

Dr Mathew J. Lipson

Urban and regional climate modelling; land surface model development

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Current Affiliation: Centre of Excellence for Weather of the 21st Century, UNSW Sydney, Australia
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RESEARCH INTERESTS

I am a weather and climate modelling scientist specialising in land surface model development, evaluation and configuration, and regional urban-weather interactions. In my current role I lead land model development for the Australian Research Council Centre of Excellence for Weather of the 21st Century. In previous roles, I have:

- coordinated an international urban 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

2024-current **Senior Research Associate.** Centre of Excellence for Weather of the 21st Century
2021-2024 **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.
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.

- In review Abramowitz, Ukkola, Hobeichi, Page, **Lipson**, De Kauwe, Green, et al., *On the predictability of turbulent fluxes from land: PLUMBER2 MIP experimental description and preliminary results*. <https://doi.org/10.5194/egusphere-2023-3084>
- 2024 Langendijk, Halenka, Hoffmann, Adinolfi, Aldama Campino, Asselin, Bastin, Bechtel, Belda, Bushenkova, Campanale, Chun, Constantinidou, Coppola, Demuzere, Doan, Evans, Feldmann, Fernandez, Fita, Hadjinicolaou, Hamdi, Hundhausen, Grawe, Johannsen, Milovac, Katragkou, Kerroumi, Kotlarski, Le Roy, Lemonsu, Lennard, **Lipson**, Mandal, Muñoz Pabón, Pavlidis, Pietikäinen, Raffa, Raluy-López, Rechid, Ito, Schulz, Soares, Takane, Teichmann, Thatcher, Top, Van Schaeybroeck, Wang, and Yuan: *Towards better understanding the urban environment and its interactions with regional climate change - The WCRP CORDEX Flagship Pilot Study URB-RCC*, Urban Climate, <https://doi.org/10.1016/j.uclim.2024.102165>.
- 2024 Jongen, **Lipson**, Teuling, Grimmond, Baik, Best, Demuzere, Fortuniak, De Kauwe, Li, McNorton, Meili, Oleson, Park, Sun, Tsiringakis, Varentsov, Steenveld. *The water balance representation in Urban-PLUMBER land surface models*. Journal of Advances in Modeling Earth Systems. <https://doi.org/10.1029/2024MS004231>.
- 2024 Su, Rennie, Torrance, Howard, Stassen, **Lipson**, Warren, Pepler, Dharssi, Franklin. *BARRA-C2: Development of the kilometre-scale downscaled atmospheric reanalysis over Australia*. Bureau Research Report No. 097. <http://www.bom.gov.au/research/publications/researchreports/BRR-097.pdf>
- 2024 Blunn, Ames, Croad, Gainford, Higgs, **Lipson**, Lo., *Machine Learning Bias Correction and Downscaling of Urban Heatwave Temperature Predictions from Kilometre to Hectometre Scale*. Meteorological Applications. <https://doi.org/10.1002/met.2200>
- 2024 Wu, Lin, Bian, **Lipson**, Laforteza, Liu, Grimmond, Velasco, Christen, Masson, et al., *Satellite observations reveal a decreasing albedo trend of global cities over the past 35 years*. Remote Sensing of Environment 303. <https://doi.org/10.1016/j.rse.2024.114003>
- 2024 **Lipson**, Grimmond, Best, Abramowitz, Coutts, Tapper, Baik, Beyers, Blunn, Boussetta, Bou-Zeid, De Kauwe, de Munck, Demuzere, Fatichi, Fortuniak, Han, Hendry, Kikegawa, Kondo, Lee, Lee, Lemonsu, Machado, Mannoli, Martilli, Masson, McNorton, Meili, Meyer, Nice, Oleson, Park, Roth, Schoetter, Simon-Moral, Steeneveld, Sun, Takane, Thatcher, Tsiringakis, Varentsov, Wang, Wang, Pitman. *Evaluation of 30 urban land surface models in the Urban-PLUMBER project: Phase 1 results*. QJRM. <https://doi.org/10.1002/qj.4589>
- 2023 Naserikia, Hart, Nazarian, Bechtel, **Lipson**, and Nice. *Land surface and air temperature dynamics: The role of urban form and seasonality*. Science of The Total Environment, 905, 167306, <https://doi.org/10.1016/j.scitotenv.2023.167306>.
- 2023 Nazarian, **Lipson**, Norford. *Book Chapter: Multiscale modeling techniques to document urban climate change*. Edited by Paolini and Santamouris. Elsevier, 123-164. <https://doi.org/10.1016/B978-0-12-818977-1.00004-1>
- 2022 **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. *Harmonized gap-filled datasets from 20 urban flux tower sites*. Earth System Science Data. <https://doi.org/10.5194/essd-14-5157-2022>
- 2022 Nice, Nazarian, **Lipson**, Hart, Seneviratne, Thompson, Naserikia, Godic, Stevenson. *Isolating the impacts of urban form and fabric from geography on urban heat and human thermal comfort*. Building and Environment. <https://doi.org/10.1016/j.buildenv.2022.109502>
- 2022 **Lipson**, Nazarian, Hart, Nice, Conroy. *A Transformation in City-Descriptive Input Data for Urban Climate Models*. Frontiers in Environmental Science. <https://doi.org/10.3389/fenvs.2022.866398>

- 2022 Ulpiani, Hart, Di Virgilio, Maharaj, **Lipson**, Potgieter. *A citizen centred urban network for weather and air quality in Australian schools*. Scientific Data. <https://doi.org/10.1038/s41597-022-01205-9>
- 2022 Ulpiani, Duhirwe, Yun, **Lipson**. *Meteorological influence on forecasting urban pollutants: Long-term predictability versus extreme events in a spatially heterogeneous urban ecosystem*. Science of the Total Environment. <https://doi.org/10.1016/j.scitotenv.2021.152537>
- 2021 Hart, Cooper, Green, **Lipson**. *Book chapter: The synergistic impacts of urban air pollution compounding our climate emergency*. Urban Climate Science for Planning Healthy Cities. Springer. https://doi.org/10.1007/978-3-030-87598-5_16
- 2021 Potgieter, Nazarian, **Lipson**, Hart, Ulpiani, Morrison, Benjamin. *Combining high-resolution land use data with crowdsourced air temperature to investigate intra-urban microclimate*. Frontiers in Environmental Science. <https://doi.org/10.3389/fenvs.2021.720323>
- 2021 Hirsch, Evans, Thomas, Conroy, Hart, **Lipson**, Ertler. *Resolving the influence of local flows on urban heat amplification during heatwaves*. Environmental Research Letters. <https://doi.org/10.1088/1748-9326/ac0377>
- 2021 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. *A global environmental crisis 42,000 years ago*. Science. <https://doi.org/10.1126/science.abb8677>
- 2020 Gurieff, Green, Koskinen, **Lipson**, Baldry, Maddocks, Menictas, Noack, Moghtaderi, Doroodchi. *Reimagining Hospitals as Sustainable Energy Hubs*. Healthy Power: Sustainability. <https://doi.org/10.3390/su12208554>
- 2019 **Lipson**, Thatcher, Hart and Pitman. *Climate change impact on energy demand in building-urban-atmosphere simulations through the 21st century*. Environ. Res. Lett. <https://doi.org/10.1088/1748-9326/ab5aa5>
- 2019 **Lipson**. *Model development for urban climates*. Dissertation. UNSW Sydney. https://primoa.library.unsw.edu.au/permalink/f/1uqach6/TN_cdi_nla_trove_235256129
- 2019 Rainsley, Turney, Golledge, Wilmshurst, McGlone, Hogg, Li, Thomas, Roberts, Jones, Palmer, Flett, de Wet, Hutchinson, **Lipson**, Fenwick, Hines, Binetti, and Fogwill. *Pleistocene glacial history of the New Zealand subantarctic islands*. Climate of the Past. <https://doi.org/10.5194/cp-15-423-2019>
- 2018 Wilson, Barthel, **Lipson**, Fogwill, and Turney. *New breeding records of seabirds at Carnley Harbour (Auckland Islands), Cossack Rock (Campbell Island) and south coast of The Snares*. Notornis, 65(3), 168–173, 2018.
- 2018 **Lipson**, Thatcher, Hart, Pitman. *A building energy demand and urban land surface model*. QJRM. <https://doi.org/10.1002/qj.3317>
- 2018 Turney, Palmer, Maslin, Hogg, Fogwill, Southon, Fenwick, Helle, Wilmshurst, McGlone, Ramsey, Thomas, **Lipson**, Beaven, Jones, Andrews, Hua. *Global Peak in Atmospheric Radiocarbon Provides a Potential Definition for the Onset of the Anthropocene Epoch in 1965*. Scientific Reports. <https://doi.org/10.1038/s41598-018-20970-5>
- 2018 Palmer, Turney, Fogwill, Fenwick, Thomas, **Lipson**, Jones, Beavan, Richardson, Wilmshurst. *Growth response of an invasive alien species to climate variations on subantarctic Campbell Island*. NZ. J. Ecol. <https://www.jstor.org/stable/26538093>
- 2017 **Lipson**, Hart, Thatcher. *Efficiently modelling urban heat storage: an interface conduction scheme in an urban land surface model (aTEB v2.0)*. Geosci. Model Dev. <https://doi.org/10.5194/gmd-10-991-2017>
- 2017 Turney, Fogwill, Palmer, van Seville, Thomas, McGlone, Richardson, Wilmshurst, Fenwick, Zunz, Goosse, Wilson, Carter, **Lipson**, Jones, Harsch, Clark, Marzinelli, Rogers, Rainsley, Ciasto, Waterman, Thomas, Visbeck. *Tropical forcing of increased*

Southern Ocean climate variability revealed by a 140-year subantarctic temperature reconstruction. Clim. Past. <https://doi.org/10.5194/cp-13-231-2017>

- 2016 Turney, McGlone, Palmer, Fogwill, Hogg, Thomas, **Lipson**, Wilmshurst, Fenwick, Jones, Hines, Clark. *Intensification of Southern Hemisphere westerly winds 2000–1000 years ago: evidence from the subantarctic Campbell and Auckland Islands (52–50°S).* J. Quaternary Sci. <https://doi.org/10.1002/jqs.2828>
- 2016 Turney, Palmer, Hogg, Fogwill, Jones, Bronk Ramsey, Fenwick, Grierson, Wilmshurst, O'Donnell, Thomas, and **Lipson**: *Multidecadal variations in Southern Hemisphere atmospheric 14C: Evidence against a Southern Ocean sink at the end of the Little Ice Age CO2 anomaly*, Global Biogeochem. Cycles, 30, 2015GB005257, <https://doi.org/10.1002/2015GB005257>

COMMUNICATION

- Weather website *Is it hot right now?* **Lipson**, Contractor and Goldie. 2017-2024. <https://isithotrightnow.com>
- Blog *The Urbanist.* **Lipson**. 2017-2024. <https://theurbanist.com.au>
- Briefing Note Nazarian, Hart, **Lipson**, Lu, and Pitman: *Urban Climates and Climate Change*, Centre of Excellence for Climate Extremes, 2024. <https://climateextremes.org.au/wp-content/uploads/Urban-Climate-Briefing-note.pdf>
- 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 **Lipson**, Grimmond, Best. *Surface energy and momentum fluxes in the Urban-PLUMBER model evaluation project: initial report.* Urban Climate News Issue 91., June-July 2024 <https://urban-climate.org/wp-content/uploads/2024/08/IAUC091.pdf>
- Association newsletter article **Lipson**, Grimmond, Best. *A new multi-site evaluation project for modelling in urban areas.* Urban Climate News Issue 75. March 2020. <https://urban-climate.org/wp-content/uploads/2023/02/IAUC075.pdf>
- Association newsletter article **Lipson**, Grimmond, Best, et al., *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 **Lipson** Grimmond, Best. *Urban-PLUMBER: A multi-site model evaluation project for urban areas.* 2021-2024; <https://urban-plumber.github.io/>

SERVICE & TEACHING

- 2024 Lecture - Weather and its applications (ENVS2004): Urban weather and climate, Fenner School Environment & Society, Australian National University.
- 2021-2024 Advisory role for coordinators: WCRP-CORDEX Urban Environments and Regional Climate Change Flagship Pilot Study
- 2020-2024 Bibliography committee member. International Association of Urban Climate Newsletter
- 2023 Scientific Program Committee co-chair, 11th International Conference on Urban Climate, Sydney, Australia
- 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.