYS, EnergyPlus, Esri ArcGIS, OriginPro, Endnote, Simapro, Corel Draw
Research	Building Energy Modelling, Bayesian Inference, Exergy Analysis, Time Series Analysis, Analytical and Numerical modelling, Geostatistical Analysis
Languages	German (native speaker), English (fluent), French (basic) and Spanish (basic)

Peer-Reviewed Publications

2017 **Menberg, K.**, Heo, Y. & Choudhary, R. Inference of error terms in energy system models using Bayesian calibration (in preparation)

2017 **Menberg, K.,** Heo, Y., Choi, W., Ooka, R., Choudhary, R. & Shukuya, M. Exergy analysis of a hybrid ground-source heat pump system. **Applied Energy** 204, 31-46

2016 **Menberg, K.**, Heo, Y. & Choudhary, R. Sensitivity analysis methods for building energy models: comparing computational costs and extractable information. **Energy and Buildings** 133, 433-445

2016 **Menberg, K.**, Pfister, S., Blum, P. & Bayer, P. A matter of meters: state of the art in the life cycle assessment of enhanced geothermal systems. **Energy and Environmental Science** 9, 2720-2743

2015 Benz, S., Bayer, P., **Menberg, K.**, Jung, S. & Blum, P. Spatial resolution of anthropogenic heat fluxes into urban aquifers. **Science of the Total Environment** 524, 427-439

2014 **Menberg, K.**, Blum, P., Kurylyk, B.L., & Bayer, P. Observed groundwater temperature response to recent climate change. **Hydrology and Earth System Sciences** 18 (11), 4453-4466

2013 **Menberg, K.**, Blum, P., Schaffitel, A. & Bayer, P. Long Term Evolution of Anthropogenic Heat Fluxes into a Subsurface Urban Heat Island. **Environmental Science & Technology** 47, 9747-9755

2013 **Menberg, K.**, Bayer, P., Zosseder, K., Rumohr, S. & Blum, P. Subsurface urban heat islands in German cities. **Science of the Total Environment** 442, 123-133

2013 **Menberg, K.**, Steger, H., Zorn, R., Reuss, M., Proell, M., Bayer, P. & Blum, P. Determination of thermal conductivity in the subsurface using laboratory and field experiments and theoretical models. **Grundwasser** 18(2), 103-116 (in German)

Conference Proceedings

2017 **Menberg, K.,** Heo, Y. & Choudhary, R. Efficiency and Reliability of Bayesian Calibration of Energy Supply System Models. *Building Simulation 2017*

2017 **Menberg, K.,** Heo, Y., Choi, W., Ooka, R., Choudhary, R & Shukuya, M. Exergy Analysis of a Ground-Source Heat Pump System. *Building Simulation 2017*

2016 **Menberg, K.,** Heo, Y., Augenbroe, G. & Choudhary, R. New Extension of Morris method for sensitivity analysis of building energy models. *Building Simulation and Optimization – 3rd IBPSA England Conference*

2016 **Menberg, K**., Blum, P., Pfister, S., Rybach, L. & Bayer, P. Life cycle assessment of geothermal power generation. *European Geothermal Congress 2016*

2015 **Menberg, K.**, Blum, P., Rivera, J., Benz, S. & Bayer P. Exploring the Geothermal Potential of Waste Heat Beneath Cities. *Proceedings World Geothermal Congress 2015*

2013 **Menberg, K.**, Bayer, P., Blum, P. Elevated temperatures beneath cities: An enhanced geothermal resource. *European Geothermal Congress 2013*

2013 **Menberg, K.**, Bayer, P., Zosseder, K., Rumohr, S., Blum, P. Urban heat islands in the subsurface of German cities. *19th Engineering Geology Congress* (in German)

2013 **Menberg, K.**, Blum, P., Limberg, A., Bayer, P. Heat islands in the groundwater of German cities. (in German). *Lower Saxony Groundwater Congress* (in German)

Other publications

2014 **Menberg, K.** Elevated temperatures beneath cities: A sustainable energy source. *Energiewirtschaftliche Tagesfragen* 64(3), 56-57 (in German)

2014 **Menberg, K.** Anthropogenic and natural alterations of shallow groundwater temperatures, PhD Thesis, Karlsruhe Institute of Technology (KIT)

2010 **Menberg, K.** Influence of specific ground parameters on a Thermal Response Test (TRT), Diploma (MSc.) Thesis, Karlsruhe Institute of Technology (KIT)

Invited Presentations

2014 *Elevated temperatures beneath cities: A sustainable energy source*

Evening debate 'Who pays the Energy Transition?', organized by the Energy and Climate Protection Foundation, Baden-Württemberg

2013 *Heat islands in the groundwater of German cities*

Lower Saxony Groundwater Congress, Braunschweig, Germany

Selected Talks

2014 *Influence of recent climate change on groundwater temperatures in shallow aquifers*

Our Climate – Our Future 2014*,* Berlin, October 6-9 2014

2014 *Subsurface urban heat islands: thermal impact of urbanization on groundwater*

Urban Environmental Pollution*,* Toronto, Canada, June 12-15 2014

2014 *Urban heat islands in the subsurface as sustainable source for geothermal energy*
European Geosciences Union General Assembly 2014, Vienna, Austria, April 27 - May 2 2014, *Geophysical Research Abstracts* Vol. 16, EGU2014- 7006

2012 *Subsurface urban heat fluxes in German cities*
11th Urban Environmental Symposium, Karlsruhe, Germany, September 17-19 2012

2012 *Urbane Wärmeinseln im Untergrund deutscher Städte*
FH-DGG Tagung 2012, Dresden, Germany, May 16-20 2012