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## BENJAMIN R. CRAWFORD

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Assistant Professor  
 Department of Geography and Environmental Sciences  
 University of Colorado Denver  
 Denver, Colorado 80217  
[benjamin.crawford@ucdenver.edu](mailto:benjamin.crawford@ucdenver.edu)

### Research Interests

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- Surface-atmosphere interactions & boundary layer climates, especially in cities and complex terrain.
- Air quality, renewable energy, and weather-related hazards
- Distributed observation networks and sensor design

### Education

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- Ph.D. (2014) Department of Geography, University of British Columbia, Vancouver, BC, Canada.  
 Dissertation: *Measurements of carbon dioxide fluxes and concentrations at multiple scales in Vancouver, Canada*
- M.S. (2007) Atmospheric Science Program, Department of Geography, Indiana University, Bloomington, IN, USA. Thesis: *Carbon dioxide fluxes in suburban Baltimore, USA*
- B.S. (2003) Department of Geography, Indiana University, Bloomington, IN, USA. Thesis: *Investigation of anthropogenic heat flux using a physical model and real-world observations*

### Professional Positions

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| <i>Assistant Professor.</i> Department of Geography and Environmental Sciences, University of Colorado Denver.   | 2019-present |
| <i>Research Affiliate.</i> Department of Civil and Environmental Engineering, Massachusetts Institute of Technology.   | 2019-present |
| <i>Postdoctoral Associate.</i> Department of Civil and Environmental Engineering, Massachusetts Institute of Technology. Project leader to measure volcanic air pollution in Hawai`i using a low-cost, community-based sensor network.                                   | 2017-2019    |
| <i>Postdoctoral Researcher.</i> Department of Meteorology, University of Reading, Reading, UK. International multidisciplinary URBANFLUXES project to integrate satellite observations with <i>in situ</i> measurements and urban climate models.                        | 2015-2017    |
| <i>Principal Investigator,</i> Leader of university-private sector collaboration for a wind energy research application in Vancouver, BC, Canada. MITACS-Accelerate Internship Fellowship.   | 2013-2014    |
| <i>Wind energy resource analyst.</i> Led wind energy turbine array site selection and layout design projects; meteorological tower site selection, design, and installation; meteorological data analysis and processing. Sea Breeze Power Corp., Vancouver, BC, Canada. | 2012-2013    |
| <i>Graduate research and teaching assistant.</i> Department of Geography, University of British Columbia, Vancouver, BC, Canada. Collaborative multidisciplinary urban micrometeorological research project (Environmental Prediction in Canadian Cities [EPICC]).       | 2008-2012    |
| <i>Staff Scientist,</i> Climate Assessment for the Southwest (CLIMAS), The University of Arizona, Tucson, Arizona. Coordinated and led climate related outreach and research focusing on drought and climate variability in the American Southwest.                      | 2005-2007    |
| <i>Graduate research and teaching assistant.</i> Department of Geography, Indiana University, Bloomington, IN, USA.  | 2003-2005    |

### Peer-reviewed publications

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- Chrysoulakis, N., Grimmond, S., Feigenwinter, C., Lindberg, F., Gastellu-Etchegorry, J.P., Marconcini, M., Mitraha, Z., Stagakis, S., **Crawford, B.**, Olofson, F. and Landier, L., (2018). Urban energy exchanges monitoring from space. *Scientific reports*, 8(1), p.11498.
- H. Dacre, **B. Crawford**, A.J. Charlton-Perez, G. Lopez-Saldana, G.H Griffiths, J. Vicencio-Veloso (2018). 'Chilean wildfires: Probabilistic prediction, emergency response and public communication', *Bulletin of the American Meteorological Society*.
- Li, S. and **B. Crawford** (2018), 'Vegetation, Air Temperature, and Sensible Heat Flux in the Urban Canopy Layer', *Urban Climate*, In review
- Crawford, B.**, C.S.B. Grimmond, A. Gabey, M. Marconcini, H.C. Ward, C. W. Kent (2018). 'Variability of urban surface temperatures and implications for aerodynamic energy exchange during unstable conditions', *Quarterly Journal of the Royal Meteorological Society*.
- Barlow, J., Best, M., Bohnenstengel, S. I., Clark, P., Grimmond, S., Lean, H., **B. Crawford...** & Lemonsu, A. (2017). 'Developing a Research Strategy to Better Understand, Observe, and Simulate Urban Atmospheric Processes at Kilometer to Sub-kilometer Scales.' *Bulletin of the American Meteorological Society*, 98(10), ES261-ES264.
- Crawford, B.**, C.S.B. Grimmond, H.C. Ward, W. Morrison, S. Kotthaus (2017): 'Spatial and temporal patterns of surface-atmosphere energy exchange in a dense urban environment using scintillometry', *Quarterly Journal of the Royal Meteorological Society*, doi:10.1002/qj.2967.
- Crawford, B.**, Krayenhoff, E. S., & Cordy, P. (2016). 'The urban energy balance of a lightweight low rise neighborhood in Andacollo, Chile.' *Theoretical and Applied Climatology*, 1-14. 10.1007/s00704-016-1922-7
- Crawford, B.**, A. Christen, I. McKendry (2016): 'Diurnal course of carbon dioxide mixing ratios in the urban boundary layer in response to surface emissions' *Journal of Applied Meteorology and Climatology*, 55.3, 507-529.
- Crawford, B.** and Christen, A. (2015): 'Spatial source attribution of measured urban eddy covariance carbon dioxide flux' *Theoretical and Applied Climatology*, 119 (3-4), 733-755.
- Crawford, B.** and Christen, A. (2014): 'Spatial variability of carbon dioxide in the urban canopy layer and implications for flux measurements' *Atmospheric Environment*, 98, pp. 308-322.
- Cordy, P., M Veiga, **B. Crawford**, O. Garcia, V. Gonzalez, D. Moraga, M. Roeser, and D. Wip. (2013). 'Characterization, mapping, and mitigation of mercury vapour emissions from artisanal mining gold shops' *Environmental Research*, 125, 82-91.
- Kellett R., Christen A., Coops N., van der Laan M; **Crawford B.R.**, Tooke T.R., Olchovski I. (2013): 'A systems approach to carbon cycling and emissions modelling at an urban neighbourhood scale' *Landscape and Urban Planning*. 110, 48-58.
- Christen, A., Coops N.C., **Crawford B.R.**, Kellett R., Liss K.N., Olchovski I., Tooke T.R., van der Laan M., Voogt J. A. (2011): 'Validation of modeled carbon-dioxide emissions from an urban neighborhood with direct eddy-covariance measurements', *Atmospheric Environment*, 45, 6057-6069
- Crawford B.R.**, Grimmond C.S.B., Christen A. (2011): 'Five years of carbon dioxide flux measurements in a highly vegetated suburban area'. *Atmospheric Env.*, 45 (4) 896-905
- McKendry I.G., D. van der Kamp, K.B. Strawbridge, A. Christen, **B. Crawford** (2009). 'Simultaneous observations of boundary-layer aerosol layers with CL31 ceilometer and 1064/532 nm lidar'. *Atmospheric Environment*, 43 (36), 5847-5852.

### Teaching

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- Spring 2018 *MIT Kaufman Teaching Certificate Program*. Participant in semester-long teaching skills development course.
- January 2018, 2019 *Teaching Assistant for MIT TREX (Travelling Research Experience) course*. Three week intensive undergraduate environmental field-based research course in Hawai'i.
- November 2016 *Applied GIS and urban microclimate*, Invited lecture and applied laboratory activity, CEM 223 School of Built Environment, University of Reading, UK.
- 2008-2013 *Teaching Assistant*, Department of Geography, University of British Columbia -G304 Synoptic Meteorology (4x)

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	-G200 Atmospheric Environments (2x)
	-G102 Introduction to Physical Geography (2x)
September 2011	'Urban Metabolism and Carbon Emissions', Invited Lecture, Urban Canada 2230, Department of Geography, Langara College, Vancouver, BC. June 2010
June 2010	'Urban Metabolism and Physical Geography of Cities', Invited Lecture, G350 Urban Geography, Department of Geography, University of British Columbia. June 2010.
2008 - 2010	<i>Instructor of Record</i> , G104 Physical Geography, University Canada West, Vancouver, BC (2x)
2004-2005	<i>Associate Instructor</i> , Department of Geography, Indiana University
	-G107 Physical Systems of the Environment
	-G109 Introduction to Weather and Climate
Spring, 2004	<i>Tutor</i> , Department of Geography, Indiana University

### **Student Research Supervision**

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Summer 2018	MIT Summer Research Program undergraduate research project (co-supervised with Prof. Jesse Kroll). <i>'Evaluation of a low-cost optical particle counter in the laboratory and field'</i>
Spring 2018	MIT CEE Undergraduate Capstone Project (co-supervised with Prof. Jesse Kroll), <i>'Testing and calibrating a low-cost particulate matter optical particle counter'</i>
Summer 2017	M.Sc. Meteorology, University of Reading (co-supervised with Prof. Sue Grimmond) <i>'Vegetation, Air Temperature, and Sensible Heat Flux in the Urban Canopy Layer'</i>

### **Grant Funding, Scholarships, and Awards**

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2018	MIT Center for Environmental Health Sciences Poster Competition Award (2 <sup>nd</sup> place)
2016	Early Career Researcher Award to attend 'Urban Air Pollution in Indian and UK cities: Characterization and Prediction of Chemically Reactive Air Pollutants Workshop', Delhi, India, 11/28-12/1/16,
2015-2016	Postdoctoral Research Fellowship, URBANFLUXES project, Department of Meteorology, University of Reading, UK
2013-2014	MITACS-Accelerate Internship Fellowship, collaboration between University of British Columbia and Sea Breeze Power Corp.
2012	Department of Geography, UBC, Ph.D. Travel Award
2011-2014	Ph.D. International Partial Tuition Scholarship, University of British Columbia
2008	GLOBE Student Sponsorship to attend GLOBE 2008 Conference, Vancouver B.C.
2007-2010	Ph.D. Tuition Fee Award, University of British Columbia
2007-2011	Canadian Foundation for Climate and Atmospheric Sciences (CFCAS) Graduate Research Assistant Fellowship
2005	Department of Geography, Indiana University Summer Research Fellowship
2005	Graduate Fellowship Award, Indiana University
2005	Indiana University Department of Geography Award for Academic Excellence
2005	National Chancellor's List
2004	University Consortium for GIS, First Runner-Up Student Poster Award: <i>Land-cover and carbon dioxide fluxes in a suburban area of Baltimore, MD: A GIS based methodology</i> . GIScience 2004, College Park, Maryland, 2004.
2004	University Consortium for GIS Summer Assembly Scholarship to attend GIScience 2004 conference, Washington, D.C.
2003	International Conference on Urban Climate Outstanding Student Poster Award: <i>Investigation of anthropogenic heat flux using a physical model and real-world observations</i> . International Conference on Urban Climate, Łódź, Poland, 2003.
2002	NSF, BCS-0095284, Research Experience for Undergraduates.
2001	IU Undergraduate Research and Creative Activity Partnership Award.

### Invited lectures and presentations

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- Crawford, B.**, J.H. Kroll, C. Heald, D.H. Hagan (2019), 'Measuring volcanic air pollution using low cost sensors' Center for the Study of Active Volcanos, University of Hilo, Hawaii (June 2, 2019)
- Crawford, B.**, H. Dacre, G. Lopez Saldana (2017). 'Probabilistic wildfire prediction in Chile using ensemble weather forecasts' (in Spanish). Wildfire Prediction Workshop, Dirección Meteorológica de Chile and University of Reading. Santiago, Chile, April 2017.
- Crawford, B.** *Urban micro-meteorological measurements in support of air quality research.* Urban Air Pollution in Indian and UK cities: Characterization and Prediction of Chemically Reactive Air Pollutants Workshop, Indian Institute of Technology, Delhi, India, 11/28-12/1/16,
- Crawford, B.** *Surface-atmosphere exchange of energy and carbon in cities.* Colloquium, Department of Atmospheric Science, Colorado State University. 02/25/16
- Crawford, B.** *Wind energy resource assessment in British Columbia, Canada.* Energy Meteorology Seminar, Department of Meteorology, University of Reading, 02/11/16
- Crawford B.**, A. Christen, A. Black, T. Oke, I. McKendry, S. Krayenhoff, M. van der Laan, R. Tooke, D. van der Kamp, R. Ketler 'Carbon dioxide fluxes in Vancouver, Canada', Boundary Layer and Urban Micrometeorology Seminar, Department of Meteorology, University of Reading, 10/28/15
- Crawford, B.**, M. Crimmins. Arizona Climate and Riparian Areas. *Understanding Riparian Areas Workshop*, Show Low, AZ, April 2007.
- Crawford, B.** Climate Change in Arizona. *Boeing Earth Day Fair*, Mesa, AZ, April 2007.
- Crawford, B.** Border Climate Summary Bi-National Product. *Climate Predictions and Applications Sciences Workshop*, Seattle, WA, March 2007.
- Crawford, B.**, G. Garfin. Arizona Drought Preparedness Innovations. *Climate Predictions and Applications Sciences Workshop*, Seattle, WA, March 2007.
- Crawford, B.** Climate Change in Arizona. *Southern Arizona Environmental Management Society's Pollution 2 Prevention Seminar*, Tucson, AZ, September 2006.
- Crawford, B.**, G. Garfin. Arizona Drought Monitoring Activities. *Arizona Hydrological Society Annual Meeting*, Glendale, AZ, September 2006.
- Crawford, B.**, G. Garfin. Arizona Climate. *Arizona Master Watershed Steward Program*, Show Low, AZ, August 2006.
- Crawford, B.**, G. Garfin. Drought and Climate in Arizona. *Bureau of Land Management Environmental Workshop*, Safford, AZ, April 2006.
- Crawford, B.**, G. Garfin, M. Crimmins. Climate Change in the Southwest Web Portal. *Climate Predictions and Application Sciences Workshop*, Tucson, AZ, March 2006.
- Crawford, B.**, G. Garfin, M. Crimmins. An overview of Arizona Climate. *Arizona Master Watershed Steward Program*, Cascabel, AZ, March 2006.

### Published technical reports

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- Pain, Kathy, Daniel Black, Jon Blower, Sue Grimmond, Alistair Hunt, Stani Milcheva, **Ben Crawford** et al. "Supporting smart urban growth: Successful Investing in Density.", *Department of Real Estate & Planning, University of Reading*, 2018.
- Feigenwinter, C., **B. Crawford**, E. Parlow, C.S.B. Grimmond, A. Gabey, C.W. Kent, T. Sun (2016). 'Validation, uncertainty analysis, and documentation of EO-derived sensible and latent heat fluxes.' *UrbanFluxes Project, European Union Horizon 2020*, 36 pp.
- Grimmond, C.S.B., **B. Crawford**, B. Forsberg, D.O. Åström, C. Åström, J. Olsson, D. Segersson, L. Strömback (2016): 'Climate indicators for urban assessments.', *Urban Sectoral Information Systems, European Centre for Medium-range Weather Forecasting*. 52 pp.
- Crawford, B.**, A. Matangi, J. Griffiths, A. Christen, A. Black. (2014): 'Atmospheric stability and wind profiles at a prospective wind energy production site' *MITACS-Accelerate project technical report*, 23 pp. <http://circle.ubc.ca/handle/2429/52662>
- Christen, A., Coops N., Kellett R., **Crawford B.**, Heyman E., Olchovski I., Tooke R., van der Laan M. (2010): 'A LiDAR-Based Urban Metabolism Approach to Neighbourhood Scale Energy and Carbon Emissions Modelling'. *University of British Columbia, 2010 Technical report* prepared for Natural Resources Canada, 104pp. <http://circle.ubc.ca/handle/2429/45079>
- Christen A., **Crawford, B.**, Liss K., Siemens C. (2010): 'Soil properties at the Vancouver EPiCC experimental sites'. *EPiCC Technical Report No. 2*, <http://circle.ubc.ca/handle/2429/45080>

- Crawford B.**, Christen, A., Ketler R. (2009): 'Eddy covariance data processing and quality control procedures'. *EPICC Technical Report No. 1*, 11pp. <http://circle.ubc.ca/handle/2429/45079>
- Crawford, B.**, G. Garfin, R. Ochoa, R. Heffernan, T. Wordell, T. Brown (2006). 'National Seasonal Wildfire Assessment Workshops Final Report.' *Institute for the Study of Planet Earth, The University of Arizona*.

### Conference Contributions

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- B. Crawford**, D.H. Hagan, I. Grossman, B. Cole, C.L. Heald, J.H. Kroll, 'Air quality during the 2018 Kilauea eruption measured with a low-cost sensor network', EGU General Assembly, April 8-12, 2019, Vienna, Austria.
- B. Crawford**, D. Hagan, J. Kroll, C. Heald, K. Vandiver, I. Grossman, 'Deploying a low-cost air quality sensor network during a volcanic eruption in Hawai'i.', International Global Atmospheric Chemistry, Takamatsu, Japan, 25-29 September 2018.
- B. Crawford**, C.S.B. Grimmond, A. Gabey, M. Marconcini, H.C. Ward, C.W. Kent, W. Morrison, S. Kotthaus, K. zum Berge, 'Variability of urban surface temperatures and implications for aerodynamic energy exchange', International Conference on Urban Climate, New York City, USA, 6-10 August 2018.
- B. Crawford**, C.S.B. Grimmond, C. Kent, A. Gabey, H. Ward, T. Sun, W. Morrison (2017): 'A dynamic aerodynamic resistance approach to calculate high resolution sensible heat fluxes in urban areas' EGU General Assembly, April 24-28, 2017, Vienna, Austria.
- B. Crawford**, H. Dacre, G. Lopez-Saldana, A. Charlton-Perez (2017): 'Design of a probabilistic wildfire alert system for Chile.' EGU General Assembly, April 24-28, 2017, Vienna, Austria.
- Christen, A., A. Black, **B. Crawford**, L.B. Flanagan, R. Ketler, Z. Nestic, C.I. Semmens. (2017): 'Diurnal and seasonal changes of  $\delta_{13}C$  and  $\delta_{18}O$  in carbon dioxide measured by eddy covariance over and urban surface'. American Meteorological Society Annual Meeting, Jan. 23-28, 2017, Seattle, WA, USA.
- C.S.B. Grimmond, V.S. Bouchet, H.C. Ward, **B. Crawford**, S. Leroyer, D. Davignon, A. Baklanov (2017): 'Urban land-surface characterization for modeling of atmospheric processes.' American Meteorological Society Annual Meeting, Jan. 23-28, 2017, Seattle, WA, USA.
- Crawford, B.**, C.S.B. Grimmond, H.C. Ward, W. Morrison, S. Kotthaus (2016): 'Spatial and temporal patterns of sensible heat flux from scintillometers in central London.' European Meteorological Society Annual Meeting, Sep. 12-16, 2016, Trieste, Italy.
- Crawford, B.**, A. Matangi, J. Griffiths, A. Christen, A. Black (2016): 'Characterizing atmospheric stability and roughness length for wind resource assessment in complex terrain.' European Meteorological Society Annual Meeting, Sep. 12-16, 2016, Trieste, Italy.
- Christen A., **Crawford B.**, Ketler R., Lee J. K., McKendry I., Nestic Z., Semmens C. (2015): 'A multi-scale approach to monitor urban carbon-dioxide emissions in the atmosphere over Vancouver, Canada'. AGU Fall Meeting, December 14 to 18, 2015, San Francisco, CA, USA.
- Christen A., Johnson M., Molodovskaya M., Ketler R., Nestic Z., **Crawford B.**, Giometto M., van der Laan M. (2013): 'Integral emission factors for methane determined using urban flux measurements and local-scale inverse models'. EGU General Assembly 2013, Vienna, Austria, 7 - 12 April 2013.
- Crawford B.**, Christen A. (2012): 'Temporal and spatial partitioning of measured urban carbon-dioxide fluxes'. ICUC-8 - 8th International Conference on Urban Climate. Dublin, Ireland. Aug 6 - 10, 2012.
- Crawford B.**, Christen A. (2012): 'Quantifying the CO<sub>2</sub> storage term in urban eddy covariance observations'. ICUC-8 - Dublin, Ireland. Aug 6 - 10, 2012.
- Christen A., Bergeron O., **Crawford B.**, Oke, T. R., van der Laan M. , Strachan I., Voogt J. A. (2011): 'Tower-based measurements of carbon emissions in four Canadian residential neighborhoods reveal linkages between urban metabolism and form'. ISUF 2011 - International Seminar on Urban Form. Montreal, Canada. August 26-29, 2011.
- Christen A., **Crawford B.**, Grimmond S., Voogt J., Oke T. (2010): 'Year-long urban-rural differences of the surface radiation and energy balance observed in and near Vancouver, BC', *44th Annual CMOS Congress / 36th Annual Scientific Meeting of CGU*. May 31 - June 4, Ottawa, Canada.
- Christen A., Coops N., **Crawford B.**, Kellett R., Liss K., Oke T., Olchovski I., Tooke R., van der Laan M., Voogt J. (2010): 'Comparing an urban metabolism model to long-term CO<sub>2</sub> eddy-

- covariance measurements', *9th AMS Symposium on the Urban Environment*, August 2 - 6, Keystone CO, USA
- Jarvi L., Grimmond S., Loridan T., Oke T., Christen A., **Crawford B.** (2010): 'Urban water balance in Vancouver: impacts of changes in land cover'. *9th AMS Symposium on the Urban Environment*, August 2 - 6, Keystone CO, USA
- Crawford B.**, A. Christen, I.G. McKendry, D. van der Kamp (2009). Vertical profiles of carbon dioxide in the urban boundary layer - measurements and modeling. *7th International Conference on Urban Climate*, Yokohama, Japan, July 2009. (oral presentation)
- Christen A., N. Coops, **B. Crawford**, K. Liss, T.R. Oke, R. Tooke (2009), The role of soils and lawns in urban-atmosphere exchange of carbon dioxide. *7th international Conference on Urban Climate*, Yokohama, Japan, July 2009. (poster)
- Crawford, B.**, A. Christen, T.R. Oke, J.A. Voogt, S. Grimmond (2009). Observations of carbon dioxide fluxes in two suburban neighborhoods in Vancouver, Canada. *Conference Proceedings, 8th Symposium on the Urban Environment, American Meteorological Society*, Phoenix, AZ, January 2009. (oral presentation)
- Crawford, B.**, A. Christen (2009). Observations of carbon dioxide concentrations in the greater Vancouver region. *Conference Proceedings, 8th Symposium on the Urban Environment, American Meteorological Society*, Phoenix, AZ, January 2009. (poster)
- Christen A., **B. Crawford**, N. Goodwin, R. Tooke, N. Coops, C.S.B. Grimmond, T.R. Oke, J. A. Voogt (2009). The EPiCC Vancouver Experiment - how do urban vegetation characteristics and garden irrigation control the local-scale energy balance? *Conference Proceedings, 8th Symposium on the Urban Environment, American Meteorological Society*, Phoenix, AZ, January 2009. (poster)
- Liss, K., **B. Crawford**, R. Jassal, C. Siemens, A. Christen. Ecosystem respiration of suburban lawns and its response to varying management and irrigation regimes (2009). *Conference Proceedings, 8th Symposium on the Urban Environment, American Meteorological Society*, Phoenix, AZ, January 2009. (poster)
- Liss, K., A. Christen, **B. Crawford**, C. Siemens (2009). Green cities: Environmental controls on carbon dioxide flux from urban turfgrass. *Rising Stars of Research - National Undergraduate Science and Engineering Research Poster Competition*, Vancouver, BC, August 2009. (poster)
- Crawford, B.**, C.S.B. Grimmond, J. Hom (2006). Carbon dioxide fluxes in a suburban area of Baltimore, MD: 2002-2004. *Annual Meeting of the American Meteorological Society*, Atlanta, GA, 2006. (oral presentation)
- Crawford, B.**, CSB Grimmond, J. Hom, B. Offerle, D. Golub. Land-cover and carbon dioxide fluxes in a suburban area of Baltimore, MD: A GIS based methodology (2004). *Conference Proceedings, GIScience Conference*, College Park, Maryland, 2004. (poster)
- Crawford, B.**, CSB Grimmond, J. Hom, B. Offerle, D. Golub. Land-cover and carbon dioxide fluxes in a suburban area of Baltimore, MD: A GIS based methodology. *Baltimore Ecosystem Study Annual Meeting*, 20-23 October, 2004, Baltimore, MD. (poster)
- Grimmond C.S.B, H.-B. Su, B. Offerle, **B. Crawford**, S.Scott, S. Zhong, and C. Clements (2004). Variability of sensible heat fluxes in a suburban area of Oklahoma City. *Preprints, The Symposium on Planning, Nowcasting, and Forecasting in the Urban Zone*, Seattle, WA, 12-14 January 2004, Amer. Meteor. Soc.
- Crawford, B.**, CSB Grimmond, B. Offerle (2003). Investigation of anthropogenic heat flux using a physical model and real world observations, *Conference Proceedings International Conference on Urban Climate*, Łodz, Poland, 2003. (poster)

### **Service and volunteering**

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| April 2018  | Cambridge Science Festival, Experimental demonstration of a solar powered balloon-based air quality measurement system.  |
| 2016 - 2017 | Reading Bicycle Kitchen. Volunteer bicycle mechanic for community bike workshop. <a href="http://www.readingbicyclekitchen.org/">http://www.readingbicyclekitchen.org/</a> |
| 2016-2017   | Postdoc mentor, Department of Meteorology, University of Reading   |
| Sep. 2016   | Urban Climate session co-chair, European Meteorological Society Annual Meeting, Sep. 12-16, 2016, Trieste, Italy.  |

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Jan- Apr 2015	Wild Ocean Whale Society, Volunteer development of online mapping application, Powell River, BC, Canada
2010-2011	Graduate Student Mentor, Department of Geography, University of British Columbia
2005-2007	Climate advisor to Arizona County Local Drought Impact Groups (LDIG)
Feb 2007	2007 Arizona Water Expo Display Booth, Phoenix, AZ
Jan 2006	2006 Arizona Water Expo Display Booth, Phoenix, AZ
2004-2005	Publicity Committee - Department of Geography, Indiana University
2004-2005	Graduate student mentor – Department of Geography, Indiana University
2004	GIS Day 2004 Support - Department of Geography, Indiana University
2001-2002	Classroom mentor for kindergarten and 2nd grade – Binford Elementary School, Bloomington, IN

### **Additional projects and activities**

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2016-2017	Design of a probabilistic warning system for Chilean wildfires. Including workshop organization and presentation in Santiago Chile with Chilean Meteorological Service.
2015 - 2017	URBANFLUXES, European Union H2020 project to calculate urban energy balance terms from space-based observations.
2015 -2016	Urban SIS – Climate Information for European Cities, climate service project for urban environmental indicators. Funded by Copernicus, ECMWF.
2016 - 2016	Supporting Smart Urban Growth: Successful Investment in Density. Urban Land Institute project to research urban development, density, and sustainability
2006-2007	Management and content development for collaborative U.S.-Mexico Border Climate Summary Product
2006-2007	Content development for AZ Dept. of Water Resources Arizona Water Atlas
2006-2007	Management and content development for CLIMAS Climate Change in the Southwest Web Portal
2005-2007	Member of Arizona State Drought Monitoring Technical Committee
2005-2007	Member of US Drought Monitor Arizona reporting group
May 2006	Co-organizer of 2006 Monsoon Region Climate Applications Workshop, Guaymas, Mexico.
April 2006	Co-organizer of 2006 Western States and Alaska National Seasonal Fire Assessment Workshop, Boulder, CO.
March 2006	Co-organizer of 2006 Climate Sciences Prediction and Applications Workshop, Tucson, AZ.
January 2006	Co-organizer of the Arizona Society for Range Managers Climate and Rangelands Workshop, Globe, AZ

### **Previous research, field experience, and past projects**

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2014-2015	<b>Powell River, BC, Canada.</b> <i>Principal and founder.</i> Skylight Renewable Energy. Data analysis and resource assessment for wind and solar energy projects.
Nov-Dec 2013	<b>Interior BC, Canada.</b> Field installation of wind resource assessment tower at remote mountain location during severe winter weather.
October 2012	<b>North Coast BC, Canada.</b> Field installation of wind resource assessment tower at a remote island location.
March-May 2009	<b>Andacollo, Chile.</b> Urban micrometeorological observational campaign to measure atmospheric mercury contamination from artisanal gold mining.
June-August 2007	<b>London, UK.</b> <i>Visiting Research Assistant,</i> Department of Geography, King's College London. Urban meteorological data processing and analysis.
2003-2005	<b>Baltimore, MD, USA</b> <i>Graduate research and teaching assistant.</i> Baltimore Ecosystem Study, Cub Hill Flux Tower, in cooperation with USDA Forest Service.
May-July 2004	<b>Bloomington, IN, USA.</b> <i>Field Scientist,</i> 2004 brood-X cicada emergence spatial sampling research. Spatial sampling of cicada emergence in forest and urban areas.

- August 2003 **Łódz, Poland.** *Field Scientist*, Urban energy and carbon balance study. Meteorological instrument maintenance and installation.
- June-August 2003 **Oklahoma City, OK, USA.** *Field Scientist*, Joint Urban 2003 Dispersion Experiment. Design, installation, and maintenance of 7 urban eddy-covariance systems.
- January-May 2003 **Bloomington, IN, USA.** *Field Scientist*, Forest sap flow study. Design, construction, and installation of tree sap flow sensors
- October 2002 **Bloomington, IN, USA.** *Field Scientist*, Soil nitrogen deposition study. Installation and maintenance of soil lysimeters
- 2002-2003 **Oklahoma City, OK; Bloomington, IN, USA.** *Principal Investigator*, Physical model and real-world observations of anthropogenic heat. Design of a heated physical model urban environment.
- 2001-2003 **Bloomington, IN, USA.** *Field Scientist*, Morgan-Monroe State Forest energy and carbon balance study, Bloomington, IN. Meteorological data analysis as well as instrument maintenance and calibration.

### Technical and Language Skills

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*Computer:* UNIX, R, IDL, MATLAB, FORTRAN, Python, ArcView GIS, QGIS, Microsoft Office, HTML, data logger programming, Adobe Illustrator, microprocessors

*Instrumentation:* Optical particle counters, electrochemical sensors, scintillometers, eddy-covariance, Micrometeorological instrument installation and calibration, including: sonic anemometers, infrared gas analyzers, krypton hygrometers, radiometers, dataloggers.

*Language:* English (native), Spanish (conversational)  
FAA unmanned aircraft system pilot

### Affiliations

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International Association for Urban Climate  
American Meteorological Society  
Association of American Geographers  
CFCAS Environmental Prediction in Canadian Cities (EPICC) Network  
Baltimore Ecosystem Study, Long Term Ecological Research (LTER) Site

National Society of Collegiate Scholars  
Phi Eta Sigma Honor Society  
UBC Varsity Outdoor Club  
Wild Ocean Whale Society  
Midwest Renewable Energy Association  
AmeriFlux Network

### Journal Referee

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*Landscape and Urban Planning*  
*Boreal Environment Research*  
*Urban Ecosystems*  
*Atmospheric Science Letters*  
*Nature*

*Atmospheric Chemistry and Physics*  
*Environmental Pollution*  
*Atmospheric Environment*  
*Journal of Geophysical Research Atmospheres*

### References

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Professor Jesse Kroll  
*Civil and Environmental Engineering, MIT*

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+1 617-253-2409

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