

# Helen Claire Ward

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## Education

- 2009-2013 **PhD in Urban Meteorology at King's College London and CEH Wallingford (UK)**  
Thesis title: *Energy, water and carbon fluxes in the suburban environment*
- 2005-2009 **Master of Physics (MPhys) – 1st Class, Oxford University (UK)**  
Specialisation in *Climate Physics* and *Geophysical Fluid Dynamics* (also *Particle Physics*).

## Current employment

Senior postdoc at Department of Atmospheric and Cryospheric Sciences, University of Innsbruck (Austria)

- 2022- **FWF Elise Richter fellowship**  
Project title: *Surface-atmosphere interactions in complex landscapes using high-resolution modelling (SCHIRM)*
- 2017-2021 **FWF Lise Meitner fellowship**  
Project title: *Understanding turbulent exchange over urban areas in highly complex terrain*
- 2020-2022 **TEAMx programme coordinator**  
Coordinator for the international TEAMx initiative (*Multi-scale transport and exchange processes in the atmosphere over mountains – programme and experiment*)

## Previous employment

- 2014-2017 **Postdoctoral researcher at Department of Meteorology, Reading University (UK)**  
Modelling of surface-atmosphere exchange in urban environments
- 2016 **Visiting researcher at Department of Atmospheric Sciences, Yonsei University (Korea)**  
Ten-week position on modelling and observing urban environments funded by the Korean Ministry of Education and National Institute of Meteorological Sciences
- 2013-2014 **Scientific researcher at Centre for Ecology and Hydrology (CEH), Wallingford (UK)**  
Collection and analysis of flux data to assess spatiotemporal variation in greenhouse gases. Development of a prototype national soil moisture monitoring network (COSMOS-UK).
- 2008, 2009 **Research assistant at CEH Wallingford (UK)**  
Two summer placements (10-11 weeks each) involving quality control and analysis of meteorological/flux data and field campaigns in the UK, Germany, Sweden and Finland.

## Peer-reviewed publications

1. **Ward HC**, Rotach MW, Gohm A, Graus M, Karl T, Haid M, Umek L, Muschinski T (2022) *Energy and mass exchange at an urban site in mountainous terrain – the Alpine city of Innsbruck*. Atmospheric Chemistry and Physics Discussions <https://doi.org/10.5194/acp-2021-1073>
2. Haid M, Gohm A, Umek L, **Ward HC**, Rotach MW (2022) *Cold-air pool processes in the Inn Valley during foehn: a comparison of four cases during the PIANO campaign*. Boundary Layer Meteorology <https://doi.org/10.1007/s10546-021-00663-9>
3. Umek L, Gohm A, Haid M, **Ward HC**, Rotach MW (2021) *Large eddy simulation of foehn-cold pool interactions in the Inn Valley during PIANO IOP2*. Quarterly Journal of the Royal Meteorological Society <https://doi.org/10.1002/qj.3954>
4. Muschinski T, Gohm A, Haid M, Umek L, **Ward HC** (2020) *Spatial heterogeneity of the Inn Valley cold air pool during south foehn: Observations from an array of temperature loggers during PIANO*. Meteorologische Zeitschrift <https://doi.org/10.1127/metz/2020/1043>
5. Hertwig D, Grimmond CSB, Hendry MA, Saunders B, Wang Z, Jeoffrion M, Vidale P-L, McGuire P, Bohnenstengel SI, **Ward HC**, Kotthaus S (2020) *Urban signals in high-resolution weather and climate simulations: role of urban land-surface characterisation*. Theoretical and Applied Climatology 142: 701-728 <https://doi.org/10.1007/s00704-020-03294-1>

6. Karl T, Gohm A, Rotach MW, **Ward HC**, Graus M, Cede A, Wohlfahrt G, Hammerle A, Haid M, Tiefengraber M, Lamprecht C, Vergeiner J, Kreuter A, Wagner J, Staudinger M (2020) *Studying urban climate and air quality in the Alps - The Innsbruck Atmospheric Observatory*. Bulletin of the American Meteorological Society 101: E488-E507 <https://doi.org/10.1175/BAMS-D-19-0270.1>
7. Haid M, Gohm A, Umek L, **Ward HC**, Muschinski T, Lehner L, Rotach MW (2020) *Foehn-cold pool interactions in the Inn Valley during PIANO IOP2*. Quarterly Journal of the Royal Meteorological Society 146: 1232-1263 <https://doi.org/10.1002/qj.3735>
8. Sabater AM, **Ward HC**, Hill TC, Gornall JL, Wade TJ, Evans JG, Prieto-Blanco A, Disney M, Phoenix GK, Williams M, Huntley B, Baxter R, Mencuccini M, Poyatos R (2019) *Transpiration from subarctic deciduous woodlands: environmental controls and contribution to ecosystem evapotranspiration*. Ecohydrology 13:e2190 <https://doi.org/10.1002/eco.2190>
9. Järvi L, Havu M, **Ward HC**, Bellucco V, McFadden JP, Toivonen T, Heikinheimo V, Kolari P, Riikonen A, Grimmond CSB (2019) *Spatial modelling of local-scale biogenic and anthropogenic carbon dioxide emissions in Helsinki*. Journal of Geophysical Research: Atmospheres 124 8363-8384 <https://doi.org/10.1029/2018JD029576>
10. Ao X, Grimmond CSB, **Ward HC**, Gabey AM, Tan J, Yang XQ, Liu D, Zhi X, Liu H, Zhang N (2018) *Evaluation of the Surface Urban Energy and Water balance Scheme (SUEWS) at a dense urban site in Shanghai: Sensitivity to anthropogenic heat and irrigation*. Journal of Hydrometeorology 19: 1983-2005 <https://doi.org/10.1175/JHM>
11. Crawford B, Grimmond CSB, Gabey A, Marconcini M, **Ward HC**, Kent CW (2018) *Variability of urban surface temperatures and implications for aerodynamic energy exchange in unstable conditions*. Quarterly Journal of the Royal Meteorological Society <https://doi.org/10.1002/qj.3325>
12. Stoy P, Peitzsch E, Wood D, Rottinghaus D, Wohlfahrt G, Goulden M, **Ward HC** (2018) *On the exchange of sensible and latent heat between the atmosphere and melting snow*. Agricultural and Forest Meteorology 252: 167-174 <https://doi.org/10.1016/j.agrformet.2018.01.028>
13. Lindberg F, Grimmond CSB, Gabey A, Huang B, Kent CW, Sun T, Theeuwes NE, Järvi L, **Ward HC**, Capel-Timms IW, Chang YY, Jonsson P, Krave N, Liu D, Meyer D, Olofson KFG, Tan J-G, Wästberg D, Xue L, Zhang Z (2018) *Urban Multi-scale Environmental Predictor: An integrated tool for city-based climate services*. Environmental Modelling and Software 99, 70-87 <https://doi.org/10.1016/j.envsoft.2017.09.020>
14. Kent CW, Lee K, **Ward HC**, Hong J-W, Hong J, Gatey D, Grimmond CSB (2017) *Aerodynamic roughness variation with vegetation: analysis in a suburban neighbourhood and a city park*. Urban Ecosystems <https://doi.org/10.1007/s11252-017-0710-1>
15. Sun T, Kotthaus S, Li D, **Ward HC**, Gao Z, Ni G, Grimmond CSB (2017) *Attribution and mitigation of heat wave-induced urban heat storage change*. Environmental Research Letters 12, 114007 <https://doi.org/10.1088/1748-9326/aa922a>
16. **Ward HC**, Tan YS, Gabey AM, Kotthaus S, Grimmond CSB (2017) *Impact of temporal resolution of precipitation forcing data on modelled urban-atmosphere exchanges and surface conditions*. International Journal of Climatology <https://doi.org/10.1002/joc.5200>
17. Barlow JM, Best M, Bohnenstengel SI, Clark P, Grimmond CSB, Lean H, Christen A, Emeis S, Haeffelin M, Harman I, Lemonsu A, Martilli A, Pardyjak E, Rotach MW, Ballard S, Boutle S, Brown A, Cai X, Carpentieri M, Coceal O, Crawford B, Di Sabatino S, Dou J, Drew DR, Edwards JM, Fallmann J, Fortuniak K, Gornall J, Gronemeier T, Halios CH, Hertwig D, Hirano K, Holtslag AAM, Luo Z, Mills G, Nakayoshi M, Pain K, Schlünzen KH, Smith S, Soulhac L, Steeneveld G-J, Sun T, Theeuwes NE, Thomson D, Voogt JA, **Ward HC**, Xie J-T, Zhong J (2017) *Developing a research strategy to better understand, observe and simulate urban atmospheric processes at kilometre to sub-kilometre scales*. Bulletin of the American Meteorological Society <https://doi.org/10.1175/BAMS-D-17-0106.1>
18. Kokkonen T, Grimmond CSB, Rätty O, **Ward HC**, Christen A, Oke TR, Kotthaus S, Järvi L (2017) *Sensitivity of Surface Urban Energy and Water Balance Scheme (SUEWS) to downscaling of reanalysis forcing data*. Urban Climate <https://doi.org/10.1016/j.uclim.2017.05.001>
19. **Ward HC**, Grimmond CSB (2017) *Assessing the impact of changes in surface cover, human behaviour and climate on energy partitioning across Greater London*. Landscape and Urban Planning 165: 142-161 <https://doi.org/10.1016/j.landurbplan.2017.04.001>
20. **Ward HC** (2017) *Scintillometry in urban and complex environments: a review*. Measurement Science and Technology 28: 064005 <https://doi.org/10.1088/1361-6501/aa5e85>
21. Crawford B, Grimmond CSB, **Ward HC**, Morrison W, Kotthaus S (2017) *Spatial and temporal patterns of surface-atmosphere energy exchange in a dense urban environment using scintillometry*. Quarterly Journal of the Royal Meteorological Society 143: 817-833 <https://doi.org/10.1002/qj.2967>

22. **Ward HC**, Kotthaus S, Järvi L, Grimmond CSB (2016) *Surface Urban Energy and Water Balance Scheme (SUEWS): Development and evaluation at two UK sites*. Urban Climate 18: 1-32  
<https://doi.org/10.1016/j.uclim.2016.05.001>
23. Evans JG, **Ward HC**, Blake JR, Hewitt EJ, Morrison R, Fry M, Ball LA, Doughty LC, Libre JW, Hitt OE, Rylett D, Ellis RJ, Warwick AC, Brooks M, Parkes MA, Wright GMH, Singer AC, Boorman DB, Jenkins A (2016) *Soil water content in southern England derived from a cosmic-ray soil moisture observing system – COSMOS-UK*. Hydrological Processes 30: 4987-4999 <https://doi.org/10.1002/hyp.10929>
24. Huntingford C, Marsh T, Scaife AA, Kendon EJ, Hannaford J, Kay AL, Lockwood M, Prudhomme C, Reynard NS, Parry S, Lowe JA, Screen JA, **Ward HC**, Roberts M, Stott PA, Bell VA, Bailey M, Jenkins A, Legg T, Otto FEL, Massey N, Schaller N, Slingo J, Allen MR (2015) *Reply to 'Drivers of the 2013/14 winter floods in the UK'*. Nature Climate Change 5: 491-492 <https://doi.org/10.1038/nclimate2613>
25. **Ward HC**, Evans JG, Grimmond CSB, Bradford J (2015) *Infrared and millimetre-wave scintillometry in the suburban environment - Part 1: structure parameters*. Atmospheric Measurement Techniques 8, 1385-1405 <https://doi.org/10.5194/amt-8-1385-2015>
26. **Ward HC**, Evans JG, Grimmond CSB (2015) *Infrared and millimetre-wave scintillometry in the suburban environment - Part 2: large-area sensible and latent heat fluxes*. Atmospheric Measurement Techniques 8, 1407-1424 <https://doi.org/10.5194/amt-8-1407-2015>
27. **Ward HC**, Kotthaus S, Grimmond CSB, Bjoergegen A, Wilkinson M, Morrison WTJ, Evans JG, Morison JIL, Iamarino M (2015) *Effects of urban density on carbon dioxide exchanges: direct observations of dense urban, suburban and woodland areas of southern England*. Environmental Pollution 198, 186-200 <https://doi.org/10.1016/j.envpol.2014.12.031>
28. Huntingford C, Marsh T, Scaife AA, Kendon EJ, Hannaford J, Kay AL, Lockwood M, Prudhomme C, Reynard NS, Parry S, Lowe JA, Screen JA, **Ward HC**, Roberts M, Stott PA, Bell VA, Bailey M, Jenkins A, Legg T, Otto FEL, Massey N, Schaller N, Slingo J, Allen MR (2014) *Potential influences on the United Kingdom's floods of winter 2013/14*. Nature Climate Change 4: 769-777 <https://doi.org/10.1038/nclimate2314>
29. **Ward HC**, Evans JG, Grimmond CSB (2014) *Multi-scale sensible heat fluxes in the suburban environment from large-aperture scintillometry and eddy covariance*. Boundary Layer Meteorology, 152: 65-89 <https://doi.org/10.1007/s10546-014-9916-4>
30. Poyatos R, Heinemeyer A, Ineson P, Evans JG, **Ward HC**, Huntley B, Baxter R (2013) *Environmental and vegetation drivers of seasonal CO<sub>2</sub> fluxes in a sub-Arctic forest-mire ecotone*. Ecosystems, 17: 377-393 <https://doi.org/10.1007/s10021-013-9728-2>
31. Stoy PC, Williams M, Evans JG, Prieto-Blanco A, Disney M, Hill TC, **Ward HC**, Wade TJ, Street LE (2013) *Upscaling tundra CO<sub>2</sub> exchange from chamber to eddy covariance tower*. Arctic, Antarctic, and Alpine Research, 45: 275-284 <https://doi.org/10.1657/1938-4246-45.2.275>
32. **Ward HC**, Evans JG, Grimmond CSB (2013) *Multi-season eddy covariance observations of energy, water and carbon fluxes over a suburban area in Swindon, UK*. Atmospheric Chemistry and Physics, 13: 4645-4666 <https://doi.org/10.5194/acp-13-4645-2013>
33. **Ward HC**, Evans JG, Hartogensis OH, Moene AF, De Bruin HAR, Grimmond CSB (2013) *A critical revision of the estimation of the latent heat flux from two-wavelength scintillometry*. Quarterly Journal of the Royal Meteorological Society, 139: 1912-1922 <https://doi.org/10.1002/qj.2076>
34. Wood CR, Pauscher L, **Ward HC**, Kotthaus S, Barlow JF, Gouvea M, Lane SE, Grimmond CSB (2013) *Wind observations above an urban river using a new lidar technique, scintillometry and anemometry*. Science of the Total Environment, 442: 527-533 <https://doi.org/10.1016/j.scitotenv.2012.10.061>
35. Evans JG, McNeil DD, Finch JW, Murray T, Harding RJ, **Ward HC**, Verhoef A (2012) *Determination of turbulent heat fluxes using a large aperture scintillometer over undulating mixed agricultural terrain*. Agricultural and Forest Meteorology, 166-167: 221-233 <https://doi.org/10.1016/j.agrformet.2012.07.010>
36. **Ward HC**, Evans JG, Grimmond CSB (2011) *Effects of Non-Uniform Crosswind Fields on Scintillometry Measurements*. Boundary Layer Meteorology, 141: 143-163 <https://doi.org/10.1007/s10546-011-9626-0>

### Book chapters

1. Grimmond CSB, **Ward HC** (2021) *Urban measurements and their interpretation* in Springer Handbook of Atmospheric Measurements edited by Foken T, Springer Nature, Switzerland, 1748 pp, ISBN 978-3-030-52170-7, [https://doi.org/10.1007/978-3-030-52171-4\\_52](https://doi.org/10.1007/978-3-030-52171-4_52)
2. Beyrich F, Hartogensis OK, De Bruin HAR, **Ward HC** (2021) *Scintillometers* in Springer Handbook of Atmospheric Measurements edited by Foken T, Springer Nature, Switzerland, 1748 pp, ISBN 978-3-030-52170-7, [https://doi.org/10.1007/978-3-030-52171-4\\_34](https://doi.org/10.1007/978-3-030-52171-4_34)
3. Grimmond CSB, **Ward HC**, Kotthaus S (2016) *How is urbanization altering local and regional climate?* in The

Routledge Handbook of Urbanization and Global Environmental Change edited by Seto KC, Solecki WD, Griffith CA. Routledge, 582 pp

4. Cooper DJ, Bell J, Hodnett M, Beven K, Gilman K, Haria A, Gardner C, Robinson M, Evans JG, **Ward HC** (2015) *Terrestrial Hydrological Processes in Progress in Modern Hydrology: Past, Present and Future* edited by Rodda JC, Robinson M. Wiley-Blackwell, 408 pp

### Non-refereed articles

1. **Ward HC**, Rotach MWR (2021) *TEAMx: a joint research initiative focused on atmospheric transport and exchange processes over mountains*. GEWEX Quarterly 3:4
2. Kotthaus S, **Ward HC**, Grimmond CSB, Evans JG (2012) *Flux Measurements in Southern England by KCL and CEH*. FluxLetter, 5: 25-31

### Manuals

1. Alton J, Antoniou V, Askquith-Ellis A, Bagnoli S, Ball L, Bennett E, Blake J, Boorman D, Brooks M, Clarke M, Cooper H, Cowan N, Cumming A, Doughty L, Evans J, Farrand P, Fry M, Hewitt E, Hitt O, Jenkins A, Kral F, Libre J, Lord W, Roberts C, Morrison R, Parkes M, Nash G, Newcomb J, Rylett D, Scarlett P, Singer A, Stanley A, Swain O, Szczykulska A, Teagle S, Thornton J, Trill E, Vincent H, Wallbank J, **Ward HC**, Warwick A, Winterbourn B, Wright G (2020) *COSMOS-UK user guide: users' guide to sites, instruments and available data*, UK Centre for Ecology and Hydrology, Wallingford, 64 pp <http://nora.nerc.ac.uk/id/eprint/528535/>
2. **Ward HC**, Järvi L, Onomura S, Lindberg F, Gabey A, Grimmond CSB (2016) *SUEWS Manual V2016a* <http://urban-climate.net/umep/SUEWS>
3. Lindberg F, Grimmond CSB, Chang YY, Gabey A, Järvi L, Kent CW, Kokkonen T, Krave N, Olofson F, Onomura S, Sun T, Tan JG, **Ward HC**, Xue L, zum Berge K (2016) *Urban Multi-scale Environmental Predictor (UMEP) Manual* [http://urban-climate.net/umep/UMEP\\_Manual](http://urban-climate.net/umep/UMEP_Manual)

### Published datasets

1. **Ward HC**, Gohm A, Umek L, Haid M, Muschinski T, Graus M, Karl T, Rotach MW (2021) *PIANO (Penetration and Interruption of Alpine Foehn) – flux data set (Version v1)* Zenodo <https://doi.org/10.5281/zenodo.5795430>
2. Gohm A, Umek L, Haid M, **Ward HC**, Rotach MW (2021) *PIANO (Penetration and Interruption of Alpine Foehn) - Radiosonde data set (Version v1)* Zenodo <https://doi.org/10.5281/zenodo.4763137>
3. Gohm A, Umek L, Haid M, **Ward HC**, Rotach MW (2021). *PIANO (Penetration and Interruption of Alpine Foehn) - MOMAA weather station data set (Version v1)* Zenodo <https://doi.org/10.5281/zenodo.4745957>
4. Gohm A, Haid M, Umek L, **Ward HC**, Rotach MW (2021) *PIANO (Penetration and Interruption of Alpine Foehn) - Doppler wind lidar data set (Version v1)* Zenodo <https://doi.org/10.5281/zenodo.4674773>
5. Gohm A, Muschinski T, Haid M, Umek L, **Ward HC**, Rotach MW (2021) *PIANO (Penetration and Interruption of Alpine Foehn) - HOBO temperature and humidity logger data set (Version v1)* Zenodo <https://doi.org/10.5281/zenodo.4672313>
6. Morrison R, Brooks M, Cooper H, Evans JG, Rowe R, **Ward HC**, McNamara NP (2020) *Eddy covariance measurements of carbon dioxide, energy and water fluxes at a winter wheat field, Lincolnshire, UK, 2012*. NERC Environmental Information Data Centre <https://doi.org/10.5285/c00ac145-6a55-4698-a6ed-13c95d178c96>
7. Morrison R, Clark E, Lloyd C, **Ward HC**, Evans JG, Brooks M, Rowe R and McNamara NP (2019) *Eddy covariance measurements of carbon dioxide, energy and water fluxes at a commercial Miscanthus x. giganteus plantation, Lincolnshire, UK, 2008 to 2013*. NERC Environmental Information Data Centre <https://doi.org/10.5285/00487c70-b74e-4c91-ab0c-31735c2e3b13>

### Conference presentations (presenting/first author only)

1. **Ward HC**, *Overview of the TEAMx Observational Campaign – with a focus on atmospheric profiling*. PROBE workshop on atmospheric boundary layer profiling in complex terrain, 23 Sep 2021, online
2. **Ward HC**, *An overview of the TEAMx Observational Campaign (TOC)*. Second TEAMx Workshop, 10-12 May 2021, online
3. **Ward HC**, Umek L, Rotach MW, Gohm A, Graus M, Karl T, Haid M, Muschinski T, *Assessing the performance*

- of WRF/urban for the alpine city of Innsbruck. 35th International Conference on Alpine Meteorology, 02-06 Sep 2019, Riva del Garda, Italy
4. **Ward HC**, Flux measurements in complex environments. 20th Anniversary of EUROFLUX workshop, 10-14 Dec 2018, Hyytiälä Forestry Field Station, Hyytiälä, Finland
  5. **Ward HC**, Rotach MW, Graus M, Karl T, Gohm A, Muschinski T, *Turbulent exchange at an urban site in highly complex terrain*. 10th International Conference on Urban Climate, 06-10 Aug 2018, New York, New York, USA
  6. **Ward HC**, Rotach MW, Graus M, Karl T, Gohm A, Muschinski T, Umek L, Haid M, Lehner L, *Turbulent exchange over the alpine city of Innsbruck*. 18th Conference on Mountain Meteorology, 25-29 Jun 2018, Santa Fe, New Mexico, USA
  7. **Ward HC**, Rotach MW, Graus M, Karl T, Gohm A, Muschinski T, Umek L, Haid M, Lehner L, *Turbulence exchange over the city of Innsbruck*. 30 May 2018, ACINN Graduate Seminar, Innsbruck University, Innsbruck, Austria
  8. **Ward HC** and EAPL, *Evaluation of SUEWS (Surface Urban Energy and Water balance Scheme) at multiple sites in South Korea*. 27 Oct 2016, Department of Atmospheric Sciences, Yonsei University, Korea
  9. **Ward HC**, Grimmond CSB, *Using biophysical modelling to assess the heat-stress risk across Greater London*. Public Health England meeting, 02 Aug 2016, University of Reading, UK
  10. **Ward HC**, Grimmond CSB, *Biophysical modelling to understand the impact of decisions in the context of heatwave resilience in London*. emBRACE project meeting, 08-10 Sep 2015, London, UK
  11. **Ward HC**, Grimmond CSB, Kotthaus S, Järvi L, Lindberg F, Evans JG, Morrison W, Mustchin J, *Using observations to improve modelled energy, water and carbon exchanges for urban areas*. 9<sup>th</sup> International Conference on Urban Climate, 20-24 Jul 2015, Toulouse, France
  12. **Ward HC**, Grimmond CSB, Kotthaus S, Järvi L, Lindberg F, Morrison W, *Using observations to improve modelled energy, water and carbon exchanges for urban areas*. Urban Met seminar, 16 Jul 2015, University of Reading, UK
  13. **Ward HC**, Grimmond CSB, Kotthaus S, Sun T, *Integration of the three modelling components and an overview of the biophysical model*. TRUC 2<sup>nd</sup> project meeting, 24-25 Feb 2015, Kolkata, India
  14. **Ward HC**, Grimmond CSB, *Integrated risk and resilience analysis: model connection points, limits and opportunities*. TRUC 2<sup>nd</sup> project meeting, 24-25 Feb 2015, Kolkata, India
  15. **Ward HC**, *Turbulent fluxes from eddy covariance and scintillometry in a suburban area*. Urban Met seminar, 17 Jul 2014, University of Reading, UK
  16. **Ward HC**, Evans JG, Grimmond CSB, *Turbulence measurements over a suburban landscape using scintillometry and eddy covariance*. 21st Symposium on Boundary Layers and Turbulence, 09-13 Jun 2014, Leeds, UK
  17. **Ward HC**, Kotthaus S, Grimmond CSB, Björkegren A, Wilkinson M, Morrison W, Christen A, Evans JG, Morrison JIL, *Linking carbon dioxide fluxes to urban density*. EGU 2014, 27 Apr-2 May 2014, Vienna, Austria
  18. **Ward HC**, Aurela M, George CT, Hayman G, *Up-scaling methane fluxes from plot to the landscape*. MAMM Science meeting, 26-27 Feb 2014, University of Manchester, UK
  19. **Ward HC**, Evans JG, Grimmond CSB, *Two-wavelength scintillometry over the suburban environment*. Tübingen Atmospheric Physics Symposium 'Scintillometers and Applications', 07-09 Oct 2013, Tübingen, Germany
  20. **Ward HC**, Evans JG, Grimmond CSB, *Large-area heat fluxes from two-wavelength scintillometer systems over suburban surfaces*. Tübingen Atmospheric Physics Symposium 'Scintillometers and Applications', 07-09 Oct 2013, Tübingen, Germany
  21. **Ward HC**, Evans JG, Grimmond CSB, *Multi-seasonal energy, water and carbon fluxes for a suburban area in the UK*. EMS 2013, 09-13 Sep 2013, Reading, UK
  22. **Ward HC**, Evans JG, Grimmond CSB, *Large-area heat fluxes from two-wavelength scintillometry in the suburban environment*. EMS 2013, 09-13 Sep 2013, Reading, UK
  23. **Ward HC**, Evans JG, Grimmond CSB, *Controls on suburban evaporation: first results from the Swindon experiment*. 8<sup>th</sup> International Conference on Urban Climate, 06-10 Aug 2012, Dublin, Ireland
  24. **Ward HC**, Evans JG, Grimmond CSB, *Urban Scintillometry*. LITFASS project meeting, 17 Nov 2011, German Meteorological Service (Deutscher Wetterdienst, DWD), Meteorological Observatory Lindenberg, Germany
  25. **Ward HC**, Evans JG, Grimmond CSB, *Comparing bichromatic scintillometry with the two-wavelength method: first results from Chilbolton*. 3<sup>rd</sup> Scintillometer Workshop, 18-19 Apr 2011, Wageningen, The Netherlands
  26. **Ward HC**, Evans JG, De Bruin HAR, Grimmond CSB, *Ground-based remote sensing of surface fluxes and*

crosswind using scintillometry over complex terrain (POSTER). Remote Sensing and Hydrology 2010 Symposium, 27-30 Sep 2010, Jackson Hole, Wyoming, USA

27. **Ward HC**, Evans JG, De Bruin HAR, Grimmond CSB, *Scintillometry with Non-Uniform Crosswind Fields* (POSTER). AMS 2010, 02-06 Aug 2010, Keystone, Colorado, USA

### Invited presentations

1. **Ward HC**, *Current challenges and future research priorities for urban areas in complex terrain*. TEAMx programme and applications webinar, 06 May 2020
2. **Ward HC**, *Measuring and interpreting CO<sub>2</sub> fluxes in urban areas*. 1<sup>st</sup> ICOS workshop on strategies to monitor greenhouse gases in urban environments, 01-04 Jul 2019, Hyytiälä Forestry Field Station, Hyytiälä, Finland
3. **Ward HC**, *Turbulent exchange in and around the alpine city of Innsbruck*. 16 May 2019, Institute of Meteorology and Climatology, Leibniz University Hannover, Hannover, Germany
4. **Ward HC**, *Turbulence observations in urban and complex landscapes*. 30 Nov 2017, Institute of Meteorology and Climate Research, Karlsruhe Institute of Technology (KIT), Garmisch-Partenkirchen, Germany
5. **Ward HC**, *Turbulence observations in urban areas*. 15 Mar 2017, ACINN Graduate Seminar, Innsbruck University, Innsbruck, Austria
6. **Ward HC**, *Urban flux measurements and modelling in the UK*. 19 Oct 2015, Department of Atmospheric Sciences, Yonsei University, Korea
7. **Ward HC**, *Understanding the urban environment using observations and modelling* (KEYNOTE). 15-16 Oct 2015, International Conference on Urban Meteorology, Jeju, Korea
8. **Ward HC**, *Fluxes obtained from eddy covariance and scintillometry in the suburban environment*. 28 Jan 2014, Laboratoire LTHE, Grenoble, France
9. **Ward HC**, *Estimating NPP using flux towers*. Terrestrial NPP Discussion meeting, 17-18 Dec 2013, CEH Lancaster, Lancaster Environment Centre, UK

### Workshops organised

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| 2021 | 1st PROBE workshop on atmospheric boundary layer profiling in complex terrain, 23 Sep 2021, online meeting (>50 participants)  |
| 2021 | 2nd Multi-scale transport and exchange processes in the atmosphere over mountains – programme and experiment (TEAMx) workshop, 10-12 May 2021, online meeting (> 170 participants) |
| 2020 | TEAMx programme and applications webinar, 06 May 2020, online meeting originally scheduled as a splinter meeting at EGU 2020 (70 participants)                                     |
| 2013 | Joint organiser: Quality control of eddy covariance data for the Ecosystem Land Use Modelling (ELUM) Project, 05-06 Mar 2013, University of Southampton, UK                        |

### Teaching experience

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| Mar 2021  | Introduction to scintillometry lecture + tutorial exercise (3 hr)<br>Field Course Atmospheric Sciences (MSc course), Innsbruck University  |
| Dec 2020  | Data visualisation lecture and exercises (2 hr)<br>Reading/writing/presenting scientific work (MSc course), Innsbruck University           |
| Mar 2020  | Introduction to scintillometry lecture + tutorial exercise (3 hr)<br>Feldkurs Atmosphärenwissenschaften (MSc course), Innsbruck University |
| Mar 2019  | Introduction to scintillometry lecture + tutorial exercise (3 hr)<br>Feldkurs Atmosphärenwissenschaften (MSc course), Innsbruck University |
| Mar 2018  | Introduction to scintillometry lecture + tutorial exercise (2 hr)<br>Feldkurs Atmosphärenwissenschaften (MSc course), Innsbruck University |
| Mar 2017  | Introduction to scintillometry lecture + tutorial exercise (2 hr)<br>Feldkurs Atmosphärenwissenschaften (MSc course), Innsbruck University |
| 2011      | Understanding and managing the urban atmosphere, King's College London<br>Lecture course (8 hours) + marking assignments                   |
| 2015-2017 | A-level physics tuition, A-level maths tuition, GCSE-level further maths tuition   |

### Supervisory experience

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|-----------|---|
| 2017-2021 | PhD: Member of supervisory committee for Alexei Perelet, University of Utah<br>Thesis title: <i>Expanding the role of two-wavelength scintillometers for micrometeorology</i> |
| 2015      | MSc: Ishani Bhattacharya, Reading University  |

- Thesis title: *An investigation of anthropogenic heat fluxes and carbon dioxide emissions in urban areas*
- 2015 MSc: Tan Yin San, Reading University  
Thesis title: *Assessing the impacts of temporal resolution of precipitation forcing data on the surface energy and water balance*
- 2013 Supervision of a 7-week student placement at CEH Wallingford
- 2010-2016 Regular provision of support and training to undergraduates, visiting students and work placements at Reading University and King's College London

### Professional activities

- 2022- Member of the TEAMx Co-ordination and Implementation Group
- 2021 Reviewer for *WMO Guidance to Measuring, Modelling and Monitoring the Canopy Layer Urban Heat Island (CL-UHI)*
- 2021 PhD defense jury member for Laura Herrera Mejía, National University of Colombia, 23 Aug 2021  
Thesis title: *Spatio-temporal variability of the atmospheric boundary layer in the Aburrá Valley: characterization, processes, multiscale interactions and impacts*
- 2020- Member of the TEAMx Field Observations Committee
- 2020- Leader of the TEAMx working group on Surface-Atmosphere Exchange
- 2020- Leader of the Complex Terrain group within the COST action PROBE (Profiling the atmospheric boundary layer at European scale)
- 2019- Board member of the International Association for Urban Climate (elected)
- 2019- IAUC Awards Committee chair
- 2019- Scientific committee member for the 11th International Conference on Urban Climate
- 2019- Member of the ICOS working group on Measurements over Urban Areas
- 2014-2015 JULES model Science and Applications Committee member and vice-chair

### Editorial activities

- 2022- Guest Associate Editor of *JGR-Atmospheres* for a special collection
- 2021- Editor of *Meteorologische Zeitschrift*
- 2021- Associate Editor of *Meteorological Applications*
- 2019- Language editing of various scientific documents (journal articles, proposals)
- 2016- Project editor of *Urban Climate News*, the quarterly newsletter of the International Association for Urban Climate

### Peer-review activities

Agricultural and Forest Meteorology (2012); Atmospheric Chemistry and Physics (2016, 2016, 2021); Atmospheric Environment (2017); Atmospheric Measurement Techniques (2014, 2015); Biogeosciences (2016); Boundary-Layer Meteorology (2011, 2012, 2014, 2014); Bulletin of the American Meteorological Society (2021, 2021); Geoscientific Model Development (2019, 2020); International Journal of Climatology (2017, 2017, 2017, 2018); Journal of Applied Meteorology and Climatology (2020); Journal of Atmospheric and Oceanic Technology (2012, 2012, 2013); Journal of Geophysical Research: Atmospheres (2020); Journal of Hydrometeorology (2021); Meteorologische Zeitschrift (2012, 2013, 2020); Meteorology and Atmospheric Physics (2012, 2017); Urban Climate (2020); Urban Forestry and Urban Greening (2020); Wetlands (2016)

### Awards and scholarships

- 2022-2026 Austrian Science Fund (FWF) Elise Richter Programme for highly qualified female scientists (€353,660)
- 2017-2021 Austrian Science Fund (FWF) Lise Meitner fellowship for highly qualified researchers (€168,550)
- 2017 Innsbruck University Research stipend (support for scientific purposes) €7,700
- 2013 NERC Algorithm PhD studentship (2009-2012) + additional 6 months' funding (2013)
- 2008 Oxford University Lincoln College Scholarship
- 2007 Oxford University Lincoln College Exhibition
- 2006 Oxford University Lincoln College Exhibition