Dr Mathew J. Lipson

Urban and regional modelling; land surface model development

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Current Affiliation:	Bureau of Meteorology, Australia
Current Role:	Modelling research scientist
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RESEARCH INTERESTS

I am an urban meteorologist and land surface model developer. In my current role as a research scientist at the Bureau of Meteorology I am responsible for configuring and evaluating new sub-kilometre meteorological models with the aim of improving weather forecasting in and around Australian cities. In previous roles, I have:

- coordinated an international model intercomparison with 65 scientists: https://doi.org/10.1002/qj.4589
- coordinated the release of the first openly available urban flux tower collection: 20 urban flux tower sites covering 50 site-years: https://doi.org/10.5194/essd-14-5157-2022
- created new datasets accurately describing urban areas for urban climate models, working with industry partners to allow data to be openly released: https://doi.org/10.3389/fenvs.2022.866398
- developed an integrated building energy and urban land surface model and undertaken city-scale simulations: https://doi.org/10.1002/qj.3317
- developed and undertaken 100-year model projections of building electricity and gas demand under 21st century climate change projections: https://doi.org/10.1088/1748-9326/ab5aa5

ROLES

2021-current	**Modelling Research Scientist**. Bureau of Meteorology, Australia
2019-2021	**Research Associate**. Centre of Excellence for Climate System Science. Based at UNSW Sydney and University of Reading, United Kingdom.
2011-2019	**Undergraduate and postgraduate study** (see below)
2005-2011	**Architect** (various roles in Australia and Papua New Guinea)

EDUCATION

2015-2019	**PhD: Climate Science Research**. UNSW Sydney, Australia
2011-2014	**Bachelor of Science (Advanced)**. UNSW Sydney, Australia Majored in Physics and Astronomy. Honours in Climate Science (1st Class).
2009	**Architect Professional Registration**. NSW Board of Architects No. 8364.
2002-2005	**Bachelor of Architecture**. University of Sydney, Australia.
1999-2001	**Bachelor of Science (Architecture),** University of Sydney, Australia.

ARTICLES AND BOOK CHAPTERS

In review *On the predictability of turbulent fluxes from land: PLUMBER2 MIP experimental description and preliminary results. Abramowitz, Ukkola, Hobeichi, Page, **Lipson**, De Kauwe, Green, et al.,* https://doi.org/10.5194/egusphere-2023-3084

In review *Machine Learning Bias Correction and Downscaling of Urban Heatwave Temperature Predictions from Kilometre to Hectometre Scale*. Blunn, Ames, Croad, Gainford, Higgs, **Lipson**, Lo.

In review *The water balance representation in Urban-PLUMBER land surface models*. Jongen, **Lipson**, Teuling, Grimmond, Baik, Best, Demuzere, Fortuniak, De Kauwe, Li, McNorton, Meili, Oleson, Park, Sun, Tsiringakis, Varentsov, Steenveld.

2024 *Satellite observations reveal a decreasing albedo trend of global cities over the past 35 years.* Wu, Lin, Bian, **Lipson**, Lafortezza, Liu, Grimmond, et al. Remote Sensing of Environment 303. https://doi.org/10.1016/j.rse.2024.114003

2023 *Evaluation of 30 urban land surface models in the Urban-PLUMBER project: Phase 1 results.* **Lipson**, Grimmond, Best, Abramowitz, Coutts, Tapper, Baik, et al., Quarterly Journal of the Royal Meteorological Society. https://doi.org/10.1002/qj.4589

2023 *Land surface and air temperature dynamics: The role of urban form and seasonality.* Naserikia, Hart, Nazarian, Bechtel, **Lipson**, and Nice. Science of The Total Environment, 905, 167306, https://doi.org/10.1016/j.scitotenv.2023.167306, 2023.

2023 *Multiscale modeling techniques to document urban climate change.* Nazarian, **Lipson**, Norford. Book chapter edited by Paolini and Santamouris. Elsevier, 123-164. https://doi.org/10.1016/B978-0-12-818977-1.00004-1

2022 *Harmonized gap-filled datasets from 20 urban flux tower sites*. **Lipson,** Grimmond, Best, Chow, Christen, Chrysoulakis, Coutts, Crawford, Earl, Evans, Fortuniak, Heusinkveld, Hong, Hong, Jarvi, Jo, Kim, Kotthaus, Lee, Masson, McFadden, Michels, Pawlak, Roth, Sugawara, Tapper, Velasco, Ward. Earth System Science Data. https://doi.org/10.5194/essd-14-5157-2022

2022 *Isolating the impacts of urban form and fabric from geography on urban heat and human thermal comfort.* Nice, Nazarian, **Lipson**, Hart, Seneviratne, Thompson, Naserikia, Godic, Stevenson. Building and Environment. *https://doi.org/10.1016/j.buildenv.2022.109502*

2022 *A Transformation in City-Descriptive Input Data for Urban Climate Models*. **Lipson**, Nazarian, Hart, Nice, Conroy. Frontiers in Environmental Science. https://doi.org/10.3389/fenvs.2022.866398

2022 *A citizen centred urban network for weather and air quality in Australian schools*. Ulpiani, Hart, Di Virgilio, Maharaj, **Lipson**, Potgieter. Scientific Data. https://doi.org/10.1038/s41597-022-01205-9

2022 *Meteorological influence on forecasting urban pollutants: Long-term predictability versus extreme events in a spatially heterogeneous urban ecosystem:* Ulpiani, Duhirwe, Yun, **Lipson**. Science of the Total Environment. https://doi.org/10.1016/j.scitotenv.2021.152537

2021 *Book chapter: The synergistic impacts of urban air pollution compounding our climate emergency.* Hart, Cooper, Green, **Lipson.** Urban Climate Science for Planning Healthy Cities. Springer. https://doi.org/10.1007/978-3-030-87598-5_16

2021 *Combining high-resolution land use data with crowdsourced air temperature to investigate intra-urban microclimate.* Potgieter, Nazarian, **Lipson**, Hart, Ulpiani, Morrison, Benjamin. Frontiers in Environmental Science. https://doi.org/10.3389/fenvs.2021.720323

2021 *Resolving the influence of local flows on urban heat amplification during heatwaves*. Hirsch, Evans, Thomas, Conroy, Hart, **Lipson**, Ertler. Environmental Research Letters. https://doi.org/10.1088/1748-9326/ac0377

2021 *A global environmental crisis 42,000 years ago*. Cooper, Turney, Palmer, Hogg, McGlone, Wilmshurst, Lorrey, Heaton, Russell, McCracken, Anet, Rozanov, Friedel,

Suter, Peter, Muscheler, Adolphi, Dosseto, Faith, Fenwick, Fogwill, Hughen, **Lipson**, Liu, Nowaczyk, Rainsley, Ramsey, Sebastianelli, Souilmi, Stevenson, Thomas, Tobler, Zech. Science. https://doi.org/10.1126/science.abb8677

2020 *Reimagining Hospitals as Sustainable Energy Hubs.* Gurieff, Green, Koskinen, **Lipson**, Baldry, Maddocks, Menictas, Noack, Moghtaderi, Doroodchi. *Healthy Power:* Sustainability. https://doi.org/10.3390/su12208554

2019 *Climate change impact on energy demand in building-urban-atmosphere simulations through the 21st century.* **Lipson**, Thatcher, Hart and Pitman. Environ. Res. Lett. https://doi.org/10.1088/1748-9326/ab5aa5

2019 *Model development for urban climates*. **Lipson**. Dissertation. UNSW Sydney. https://primoa.library.unsw.edu.au/permalink/f/1uqach6/TN_cdi_nla_trove_235256129

2019 *Pleistocene glacial history of the New Zealand subantarctic islands.* Rainsley, Turney, Golledge, Wilmshurst, McGlone, Hogg, Li, Thomas, Roberts, Jones, Palmer, Flett, de Wet, Hutchinson, **Lipson**, Fenwick, Hines, Binetti, and Fogwill., Climate of the Past, https://doi.org/10.5194/cp-15-423-2019

2018 *New breeding records of seabirds at Carnley Harbour (Auckland Islands), Cossack Rock (Campbell Island) and south coast of The Snares.* Wilson, Barthel, **Lipson**, Fogwill, and Turney., Notornis, 65(3), 168–173, 2018.

2018 *A building energy demand and urban land surface model*. **Lipson**, Thatcher, Hart, Pitman. Quarterly Journal of the Royal Meteorological Society. https://doi.org/10.1002/qj.3317

2018 *Global Peak in Atmospheric Radiocarbon Provides a Potential Definition for the Onset of the Anthropocene Epoch in 1965.* Turney, Palmer, Maslin, Hogg, Fogwill, Southon, Fenwick, Helle, Wilmshurst, McGlone, Ramsey, Thomas, **Lipson**, Beaven, Jones, Andrews, Hua. Scientific Reports. https://doi.org/10.1038/s41598-018-20970-5

2018 *Growth response of an invasive alien species to climate variations on subantarctic Campbell Island.* Palmer, Turney, Fogwill, Fenwick, Thomas, **Lipson**, Jones, Beavan, Richardson, Wilmshurst. New Zeal. J. Ecol. https://www.jstor.org/stable/26538093

2017 *Efficiently modelling urban heat storage: an interface conduction scheme in an urban land surface model (aTEB v2.0*). **Lipson**, Hart, Thatcher. Geosci. Model Dev. https://doi.org/10.5194/gmd-10-991-2017

2017 *Tropical forcing of increased Southern Ocean climate variability revealed by a 140-year subantarctic temperature reconstruction*.Turney, Fogwill, Palmer, van Sebille, Thomas, McGlone, Richardson, Wilmshurst, Fenwick, Zunz, Goosse, Wilson, Carter, **Lipson**, Jones, Harsch, Clark, Marzinelli, Rogers, Rainsley, Ciasto, Waterman, Thomas, Visbeck. Clim. Past. https://doi.org/10.5194/cp-13-231-2017

2016 *Intensification of Southern Hemisphere westerly winds 2000–1000 years ago: evidence from the subantarctic Campbell and Auckland Islands (52–50°S).* Turney, McGlone, Palmer, Fogwill, Hogg, Thomas, **Lipson**, Wilmshurst, Fenwick, Jones, Hines, Clark.. J. Quaternary Sci. https://doi.org/10.1002/jqs.2828

2016 *Multidecadal variations in Southern Hemisphere atmospheric 14C: Evidence against a Southern Ocean sink at the end of the Little Ice Age CO2 anomaly.* Turney, Palmer, Hogg, Fogwill, Jones, Bronk Ramsey, Fenwick, Grierson, Wilmshurst, O'Donnell, Thomas, **Lipson**. Global Biogeochem. Cycles. https://doi.org/10.1002/2015GB005257

CONFERENCE PRESENTATIONS

2023 *The Urban-PLUMBER model evaluation project: Phase 1 results.* 11th International Conference on Urban Climate (speaker)

2023 *Building-resolving urban data in next-generation convective-scale weather forecasts.* 11th International Conference on Urban Climate (poster)

2023 *A new open collection of 20 urban flux tower datasets, harmonized and gap filled for land surface model evaluation*. iLEAPS-OzFlux2023 Joint Conference 2023 (speaker)

2022 *Urban-scale NWP at the Bureau*. ACCESS-NRI Workshop (invited speaker)

2022 *An open collection of 20 urban flux tower datasets.* International Association of Urban Climate Poster Conference (poster)

2022 *Improved high resolution city-descriptive input data for urban meteorological modelling*. International Association of Urban Climate Poster Conference (poster)

2021 *Urban-PLUMBER model evaluation project: initial results and next steps.* CORDEX Flagship Pilot Study for urban environments and regional climate change (speaker).

2021 *Urban-PLUMBER model evaluation project: initial results.* EGU General Assembly 2021 (speaker).

2020 *Urban-PLUMBER: A new evaluation and benchmarking project for land surface models in urban areas.* EGU General Assembly 2020 (speaker).

2020 *Urban-PLUMBER – Evaluation and Benchmarking of Land Surface Models in Urban Areas. AMS Annual Meeting 2020.* Boston, 2019 (poster)

2019 *How will future global warming affect urban climate and building energy demand? Exploration through fully coupled and single column urban modelling systems.* EGU General Assembly 2019, Vienna (speaker)

2018 *Applications for a new city-scale building energy demand model.* 10th International Conference on Urban Climate/ 14th Symposium on the Urban Environment, New York, U.S.A., 2018 (speaker)

2018 *A mixed physical/statistical city-scale energy demand model for Australia*. 25th National Conference of the Australian Meteorological and Oceanographic Society, Sydney, Australia (speaker).

2017 *Efficiently representing thermal processes in urban canopy models*. 97th American Meteorological Society Annual Meeting, Seattle, U.S.A. (poster).

2017 *From room to regional scales: developing a coupled energy demand & urban climate model.* 5th ARC Centre of Excellence for Climate System Science Workshop, Canberra, Australia (poster).

2017 *Improving urban climate models*. GlobalTech Global Fellows Programme, Berghausen, Germany (poster and attendee).

2016 *Improving the representation of heat storage in urban climate models.* National Conference of the Australian Meteorological and Oceanographic Society, Melbourne, Australia (speaker).

2016 *Developments in the aTEB urban land surface model.* 4th ARC Centre of Excellence for Climate System Science Workshop, Lorne, Australia (poster).

2015 *Adequately and efficiently representing heat conduction and storage for urban surfaces.* 9th International Conference on Urban Climate, Toulouse (speaker).

2014 *Efficiently simulating the impact of Australian urban areas on climate.* 3rd Australian Earth System Outlook Conference, Canberra, Australia (poster).

TEACHING

2024 Guest lecture - Weather and its applications (ENVS2004): Urban weather and climate, Fenner School Environment & Society, Australian National University.

2021 Masters supervision: *Explore the different factors that affect albedo by comparing two urban sites*. Xiangyang Fan. University of Reading.

2020 Masters supervision: *Influences of energy demand on local meteorology in Central London: a modelling study.* Eleanor Pinches. University of Reading.

2017 *Introduction to Atmospheric Science:* Laboratory coordinator and tutor

COMMUNICATION

Weather website	*Is it hot right now?* 2021; **Lipson**, Contractor and Goldie. https://isithotrightnow.com
Blog	*The Urbanist.* **Lipson**. https://theurbanist.com.au
The Conversation	*When the heat is on, we need city-wide plans to keep cool*; **Lipson** & Hart, The Conversation; 2017; http://bit.ly/2jKN2Hu
Association newsletter article	*Surface energy and momentum fluxes in the Urban-PLUMBER model evaluation project: initial report.* Urban Climate News Issue XX., *March 2024 (in press)*
Association newsletter article	*A new multi-site evaluation project for modelling in urban areas.* **Lipson**, Grimmond, Best. Urban Climate News Issue 75. March 2020. https://urban-climate.org/wp-content/uploads/2023/02/IAUC075.pdf
Association newsletter article	*A new open collection of 20 flux tower datasets from global cities.* Lipson et al. Urban Climate News Issue 86. December 2022. https://urban-climate.org/wp-content/uploads/2023/02/IAUC086.pdf
Project website	*Urban-PLUMBER: A multi-site model evaluation project for urban areas*. **Lipson** Grimmond, Best. 2023; https://urban-plumber.github.io/