

Ariane Middel, Ph.D.

Assistant Research Professor
School of Geographical Sciences and Urban Planning
Senior Sustainability Scientist
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Education

Dr.-Ing./Ph.D. Computer Science, University of Kaiserslautern, Germany, 2008

Dissertation: Visualization of Urban Futures – A Framework for Visualizing
Multidimensional Geospatial Data

Dipl.-Ing. Geodetic Engineering (equivalent to B.Sc. and M.Sc. in Engineering), University of Bonn, Germany, 2003

Majors: Geographic Information Systems (GIS), Cartography, and Photogrammetry
Minors: Statistics, Physical and Mathematical Geodesy, Surveying Engineering, and
Urban Planning
Thesis: Virtuelle Wegweiser in Panoramen (Virtual signposts in panoramic images)

Academic Appointments

2015 – present **Assistant Research Professor**

School of Geographical Sciences and Urban Planning, Arizona State University

2009 – 2013 **Postdoctoral Research Fellow**

Decision Center for a Desert City, Arizona State University

2005 – 2008 **Research Assistant**

Department for Computer Graphics and HCI, University of Kaiserslautern, Germany

1999 – 2003 **Research Assistant**

Institute of Cartography and Geoinformation, University of Bonn, Germany

Research Interests

Urban climate, modeling and simulation, thermal comfort, microclimate, local climate, heat mitigation, urban form, climate adaptation and mitigation, sustainable cities, geovisualization

Grants and Awards

- 10/2016 – 08/2020 **CHAMP ASU ISA (in preparation)**
Co-PI (23%), Arizona Department of Health Services, with David Hondula (PI), Nalini Chhetri, Nancy Selover, \$100,000.
- 04/2017 – 03/2020 **GP-IMPACT: Bridge into Geosciences Graduate Studies (pending)**
Co-PI (12%), NSF, with David Sailor (PI), Randall Cerveny, Trisalyn Nelson, Ian Walker, \$398,668.
- 05/2017 – 04/2019 **Temperature Matters: Enhancing Weather Readiness in the Pac-12 (pending)**
Co-PI (30%), Pac-12 Conference, with David Hondula (PI), Randall Cerveny, Nancy Selover, Joshua Beaumont, Kris Ebi, Ben McMahan, Jennifer Vanos, \$399,404.
- 01/2017 – 06/2018 **Thermal Performance of Cool Roof Strategies in Hot Arid Climates (pending)**
Co-PI (35%), The American Institute of Architects (AIA), with Paul Coseo (PI), Harvey Bryan, Jennifer Vanos, \$29,799.
- 11/2016 – 10/2019 **Global Network for Urbanization and the Environment (GNUE) (pending)**
Co-PI (5%), NSF, with Christopher Boone (PI), Rimjhim Aggarwal, Mikhail Chester, Corrie Griffith, Kevin Gurney, Sharon Hall, Kelli Larson, Jose Lobo, Soe Myint, David Sailor, Shade Shutters, Billie Turner, Mark Watkins, Abigail York, \$961,352.
- 12/2016 – 11/2022 **Long-Term Ecological Research Program (LTER) CAP IV: Design with nature (recommended for probationary funding)**
Senior Personnel, NSF, with Daniel Childers (PI), Billie L. Turner II, Abigail York, Nancy Grimm, Sharon Hall, Paige Warren, \$6,761,958.
- 08/2016 – 07/2019 **A simulation platform to enhance infrastructure and community resilience to extreme heat events**
Co-PI (20%), NSF, with Mikhail Chester (PI), David Hondula, and David Eisenman, \$450,000.
- 08/2016 – 07/2017 **Optimal deployment of trees to mitigate pedestrian heat exposure: novel measurements and high-resolution modeling**
Co-PI (33%), Roskind Small Grants, with Matei Georgescu (PI), Erell Evyatar, \$10,000.
- 07/2016 – 08/2016 **Impact of interior temperatures of shaded and unshaded vehicles on children's health – A case study in Phoenix, AZ**
PI (100%), CAP LTER REU proposal for summer 2016, with Jennifer Vanos, \$4,000
- 08/2015 – 07/2019 **SRN: The Urban Water Innovation Network (U-WIN): Transitioning Toward Sustainable Urban Water Systems**
Collaborator, NSF, with Mazdak Arabi (PI), Matei Georgescu (Co-PI), \$12,000,000 (ASU component \$1,191,572)

- 05/2015 – 06/2016 **City of Tempe - Tree and shade**
Co-PI (33%), with Gerald Oneill (PI), Anne Reichman, Bonnie Richardson, \$28,310.
- 01/2015 – 12/2017 **Microclimate data collection, analysis, and visualization**
Co-PI (50%), University of Kaiserslautern, with Ross Maciejewski (PI), \$158,101.
- 05/2014 – 08/2016 **Arizona BRACE**
Senior Personnel, Subcontract to Arizona State University for development of Arizona Climate and Health Profile under auspices of Centers for Disease Control (CDC) Building Resilience Against Climate Effects (BRACE) program, agreement #ADHS15-077418, with Nalini Chhetri (PI), Matthew Roach (ADHS), David M. Hondula and Nancy J. Selover, \$125,000.
- 08/2014 – 07/2015 **Informing emergency and risk management climate knowledge in arid regions**
Co-PI (20%), NOAA-OAR-CPO-2013-2003445, with Nalini Chhetri (PI), Kenneth J. Galluppi and Nancy J. Selover, \$98,443.
- 05/2014 – 06/2016 **Microclimate impacts of photovoltaic canopy structures**
Co-PI (33%), Lightworks and Strategic Solar Energy, LLC, with Nalini Chhetri (PI) and Nancy J. Selover, \$15,000.
- 08/2012 – 07/2017 **Understanding impacts of desert urbanization on climate and surrounding environments to foster sustainable cities using remote sensing and numerical modeling**
Co-PI (20%), NASA ROSES-NNH11ZDA001N, with Soe W. Myint (PI), Ronald Rindfuss, Huei-Ping Huang, Karen Seto, Anthony Brazel and Dan Blumberg, \$928,987.
- 07/2011 – 06/2012 **Impact of microclimate on residential energy consumption and water use**
Co-PI (50%), Decision Center for a Desert City, with Subhrajit Guhathakurta (PI), \$49,303.
- 10/2010 – 12/2014 **Urban form and energy use explored through dynamic networked infrastructure model**
Co-PI (33%), NSF grant #1031690, with Subhrajit Guhathakurta (PI) and Eric Williams, \$350,213.
- 01/2009 – 12/2015 **Visualization of large and unstructured data sets: Applications in geospatial planning, modeling, and engineering**
Lead personnel, DFG grant #1131, with Hans Hagen (PI), Jan Aurich, Magali Billen, Christoph Garth, Bernd Hamann, Chuck Hansen, Chris Johnson, Kenneth Joy, Louise Kellogg, Mike Kirby, Oliver Kreylos, Ellen Kuhl, Peter Liggesmeyer, Paul Müller, Theo Schmitt, Gerhard Steinebach, Natarajan Sukumar, and Anthony Wexler, €6,800,000 (\$8,356,000).

Publications

Peer-Reviewed Articles

Ariane Middel, Nancy Selover, Björn Hagen, Nalini Chhetri, Impact of Shade on Outdoor Thermal Comfort - A Seasonal Field Study in Tempe, Arizona, *International Journal of Biometeorology*, 2016, in press. DOI: 10.1007/s00484-016-1172-5

Katherine Crewe, Anthony J. Brazel, **Ariane Middel**, Desert New Urbanism: Testing for Comfort in Downtown Tempe Arizona, *Journal of Urban Design*, 2016, in press. DOI: 10.1080/13574809.2016.1187558

Björn Hagen, **Ariane Middel**, David Pijawka, Global Climate Change Risk and Mitigation Perceptions: A comparison of nine countries, *Journal of Sustainable Development*, 9(5): 214–228, 2016. DOI: 10.5539/jsd.v9n5p214

Fanhua Kong, Changfeng Sun; Fengfeng Liu; Haiwei Yin, Fei Jiang, Yingixa Pu, Gina Cavan, Cynthia Skelhorn, **Ariane Middel**, Iryna Dronova, Energy saving potential of fragmented green spaces due to their temperature regulating ecosystem services in the summer, *Applied Energy*, 183:1428–1440, 2016. DOI: 10.1016/j.apenergy.2016.09.070.

Björn Hagen, David Pijawka, **Ariane Middel**, European climate change perceptions: mitigation and adaptation policies to improve resiliency, *Environmental Policy and Governance*, 26:170–183, 2016. DOI: 10.1002/eet.1701

Xiaoxiao Li, Wenwen Li, **Ariane Middel**, Sharon Harlan, Anthony J. Brazel, Billie L. Turner II, Remote sensing of the surface urban heat island and land architecture in Phoenix, Arizona: combined effects of land composition and configuration and cadastral-demographic-economic factors, *Remote Sensing of Environment*, 174:233–243, 2016. DOI: 10.1016/j.rse.2015.12.022

Jennifer K. Vanos, **Ariane Middel**, Grant R. McKercher, Evan R. Kuras, Benjamin L. Ruddell, A multiscale surface temperature analysis of urban playgrounds in a hot, dry city. *Landscape and Urban Planning*, 146:29–42, 2016. DOI: 10.1016/j.landurbplan.2015.10.007

Kathrin Häb, Benjamin L. Ruddell, **Ariane Middel**, Sensor lag correction for mobile urban microclimate measurements, *Urban Climate*, 14(4):622–635, 2015. DOI: 10.1016/j.uclim.2015.10.003

Soe W. Myint, Baojuan Zheng, Emily Talen, Chao Fan, Shai Kaplan, **Ariane Middel**, Martin Smith, Huei-Ping Huang, Anthony J. Brazel, Does the spatial arrangement of urban landscape matter? Examples of urban warming and cooling in Phoenix and Las Vegas, *Ecosystem Health and Sustainability*, 1(4), art15, 2015. DOI: 10.1890/EHS14-0028.1

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Hans Hagen, TraVis – A visualization framework for mobile transect data sets in an urban microclimate context, *Proceedings of the Pacific Visualization Symposium (PacificVis)*, 2015 IEEE, Hangzhou, China, April 14-17, 2015.

Ariane Middel, Nalini Chhetri, Ray Quay, Urban forestry and cool roofs: Assessment of heat mitigation strategies in Phoenix residential neighborhoods, *Urban Forestry and Urban Greening*, 14(1):178–186, 2015. DOI: 10.1016/j.ufug.2014.09.010

Kathrin Häb, Nils H. Feige, Lars S. Hüttenberger, **Ariane Middel**, Hans Hagen, Visualizing the temporal development of thermo-radiative features on ground-based thermographs, *Environmental Earth Sciences*, 72(10):3781–3793, 2014. DOI: 10.1007/s12665-014-3472-6

Ariane Middel, Kathrin Häb, Anthony J. Brazel, Chris Martin, Subhrajit Guhathakurta, Impact of urban form and design on mid-afternoon microclimate in Phoenix local climate zones, *Landscape and Urban Planning*, 122:16–28, 2014. DOI: 10.1016/j.landurbplan.2013.11.004

Ariane Middel, Anthony J. Brazel, Patricia Gober, Soe W. Myint, Heejun Chang, Jiunn-Der Duh, Land cover, climate, and the summer surface energy balance in Phoenix, AZ and Portland, OR, *International Journal of Climatology*, 32(13):2020–2032, 2012. DOI: 10.1002/joc.2408

Patricia Gober, **Ariane Middel**, Anthony J. Brazel, Soe W. Myint, Heejun Chang, Jiunn-Der Duh, Lily House-Peters, Tradeoffs between water conservation and temperature amelioration in Phoenix and Portland: Implications for urban sustainability, *Urban Geography*, 33(7):1030–1054, 2012. DOI: 10.2747/0272-3638.33.7.1030

Ariane Middel, Anthony J. Brazel, Shai Kaplan, Soe W. Myint, Daytime cooling efficiency and diurnal energy balance in Phoenix, AZ, *Climate Research*, 54(1):21–34, 2012. DOI: 10.3354/cr01103

Ariane Middel, Anthony J. Brazel, Björn Hagen, Soe W. Myint, Land cover modification scenarios and their effects on daytime heating in the inner core residential neighborhoods of Phoenix, AZ, USA, *Journal of Urban Technology*, 18(4):61–79, 2011. DOI: 10.1080/10630732.2011.648434

Articles in Review

Evan R. Kuras, Molly C. Bernhard, Miriam M. Calkins, Kristie L. Ebi, Jeremy J. Hess, Kristina W. Kintziger, Meredith A. Jagger, **Ariane Middel**, Anna A. Scott, June T. Spector, Christopher K. Uejio, Jennifer K. Vanos, Benjamin F. Zaitchik, Julia M. Gohlke, David M. Hondula, Opportunities and Challenges for Personal Heat Exposure Research, *Environmental Health Perspectives*, in review.

Articles in Preparation

Ariane Middel, Scott Krayenhoff, Micrometeorological factors determining the outdoor thermal environment during record-breaking extreme heat in Tempe, Arizona: Design for optimal microscale heat mitigation, *Environmental Research Letters*.

Ariane Middel, Chuyuan Wang, Shai Kaplan, Soe W. Myint, Anthony J. Brazel, Local Climate Zones in Arid Cities – An Assessment for Phoenix, AZ and Las Vegas, NV, USA, *Remote Sensing of Environment*.

Ariane Middel, Jonas Lukasczyk, Sky view factor footprints from synthetic fisheye photos, *Environmental Research Letters*.

Ariane Middel, Jonas Lukasczyk, Multiscale Evaluation of Sky View Factors for Phoenix, AZ. *Urban Climate*.

Wei Luo, Kathrin Feige, **Ariane Middel**, Niklas Röber, Michael Böttinger, Mark Rautenhaus, Hans Hagen, Ross Maciejewski, A Survey of Visualization Methods for Climate Change and its Cascading Impacts, EuroVIS STAR – State of The Art Report 2017, 36(3), 2017.

Nils Feige, Kathrin Feige, **Ariane Middel**, Area calculation of triangle meshes cut by two arbitrary (non-) parallel planes, *Journal for Geometry and Graphics*.

Refereed Conference Proceedings

Roxana Bujack, **Ariane Middel**, Strategic initiatives for flow visualization in environmental sciences, *Proceedings of the Workshop on Visualization in Environmental Sciences (EnvirVis)*, Groningen, Netherlands, June 6-7, 2016.

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Hans Hagen, A data-driven approach to categorize climatic microenvironments, *Proceedings of the Workshop on Visualization in Environmental Sciences (EnvirVis)*, Groningen, Netherlands, June 6-7, 2016.

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Hans Hagen, Spatial aggregation of mobile transect measurements for the identification of climatic microenvironments, *Proceedings of the Workshop on Visualization in Environmental Sciences (EnvirVis)*, Cagliari, Italy, May 25-26, 2015.

Jonas Lukasczyk, Xing Liang, Wei Luo, Eric Ragan, **Ariane Middel**, Nadya Bliss, Dave White, Hans Hagen, Ross Maciejewski, A Collaborative Web-Based Environmental Data Visualization and Analysis Framework, *Proceedings of the Workshop on Visualization in Environmental Sciences (EnvirVis)*, Cagliari, Italy, May 25-26, 2015.

Jonas Lukasczyk, **Ariane Middel**, Hans Hagen, WebGL-based geodata visualization for policy support and decision making, *Proceedings of the Workshop on Visualisation in Environmental Sciences (EnvirVis)*, Swansea, Wales, UK, June 9-13, 2014.

Kathrin Häb, **Ariane Middel**, Hans Hagen, Using K-means clustering for a spatial analysis of multivariate and time-varying microclimate data, *Proceedings of the Workshop on Visualization in Environmental Sciences (EnvirVis)*, Leipzig, Germany, June 17-18, 2013.

Ariane Middel, Kathrin Häb, Anthony J. Brazel, Chris Martin, Subhrajit Guhathakurta, Urban form, landscape design, and microclimate in Phoenix, Arizona, *Proceedings of the 8th International Conference on Urban Climate (ICUC8)*, Dublin, Ireland, August 6-10, 2012.

Sebastian Thelen, Jörg Meyer, **Ariane Middel**, Peter-Scott Olech, Achim Ebert, Hans Hagen, Tag-based interaction with large high-resolution displays, *Proceedings of the 4th IASTED International Conference on Human-Computer Interaction (IASTED-HCI)*, St. Thomas, Virgin Islands, USVI, November 22-24, 2009.

Ariane Middel, Björn Hagen, Anthony J. Brazel, Soe Myint, Simulation of possible scenarios for local scale energy balances in residential neighborhoods in Phoenix, AZ, USA, *Proceedings of the 8th*

International Symposium (UPE 8) of the International Urban Planning and Environment Association, Kaiserslautern, Germany, March 23-26, 2009.

Peter-Scott Olech, **Ariane Middel**, Max Langbein, Sebastian Thelen, Achim Ebert, Jörg Meyer, Hans Hagen, Enhancing the planner's toolkit – New display technologies for planning support, *Proceedings of the 8th International Symposium (UPE 8) of the International Urban Planning and Environment Association, Kaiserslautern, Germany, March 23-26, 2009.*

Peter-Scott Olech, Sebastian Thelen, **Ariane Middel**, Achim Ebert, Jörg Meyer, Hans Hagen, Digital representation of environment data using advanced display technologies, *ISDE6 - The 6th International Symposium on Digital Earth, Beijing, China, 2009.*

Ariane Middel, Peter-Scott Olech, Björn Hagen, Re-tooling urban planners - Google Earth as a planning support tool, *Proceedings of the 11th International Conference on Computers in Urban Planning and Urban Management (CUPUM 2009), Hong Kong, 2009.*

Thomas H. Kolbe, **Ariane Middel**, Lutz Plümer, 3D-Kartographie für die Fußgängernavigation: Virtuelle Wegweiser in Panoramen, Tagungsband zur 40. Sitzung der Arbeitsgemeinschaft 'Automation in der Kartographie' AgA 2003 in Erfurt, *Mitteilungen des Bundesamtes für Kartographie und Geodäsie, BKG, Heft 31, Frankfurt, 2004.*

Edited Books

Christoph Garth, **Ariane Middel**, Hans Hagen (eds.), *Visualization of Large and Unstructured Data Sets - Applications in Geospatial Planning, Modeling and Engineering (IRTG 1131 Workshop 2011)*, OASICS Vol. 27, June 10-11, 2011, ISBN 978-3-939897-46-0.

Ariane Middel, Inga Scheler, Hans Hagen (eds.), *Visualization of Large and Unstructured Data Sets - Applications in Geospatial Planning, Modeling and Engineering (IRTG 1131 Workshop 2010)*, OASICS Vol. 19, March 19-21, 2010, ISBN 978-3-939897-29-3.

Book Chapters

Darren M. Ruddell, Anthony J. Brazel, Winston Chow, **Ariane Middel**, The Urban Heat Island, David Pijawka (ed.), *Sustainability in the 21st Century*, Kendall Hunt Publishing, 2015.

Björn Hagen, **Ariane Middel**, What do sustainable cities look like?, David Pijawka (ed.), *Sustainability in the 21st Century*, Kendall Hunt Publishing, 2015.

Ariane Middel, Subhrajit Guhathakurta, Hans Hagen, Peter-Scott Olech, Florian Höpel, Visualizing future 3-dimensional neighborhoods in Phoenix: An application incorporating empirical methods with computational graphics, M. Batty and H. Lin (eds.), *Virtual Geographic Environments*, Science Press, 2009, ISBN 978-7-03-023467-4.

Ariane Middel, Estimating residential building types from demographic information at a neighborhood scale, Gerhard Steinebach (ed.), *Visualizing Sustainable Planning*, p.187-202, Springer, 2009, ISBN 978-3-540-88202-2.

Ariane Middel, A framework for visualizing multivariate geodata, Hans Hagen, Martin Hering-Bertram, Christoph Garth (eds.) *Visualization of Large and Unstructured Data Sets*, p. 13-21, Kaiserslautern, 2007, GI-Edition, Lecture Notes in Informatics (LNI), Seminars Vol. S-7, ISBN 978-3-88579-441-7.

Ariane Middel, Procedural 3D modeling of cityscapes, Hans Hagen, Andreas Kerren, Peter Dannenmann (eds.), *Visualization of Large and Unstructured Data Sets*, pp. 133-142, Kaiserslautern, 2006, GI-Edition, Lecture Notes in Informatics (LNI), Seminars Vol. S-4, ISBN 978-3-88579-438-7.

Reports

Alex Slaymaker, Bonnie Richardson, **Ariane Middel**, Braden Kay, Andrea Levy, Suzanne Jumper, Abby Johnson, City of Tempe Urban Forest Master Plan, 2016.

Wen-Ching Chuang, Alex Karner, Nancy Selover, David Hondula, Nalini Chhetri, **Ariane Middel**, Matthew C. Roach, Brigitte Dufour, Arizona Extreme Weather, Climate and Health Synthesis Report. A report prepared for Arizona Department of Health Services and the United States Centers for Disease Control and Prevention Climate-Ready States and Cities Initiative, 2015.

Nancy Selover, **Ariane Middel**, Nalini Chhetri, Ben Mackowski, C.J. Sisodiya, Impact of solar parasol shading on Automobile Temperatures, Summary report of preliminary findings, Arizona State University, June 2015.

Ariane Middel, Nalini Chhetri, 2014, City of Phoenix Cool Urban Spaces Project—urban forestry and cool roofs: Assessment of heat mitigation strategies in Phoenix. Center for Integrated Solutions to Climate Challenges, Arizona State University.

Ariane Middel, Ray Quay, Dave White, 2013, Water Reuse in Central Arizona. DCDC Technical Report 13-01, Tempe, AZ, Arizona State University.

Conference Presentations and Posters

Ariane Middel, Scott Krayenhoff, Directional Contributions to the Radiant Temperature Environment Measured During Record-Breaking Extreme Heat in Tempe, AZ, *97th AMS Annual Meeting*, Seattle, Washington, January 22–26, 2016.

Kathrin Feige, **Ariane Middel**, Scott Krayenhoff, Benjamin L. Ruddell, Tim Albring, Nicolas R. Gauger, Evaluating SU2 for simulation of urban canopy layer flow, *97th AMS Annual Meeting*, Seattle, Washington, January 22–26, 2016.

Ariane Middel, Jonas Lukasczyk, Impact of urban form on pedestrian thermal comfort –A case study in Phoenix, Arizona, *ACSP 56th Annual Conference*, Portland, November 3-6, 2016.

Ariane Middel, Nancy J. Selover, Björn Hagen, Nalini Chhetri, Impact of Photovoltaic Canopy Shade on Outdoor Thermal Comfort in a Hot Desert City, *EGU General Assembly 2016*, Vienna, Austria, April 17–22, 2016.

Zoe Cayetano, Ryan Taylor, Christian Monahan, Elijah Campbell, Kelsey O'Brien, Rebecca Lydford, Amy Dicker, **Ariane Middel**, Björn Hagen, The Influence of Vegetation and Built Environments on

Midday Summer Thermal Comfort, Poster presented January 15, 2016 at the *18th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2016.

Ariane Middel, Nancy J. Selover, Björn Hagen, Nalini Chhetri, How to stay cool in the desert - The benefits of photovoltaic canopy shade, *AAG Annual Meeting*, San Francisco, California, March 29–April 2, 2016.

Anthony Brazel, **Ariane Middel**, Evaluation of an urban network (AZMET) in the Phoenix metro area, *AAG Annual Meeting*, San Francisco, California, March 29–April 2, 2016.

Ariane Middel, Jennifer Vanos, Benjamin L. Ruddell, Time-detrending surface temperature observations from mobile transects – A sensitivity analysis, *96th AMS Annual Meeting*, New Orleans, Louisiana, January 10–14, 2016.

Nancy J. Selover, **Ariane Middel**, Nalini Chhetri, Ben Mackowski, C.J. Sisodiya, How much can solar shade structures reduce interior automobile temperatures? *96th AMS Annual Meeting*, New Orleans, Louisiana, January 10–14, 2016.

Melissa Wagner, Anthony J. Brazel, **Ariane Middel**, Thermal Comfort and Extreme Heat: A Summertime Assessment of RayMan Model Sensitivity in Downtown Tempe, AZ, *96th AMS Annual Meeting*, New Orleans, Louisiana, January 10–14, 2016.

Ariane Middel, Xiaoxiao Li, Remote sensing of the surface urban heat island and land architecture in Phoenix, Arizona: combined effects of land composition and configuration and cadastral-demographic-economic factors, *AGU Fall Meeting*, San Francisco, December 14–16, 2015.

Subhrajit Guhathakurta, Ariane Middel, Energy and urban form explored through dynamic networked infrastructure model, *ACSP 55th Annual Conference*, Houston, Texas, October 22–25, 2015.

Ariane Middel, Nancy J. Selover, Nalini Chhetri, Björn Hagen, Outdoor thermal comfort under photovoltaic canopies – a seasonal field study at Arizona State University, *9th International Conference on Urban Climate (ICUC9)*, Toulouse, France, July 20–24, 2015.

Jennifer Vanos, **Ariane Middel**, Benjamin L. Ruddell, Evan Kuras, A Multiscaler Thermal Analysis of Urban Playgrounds, *9th International Conference on Urban Climate (ICUC9)*, Toulouse, France, July 20–24, 2015.

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Relationship between land use and microclimate based on mobile transect measurements, *9th International Conference on Urban Climate (ICUC9)*, Toulouse, France, July 20–24, 2015.

Anthony J. Brazel, Katherine Crewe, **Ariane Middel**, Shai Kaplan, Mill Avenue, Tempe, AZ Downtown Microclimate – an APA-designated Best Street. *9th International Conference on Urban Climate (ICUC9)*, Toulouse, France, July 20–24, 2015.

Ariane Middel, Benjamin L. Ruddell, Kathrin Häb, Seasonal and diurnal desert microclimate dynamics of various shade tree and surface cover combinations. *AAG Annual Meeting*, Chicago, Illinois, April 21–25, 2015.

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Classifying urban microclimate patches based on multitemporal mobile transect observations. *AAG Annual Meeting*, Chicago, Illinois, April 21–25, 2015.

Bjoern Hagen, Ariane Middel, David Pijawka, The longitudinal impact of climate related hydro-meteorological disasters on public perception of climate change in the United States. *AAG Annual Meeting*, Chicago, Illinois, April 21–25, 2015.

Nancy J. Selover, **Ariane Middel**, Nalini Chhetri, Ben Mackowski, Chhatrapalsinh Jaydevsinh Sisodiya, Impact of Solar Shade Structures on Automobile's Interior Temperatures. *AAG Annual Meeting*, Chicago, Illinois, April 21–25, 2015.

Ariane Middel, Nancy Selover, Nalini Chhetri, Björn Hagen, Benjamin Mackowski, Chhatrapalsinh Jaydevsinh Sisodiya, Microclimate effects of photovoltaic canopies: ongoing research projects. Poster presented January 16, 2015 at the *17th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2015.

Kathrin Häb, Benjamin L. Ruddell, **Ariane Middel**, Sensor Lag Correction for Mobile Air Temperature Measurements in an Urban Microclimate Context. Poster presented January 16, 2015 at the *17th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2015.

Ariane Middel, Nancy Selover, Nalini Chhetri, Björn Hagen, Outdoor Thermal Comfort under Photovoltaic Canopy Structures – A Field Study at Arizona State University. *Sixth Conference on Environment and Health, AMS conference*, Phoenix, Arizona, January 4–8, 2015.

Kenneth Galluppi, Hana Putnam, Nalini Chhetri, Nancy Selover, **Ariane Middel**, Informing emergency and risk management with climate knowledge in arid urban areas. *10th Symposium on Societal Applications: Policy, Research and Practice, AMS conference*, Phoenix, Arizona, January 4–8, 2015.

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Hans Hagen, Visual analytics and microclimate analysis: A use case for a visualization tool developed for mobile measurements. *31st Conference on Environmental Information Processing Technologies, AMS conference*, Phoenix, Arizona, January 4–8, 2015.

Donna A. Hartz, Ronald Pope, Gelas M. Simiyu, **Ariane Middel**, Peter Cheboss, Philip Raburu, Air Quality and Health Impacts: A novel approach to an international cooperative monitoring project in Uasin Gishu County, Kenya. *Sixth Conference on Environment and Health, AMS conference*, Phoenix, Arizona, January 4–8, 2015.

Soe W. Myint, Baojuan Zheng, Chao Fan, Shai Kaplan, Anthony Brazel, **Ariane Middel**, Martin Smith, Exploring the influence of built and vegetative features on urban warming and cooling: Does spatial arrangement matter? *20th Conference on Satellite Meteorology and Oceanography, AMS conference*, Phoenix, Arizona, January 4–8, 2015.

Matthew C. Roach, Nalini Chhetri, Wen-Ching Chuang, Nancy Selover, David. M. Hondula, **Ariane Middel**, Alex Karner, Building resilience against climate effects in Arizona: Lessons learned implementing CDC's BRACE framework. *Sixth Conference on Environment and Health, AMS conference*, Phoenix, Arizona, January 4–8, 2015.

Soe W. Myint, Baojuan Zheng, Chao Fan, Shai Kaplan, Anthony Brazel, **Ariane Middel**, Martin Smith, Does the spatial arrangement of vegetation and anthropogenic land cover features matter? Case studies of

urban warming and cooling in Phoenix and Las Vegas. *AGU Fall Meeting*, San Francisco, California, December 15–19, 2014.

Ariane Middel, Shai Kaplan, Kathrin Häb, Anthony J. Brazel, The daytime oasis effect of desert cities - The case study of Las Vegas, NV. *UGEC*, Taipei, Taiwan, November 6–9, 2014.

Ariane Middel, Shai Kaplan, Anthony J. Brazel, Impact of land cover on local climate - The case study of Las Vegas, NV. *AAG Annual Meeting*, Tampa, Florida, April 8–12, 2014.

Björn Hagen, **Ariane Middel**, David Pijawka, The impact of recent climate-related hydro-meteorological disasters on public perception of climate change in the US. *AAG Annual Meeting*, Tampa, Florida, April 8–12, 2014.

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Source area computation for microclimate measurements within the urban canopy layer. *AAG Annual Meeting*, Tampa, Florida, April 8–12, 2014.

Ariane Middel, Kathrin Häb, Anthony J. Brazel, Chris A. Martin, Benjamin L. Ruddell, Linking shading patterns of trees in Phoenix, AZ to thermal comfort. *11th Symposium on the Urban Environment, AMS conference*, Atlanta, Georgia, February 2014.

Ariane Middel, Kathrin Häb, Benjamin L. Ruddell, Anthony J. Brazel, Chris A. Martin, Understanding the physical dynamics of microclimate: ongoing research projects. Poster presented January 17, 2014 at the *16th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2014.

Kathrin Häb, **Ariane Middel**, Benjamin L. Ruddell, Visualizing urban transect data. Poster presented January 17, 2014 at the *16th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2014.

Stephanie Schweitzer, **Ariane Middel**, Wenwen Zhang, Urban transport energy consumption explored through 3D arc maps. *IEEE VisWeek 2013*, Visualization, October 13–18, Atlanta, Georgia, 2013.

Björn Hagen, **Ariane Middel**, David Pijawka, The importance of public climate change perceptions for the successful implementation of mitigation and adaptation planning strategies to improve resiliency. *Planning for Resilient Cities and Regions, AESOP/ACSP Congress*, July 15–19, Dublin, Ireland, 2013.

Björn Hagen, **Ariane Middel**, David Pijawka, Rick van Schoick, Bi and multi-national partnership models for sustainability education: What works? *CONAHEC's 15th North American Higher Education Conference*, May 1–3, 2013, Edmonton, Canada.

Ariane Middel, Kathrin Häb, Anthony J. Brazel, Chris Martin, Subhrajit Guhathakurta, Impact of urban form and design on mid-afternoon microclimate in Phoenix neighborhoods. Poster presented January 11, 2013 at the *15th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2013.

Ariane Middel, Kathrin Häb, James P. Erickson, Anthony J. Brazel, Chris Martin, Subhrajit Guhathakurta, Impact of microclimate on residential energy consumption in different Phoenix Arizona neighborhood types. Poster presented October 4, 2012 at the *PhD Design, Environment, and the Arts Student Research Poster Exhibit*, Tempe, Arizona, 2012.

Ariane Middel, Anthony J. Brazel, Shai Kaplan, Soe W. Myint, Summer nighttime cooling and cooling efficiency in Phoenix, AZ. Poster presented January 13, 2012 at the *14th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2012.

Patricia Gober, **Ariane Middel**, Anthony Brazel, Soe Myint, Heejun Chang, Jiunn-Der Duh, Lily House-Peters, Tradeoffs between water conservation and temperature amelioration in Phoenix and Portland: Implications for urban sustainability. *2011 AAG Annual Meeting*, April 12, 2011, Seattle, Washington.

Stephane Frijia, Subhrajit Guhathakurta, Eric Williams, **Ariane Middel**, Re-examining the life cycle energy of residences: Functional unit, technological dynamics and scaling. *COURS Poster Session*, Arizona State University, Tempe, Arizona, 2011.

Stephane Frijia, Subhrajit Guhathakurta, Eric Williams, **Ariane Middel**, Scaling behavior of the life cycle energy of residences. Poster presented February 20, 2011 at the *Decision Making Under Uncertainty (DMUU) Session of the AAAS Annual Meeting*, Washington, DC, 2011.

Ariane Middel, Anthony J. Brazel, Patricia Gober, Soe W. Myint, Heejun Chang, Jiunn-Der Duh, Impacts of weather variability on turbulent heat fluxes in Phoenix, AZ and Portland, OR. Poster presented at the *January 13, 2011 13th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2011.

Stephane Frijia, Eric Williams, Subhrajit Guhathakurta and **Ariane Middel**, Scaling behavior of the life cycle energy of residential building and impacts on greenhouse gas emissions. Poster presented at the *January 13, 2011 13th Annual CAP LTER Poster Symposium*, Tempe, Arizona, 2011.

Anthony J. Brazel, Katherine Crewe, **Ariane Middel**, Tradeoffs between water and heat in Phoenix, Arizona - toward a more climatically sustainable city. *32nd Annual Meeting of the Applied Geographers Organization (AGC)*, October 28–31, Baton Rouge, LA, 2009.

Ariane Middel, Peter-Scott Olech, Re-tooling urban planners - Google Earth as planning support tool, *8th International Symposium (UPE 8) of the International Urban Planning and Environment Association*, March 23–26, Kaiserslautern, Germany, 2009.

Ariane Middel, Robert Pahle, Peter-Scott Olech, Hans Hagen, Policy-driven visualization of urban forms for planning support, *IEEE VisWeek 2008*, Visualization, Oct. 19–24, Columbus, Ohio, 2008.

Ariane Middel, Visualizing urban futures, *3rd Annual IRTG Workshop on "Visualization of Large and Unstructured Data Sets"*, September 29, Kaiserslautern, Germany, 2008.

Invited Presentations

03/2016 **How to stay cool in the desert: Examples of urban climate research at the local and micro-scale**
Information Science and Technology Seminar Speaker Series, Los Alamos National Lab, March 7, 2016

05/2016 **Impact of urban form and vegetation on micro-climate and thermal comfort in hot desert environments**
Seminar, Nanjing University, China, May 25, 2016

Teaching

- 09/2016 **Impact of urban form, design, and landscaping on microclimate and thermal comfort: Microclimate modeling and field observation studies in Phoenix**
Guest Lecture, PUP 442: Environmental Planning
- 03/2016 **The UHI and sustainability science: Causes, impacts, and solutions**
Guest Lecture, PUP 190/SOS 111: Sustainable Cities, Arizona State University
- 08/2015 – 12/2015 **Climatology and Planning**
GPH/PUP 498/591, Arizona State University
- 11/2015 **The UHI and sustainability science: Causes, impacts, and solutions**
Guest Lecture, PUP 190/SOS 111: Sustainable Cities, Arizona State University
- 10/2015 **The hot and cold of It: Environmental research in extreme climates**
Guest Lecture, GPH 212: Introduction to Meteorology
- 09/2015 **Urban Heat Island mitigation**
Guest Lecture, PUP 598: Environmental Planning, Arizona State University
- 04/2015 **Impact of urban form, design, and landscaping on microclimate and thermal comfort: Microclimate modeling and field observation studies in Phoenix**
Guest Lecture, PUP 591: Cool Cities, Arizona State University
- 11/2014 **Impact of vegetation and urban form on neighborhood microclimate and water use: Examples of local- and microscale modeling and field observation studies in Phoenix**
Guest Lecture, GPH 591: Urban Climate, Arizona State University
- 11/2014 **Urbanization and the Urban Heat Island (UHI)**
Guest Lecture, GPH 314: Global Change, Arizona State University
- 10/2014 **The UHI and Sustainability Science: Causes, Impacts, and Solutions**
Guest Lecture, PUP 190/SOS 111: Sustainable Cities, Arizona State University
- 04/2014 **Planning for Cooler Cities: Heat mitigation in Phoenix through landscape and urban design**
Guest Lecture, PUP 591: Cool Cities, Arizona State University
- 04/2013 **Planning for Cooler Cities: Microclimate Modeling**
Guest Lecture, PUP 591: Cool Cities, Arizona State University
- 10/2012 **Climate Modeling in Urban Planning**
Guest Lecture, PUP 571, Arizona State University
- 11/2011 – 03/2012 **Research Methods for PhD students**
Department of Computer Science, University of Kaiserslautern, Germany
- 10/1997 – 12/1998 **Introduction to MS EXCEL**
Institute of Theoretical Geodesy, University of Bonn, Germany

Mentoring

09/2016 – present	Mehdi Aminipouri, Simon Fraser University, PhD student (Committee member)
09/2016 – present	Ema Shqalsi, Arizona State University, Honors student (Committee member)
06/2016 – present	NASA CubeSat mission, co-advisor for undergraduate student “Science team”
08/2016 – present	Sophie Zakrzewski, University of Kaiserslautern, Master’s student (Committee member)
07/2016 – present	Michelle Poletti, Florida International University, undergraduate student (REU)
10/2015 – present	Mehdi P. Heris, University of Colorado Denver, Ph.D. student (Committee member)
04/2015 – present	Elicia Ratajczyk, Arizona State University, Ph.D. student (Committee member)
06/2015 – present	Jonas Lukasczyk, University of Kaiserslautern, Ph.D. student (Committee member)
09/2015 – present	Kathrin Hüb, University of Kaiserslautern, Post-Doc
04/2015 – 04/2016	Kaylee Colter, Arizona State University, Master’s student (Committee member)
08/2015 – 01/2016	PUP 190/SOS 101 Honors student recitation
12/2011 – 08/2015	Kathrin Hüb, University of Kaiserslautern, Ph.D. committee (Co-chair)
09/2013 – 12/2013	Engineering Projects in Community Service (EPICS)—student group developing an Urban Heat Island exhibit for the Arizona Science Center
11/2013 – 10/2014	Jonas Lukasczyk, University of Kaiserslautern, Master’s student
02/2013 – 10/2013	Stephanie Schweitzer, University of Kaiserslautern, Master’s student

Professional Memberships

2016 – present	Member of EGU (European Geosciences Union)
2015 – present	Member of ISB (International Society of Biometeorology)
2015 – present	Member of AGU (American Geophysical Union)
2013 – present	Member of AMS (American Meteorological Society)
2011 – present	Member of IAUC (International Association for Urban Climate)
2011 – present	Member of AAG (Association of American Geographers)
2011 – present	Member of IEEE (Institute of Electrical and Electronics Engineers)
2011 – present	Member of APA (American Planning Association)
2001 – present	Member of DVW (German Surveying Association)

Peer-Review Activities

Advances in Atmospheric Sciences, Annals of GIS, Buildings, Climatic Change, Energies, Environmental Health Perspectives, EnvirVIS conference, Eurographics, IEEE Symposium on Visualization, International Journal of Climatology, ISPRS International Journal of Geo-Information, Journal of Digital Earth, Journal of Horticulture and Forestry, Journal of Sustainable Development, Journal of Urban Ecology, Journal of Urban Forestry and Urban Greening, Journal of Urban Technology, Landscape and Urban Planning, Remote Sensing, Sustainability, The Egyptian Journal of Remote Sensing and Space Sciences, Theoretical and Applied Climatology, Urban Climate

Professional Service

2017 Workshop Co-chair, EnvirVIS 2017, Barcelona, Spain, June 12-16, 2017
2016 – present Steering Committee, Urban Climate Research Center, Arizona State University
2016 Workshop Co-chair, EnvirVIS 2016, Groningen, Netherlands, June 6-10, 2016
2015 Workshop Co-chair, EnvirVIS 2015, Cagliari, Italy, May 25-26, 2015
2014 Program Committee, EnvirVIS 2014, Swansea, UK, June 9-13, 2014
2013 Scientific Committee, CUPUM 2013, Utrecht, Netherlands, July 2-5, 2013
2011 Co-organizer, Annual IRTG Workshop, Kaiserslautern, Germany, June 10-11, 2011
1998 – 2003 Board member of the German Geodesy student society ARGEOS

Public Service

ASU News (September 2016): Staying cool: The science of shade
<https://asunow.asu.edu/20160914-staying-cool-au-science-shade>

University of Kaiserslautern Unispectrum (September 2016): Vom Klassenzimmer in der Pfalz in die Weiten Arizonas
<http://www.unispectrum.de/forschen/vom-klassenzimmer-in-der-pfalz-in-die-weiten-arizonas>

UGEC Viewpoints (March 2016): Transforming desert playgrounds into urban oases
<https://ugecviewpoints.wordpress.com/2016/03/22/transforming-desert-playgrounds-into-urban-oases/>

Science Daily (November 2015): Dangerously hot playground temperatures explored by researcher
<https://www.sciencedaily.com/releases/2015/11/151111172514.htm>

Texas Tech Today (November 2015, July 2016): Dangerously Hot Playground Temperatures Explored by Researcher
<http://today.ttu.edu/posts/2015/11/hot-playground-temperatures-explored-by-researcher>
<http://today.ttu.edu/posts/2016/07/hot-playground>

ASU News (September 2015): Made in the shade: ASU team crunches data on how best to cool urban areas

<https://asunow.asu.edu/content/made-shade-asu-team-crunches-data-how-best-cool-urban-areas>

ASU News (February 2014): ASU report contributes to water reuse policy dialogue

<https://asunow.asu.edu/content/asu-report-contributes-water-reuse-policy-dialogue>

ASU News (March 2014): Changing climate in your own backyard

<https://asunow.asu.edu/content/changing-climate-your-own-backyard>

ASU News (December 2009): ASU hosts second Chinese science delegation

<https://asunow.asu.edu/content/asu-hosts-second-chinese-science-delegation>

10/2016