

# DR CATHERINE SCOTT

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I am a **NERC Independent Research Fellow** and **University Academic Fellow** in Biosphere-Climate Interactions. The overall aim of my research is to understand the extent to which land-use change can help mitigate climate change and meet the targets set in the Paris Agreement on Climate. I co-founded and am **Director** of the **Leeds Ecosystem, Atmosphere and Forest (LEAF)** centre which brings cross-faculty researchers working on forests together with end-users of the research such as local authorities, UK government, charities and NGOs.

## ACADEMIC EMPLOYMENT

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- 2019 - present: **Natural Environment Research Council (NERC) Independent Research Fellow** and **University Academic Fellow** in Biosphere-Climate Interactions, University of Leeds
- 2018 - present: **Director** of the **Leeds Ecosystem, Atmosphere & Forest (LEAF) Centre**, University of Leeds
- 2018 - 2019: **Secondment** to Science and Innovation for Climate and Energy (SICE) directorate, **Department for Business, Energy and Industrial Strategy**, UK Government (0.4 FTE):
- 2013 - 2018: **Coordinator** of the **Leeds Ecosystem, Atmosphere & Forest (LEAF) Centre**, University of Leeds (0.4 FTE)
- 2013 - 2019: **Postdoctoral Research Fellow** on NERC and Horizon2020 funded projects in the School of Earth & Environment, University of Leeds (0.6 FTE)

## EDUCATION

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- 2009-2013: **PhD (awarded Nov 2013)** "*The biogeochemical impacts of forests and the implications for climate-change mitigation*" School of Earth & Environment, University of Leeds.
- 2008-2009: **MSc Energy and Environment** (Distinction) School of Process, Environmental & Materials Engineering, University of Leeds.
- 2003-2007: **MChem Chemistry with Industrial Experience** (First Class, 75%) School of Chemistry, University of Manchester.

## PRIZES, FELLOWSHIPS & AWARDS

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- I was awarded a Natural Environment Research Council (NERC) 5-year Independent Research Fellowship (2019).
- I received the award for *Building Knowledge & Capacity* at the University of Leeds Sustainability Awards (2018).
- I was awarded an *Engagement Excellence Fellowship* by the University of Leeds (2017).
- I received the *Early Career Oral Presentation Prize* at the International Global Atmospheric Chemistry (IGAC) Conference in Colorado, USA (2016).
- I won the Climate Change Zone in *I'm a Scientist, Get me out of here!* competition (2016).
- My PhD thesis was recognised with an international *Springer Thesis Prize* (2014).

## SELECTED FUNDING SUCCESS

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- Funding from Natural England and Yorkshire Wildlife Trust for *All Our Land*, arts-based climate change engagement project with Yorkshire Dales Millennium Trust and artists (PI, £30000, 2022).
- EU Horizon2020 project *Upsurge* (Co-I, £260000 to University of Leeds, 2021-2026).
- Funding from UBoC for *Large scale forest restoration in Yorkshire* (PI, £337500, 2020-2023) and the [Wild Ingleborough](#) project (Co-I, £500000, 2020).
- Strategic Priorities Funding via the University of Leeds for *The potential contribution of UK forests to meeting net-zero by 2050* (PI, £30000, 2020).
- CRUCIBLE award from University of Leeds for interdisciplinary project in partnership with Leeds City Council on optimisation of future tree planting for multiple benefits (Co-I, £9066, 2020).
- Economic and Social Research Council Impact Accelerator Account to deliver *The Climate Curriculum* in partnership with local charities and schools (PI, £14700, 2020).
- NERC Independent Research Fellowship: *Meeting the Paris Agreement on Climate: Exploiting Earth System Models to determine the role of future land-use change* (PI, £577362, 2019-2024).
- Project grant awarded by The Woodland Trust for [i-Tree Leeds](#) project to value ecosystem services of trees in Leeds (PI, £10000, 2018).
- *Living Lab for Air Quality* project grant from Sustainability Service at University of Leeds (Joint PI, £19177, 2017).
- NERC Public Engagement Pilot project grant for *Making the Invisible Visible* air quality awareness campaign (Co-I, £33527, 2016).

## PUBLICATION SUMMARY

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I have published 26 peer-reviewed articles (5 as first author) on topics related to the impacts of vegetation on climate and atmospheric composition, including publications in *Nature*, *Science*, *Nature Geoscience*, *PNAS* and *Nature Communications* (>1,500 citations). My work has been cited by the Intergovernmental Panel on Climate Change in the contribution of Working Group 1 to their Sixth Assessment Report (Chapters 6 and 7), their Special Report on Climate Change and Land (Chapter 2), and the Special Report on Warming of 1.5 Degrees (Chapter 2). In each case my work was the key evidence available to inform our understanding of the interactions and feedbacks between vegetation, biogenic emissions and climate. I have authored two book chapters, one on aerosol emissions and another on the climate impacts of land-use change; a full publication list is provided at the end of this CV.

## INVITED PRESENTATIONS

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I have been invited to present at the University of Sheffield (2022), Swedish University of Agricultural Sciences (2022), University of Cambridge (2013 & 2020), the European Geoscience Union General Assembly (2020), the University of Leicester (2019), the Hoffmann Centre for Sustainable Resource Economy at Chatham House (2019), the International Aerosol Modelling Algorithms Conference, USA (2017 & 2019) and the EcoBuild Conference, UK (2018). I have also been invited to speak at both in-person and virtual citizens' assemblies on climate change across the UK.

## TEACHING, SUPERVISORY & ADMINISTRATIVE ACTIVITIES

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- I am main or co-supervisor for six PhD students at the University of Leeds; topics include carbon sequestration rates in native UK woodlands, air quality side-effects of large-scale afforestation in the UK, greenhouse gas emissions from agriculture, use of machine learning to identify urban trees in historic maps, and the impacts of restoration on the provision of public goods in the UK uplands.
- I am the Module Leader for *Terrestrial Biosphere in the Earth System* final year / Masters level module in the School of Earth and Environment and contribute to teaching on four other undergraduate and postgraduate modules across the University of Leeds.
- I am contributing to the development of a new MSc programme in Climate Futures at the University of Leeds (launching in 2023).
- I have supervised eleven final year undergraduate or postgraduate research projects and seven summer research placements at the University of Leeds since 2017.
- I have convened sessions based around “Natural Aerosols and Climate” at the European Geosciences Union meeting (2019, 2020, 2021, 2022) and the American Geophysical Union Fall Meeting (2020).
- I have reviewed research proposals (for NERC, the French National Research Agency and University of Hyderabad, India) and research articles for the *Proceedings of the National Academy of Sciences*, *Nature Communications*, *Journal of Geophysical Research – Atmospheres*, *Atmospheric Chemistry and Physics*, *Global Change Biology*, and *Geoscientific Model Development*.

## SELECTED PUBLICATIONS FOR A NON-ACADEMIC AUDIENCE

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- [Net Zero Exchanges: Connecting policy and research for climate action](#), 2021, All-Party Parliamentary Climate Change Group & Policy Connect.
- [Ancient Woodland - carbon sink or source?](#), 2021, in *Wood Wise* by the Woodland Trust.
- [How can carbon offsetting help UK Further and Higher Education Institutions Achieve Net-Zero Emissions](#), 2021, COP26 Universities Network Briefing.
- [Tree cover targets to tackle greenhouse gases](#), 2020, in *Wood Wise* by the Woodland Trust.
- [University of Leeds: Enhancing the Benefits of Trees on Campus](#), 2019, UBoC & LEAF, University of Leeds.
- [A Brief Guide to the Benefits of Urban Green Spaces](#), 2015, UBoC & LEAF, University of Leeds.

## FULL PUBLICATION LIST

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### Peer-reviewed journal articles:

1. Leinonen V; Kokkola H; Yli-Juuti, T; Mielonen T; Kühn T; Nieminen T; Heikkinen S; Miinalainen T; Bergman T; Carslaw K; Decesari S; Fiebig M; Hussein T; Kivekäs N; Kulmala M; Leskinen A; Massling A; Mihalopoulos N; Mulcahy JP; Noe SM; van Noije T; O'Connor FM; O'Dowd C; Olivie D; Pernov JB; Petäjä T; Seland Ø; Schulz M; **Scott CE**; Skov H; Swietlicki E; Tuch T; Wiedensohler A; Virtanen A; Mikkonen S, “Comparison of particle number size distribution trends in ground measurements and climate models”, 2022, *Atmos. Chem. Phys.*, 22(19), pp. 12873-12905, [doi.org/10.5194/acp-22-12873-2022](https://doi.org/10.5194/acp-22-12873-2022).
2. Checa-Garcia R, Balkanski Y, Albani S, Bergman T, Carslaw K, Cozic A, Dearden C, Marticorena B, Michou M, van Noije T, Nabat P, O'Connor FM, Olivie D, Prospero JM, Le

- Sager P, Schulz M, **Scott CE**, "Evaluation of natural aerosols in CRESCENDO Earth system models (ESMs): mineral dust", **2021**, *Atmos. Chem. Phys.*, 21(13), pp. 10295-10335, [doi.org/10.5194/acp-21-10295-2021](https://doi.org/10.5194/acp-21-10295-2021).
3. Fletcher T; **Scott CE**; Hall J; Spracklen DV, "The carbon sequestration potential of Scottish native woodland", **2021**, *Environ. Res. Commun.*, 3, 041003, [doi.org/10.1088/2515-7620/abf467](https://doi.org/10.1088/2515-7620/abf467).
  4. Sengupta K; Pringle K; Johnson JS; *et al.*, inc **Scott CE**, "A global model perturbed parameter ensemble study of secondary organic aerosol formation", **2021**, *Atmos. Chem. Phys.*, 21(4), pp. 2693-2723, [doi.org/10.5194/acp-21-2693-2021](https://doi.org/10.5194/acp-21-2693-2021).
  5. Wang X; Dallimer M; **Scott CE**; *et al.*, "Tree species richness and diversity predicts the magnitude of urban heat island mitigation effects of greenspaces", **2021**, *Science of The Total Environment*, 770, 145211, [doi.org/10.1016/j.scitotenv.2021.145211](https://doi.org/10.1016/j.scitotenv.2021.145211).
  6. Goddard MA; Davies ZG; Guenat S; *et al.*, inc **Scott CE**, "A global horizon scan of the future impacts of robotics and autonomous systems on urban ecosystem", **2021**, *Nature Ecology and Evolution*, 5(2), pp. 219-230, [doi.org/10.1038/s41559-020-01358-z](https://doi.org/10.1038/s41559-020-01358-z).
  7. Thornhill G; Collins W; Olivé D; *et al.*, inc **Scott CE**, "Climate-driven chemistry and aerosol feedbacks in CMIP6 Earth system models", **2021**, *Atmos. Chem. Phys.*, 21(2), pp. 1105-1126, [doi.org/10.5194/acp-21-1105-2021](https://doi.org/10.5194/acp-21-1105-2021).
  8. Mulcahy JP; Johnson C; Jones CG; *et al.*, inc **Scott CE**, "Description and evaluation of aerosol in UKESM1 and HadGEM3-GC3.1 CMIP6 historical simulations", **2020**, *Geosci. Model Dev.*, 13(12), pp. 6383-6423, [doi.org/10.5194/gmd-13-6383-2020](https://doi.org/10.5194/gmd-13-6383-2020).
  9. Rap A; **Scott CE**; Reddington CL; *et al.*, "Reply to: Complexities between plants and the atmosphere", **2019**, *Nature Geoscience*, 12(9), pp. 695-695, [doi.org/10.1038/s41561-019-0437-0](https://doi.org/10.1038/s41561-019-0437-0).
  10. Reddington CL; Morgan WT; Darbyshire E; *et al.*, inc. **Scott CE**; "Biomass burning aerosol over the Amazon: analysis of aircraft, surface and satellite observations using a global aerosol model", **2019**, *Atmos., Chem. Phys.*, 19(4), pp 9125-9152, [doi.org/10.5194/acp-19-9125-2019](https://doi.org/10.5194/acp-19-9125-2019).
  11. **Scott CE**; Arnold SR; Monks SA; *et al.*, "Substantial large-scale feedbacks between natural aerosols and climate", **2018b**, *Nature Geoscience*, 11, p44-48, [doi.org/10.1038/s41561-017-0020-5](https://doi.org/10.1038/s41561-017-0020-5).
  12. Rap A; **Scott CE**; Reddington CL; *et al.*, "Enhanced global primary production by biogenic aerosol via diffuse radiation fertilization", **2018**, *Nature Geoscience*, 11, p640-644, [doi.org/10.1038/s41561-018-0208-3](https://doi.org/10.1038/s41561-018-0208-3).
  13. Hamilton D; Hantson S; **Scott CE**; *et al.*, "Reassessment of pre-industrial fire emissions strongly affects anthropogenic aerosol forcing", **2018**, *Nature Communications*, 9, 3182, [doi.org/10.1038/s41467-018-05592-9](https://doi.org/10.1038/s41467-018-05592-9).
  14. **Scott CE**; Monks SA; Spracklen DV; *et al.*, "Impact on short-lived climate forcers increases projected warming due to deforestation", **2018a**, *Nature Communications*, 9, 157, [doi.org/10.1038/s41467-017-02412-4](https://doi.org/10.1038/s41467-017-02412-4).
  15. **Scott CE**; Monks SA; Spracklen DV; *et al.*, "Impact on short-lived climate forcers (SLCFs) from a realistic land-use change scenario via changes in biogenic emissions", **2017**, *Faraday Discussions*, [doi.org/10.1039/C7FD00028F](https://doi.org/10.1039/C7FD00028F).
  16. Gordon H; Sengupta K; Rap A; *et al.*, inc. **Scott CE**, "Reduced anthropogenic aerosol radiative forcing caused by biogenic new particle formation", **2016**, *Proc. Nat. Acad. Sci.*, 113, p12053-12058, [doi.org/10.1073/pnas.1602360113](https://doi.org/10.1073/pnas.1602360113).
  17. Kapadia ZZ; Spracklen DV; Arnold SR; Borman DJ; Mann GW; Pringle KJ; Monks SA; Reddington CL; Benduhn F; Rap A; **Scott CE**; Butt EW; Yoshioka M, "Impacts of aviation fuel sulfur content on climate and human health", **2016**, *Atmos. Chem. Phys.* 16, p10521-10541, [doi.org/10.5194/acp-16-10521-2016](https://doi.org/10.5194/acp-16-10521-2016).
  18. Kirkby J; Duplissy J; Sengupta K; *et al.*, inc. **Scott CE**, "Ion-induced nucleation of pure biogenic particles", **2016**, *Nature*, 533, p521-526, [doi.org/10.1038/nature17953](https://doi.org/10.1038/nature17953).
  19. Butt EW; Rap A; Schmidt A; **Scott CE**; *et al.*, "The impact of residential combustion emissions on atmospheric aerosol, human health and climate", **2016**, *Atmos. Chem. Phys.*, 16, p873-905, [doi.org/10.5194/acp-16-873-2016](https://doi.org/10.5194/acp-16-873-2016).

20. **Scott CE**; Spracklen DV; Pierce JR; *et al.*, "Impact of gas-to-particle partitioning approaches on the simulated radiative effects of biogenic secondary organic aerosol", **2015**, *Atmos. Chem. Phys.*, 15, p12989-13001, [doi.org/10.5194/acp-15-12989-2015](https://doi.org/10.5194/acp-15-12989-2015).
21. Kodros JK; **Scott CE**; Farina SC; Lee YH; L'Orange C; Volckens J; Pierce JR, "Uncertainties in global aerosols and climate effects due to biofuel emissions", **2015**, *Atmos. Chem. Phys.*, 15, p8577-8596, [doi.org/10.5194/acp-15-8577-2015](https://doi.org/10.5194/acp-15-8577-2015).
22. D'Andrea SD; Acosta Navarro JC; Farina SC; **Scott CE**; Rap A; Farmer DK; Spracklen DV; Riipinen I; Pierce JR, "Aerosol size distribution and radiative forcing response to anthropogenically driven historical changes in biogenic secondary organic aerosol formation", **2015**, *Atmos. Chem. Phys.*, 15, p 2247-2268, [doi.org/10.5194/acp-15-2247-2015](https://doi.org/10.5194/acp-15-2247-2015).
23. Riccobono F; Schobesberger S; **Scott CE**; *et al.*, "Oxidation Products of Biogenic Emissions Contribute to Nucleation of Atmospheric Particles", **2014**, *Science*, 344, p717-721, [doi.org/10.1126/science.1243527](https://doi.org/10.1126/science.1243527).
24. **Scott CE**; Rap A; Spracklen DV; *et al.*, "The direct and indirect radiative effects of biogenic secondary organic aerosol", **2014**, *Atmos. Chem. Phys.*, 14, p447-470, [doi.org/10.5194/acp-14-447-2014](https://doi.org/10.5194/acp-14-447-2014).
25. Rap A; **Scott CE**; Spracklen DV; *et al.*, "Natural aerosol direct and indirect radiative effects", **2013**, *Geophys. Res. Lett.*, 40, [doi.org/10.1002/grl.50441](https://doi.org/10.1002/grl.50441).
26. Pierce JR; Evans MJ; **Scott CE**; *et al.*, "Weak global sensitivity of cloud condensation nuclei and the aerosol indirect effect to Criegee + SO<sub>2</sub> chemistry", **2013**, *Atmos. Chem. Phys.*, 13, p 3163-3176, [doi.org/10.5194/acp-13-3163-2013](https://doi.org/10.5194/acp-13-3163-2013).

#### **Book Chapters:**

1. Bond T and **Scott CE**; "Aerosol and precursor gas emissions", **2022**, in: Carslaw K (eds.) [Aerosols and Climate](#), Elsevier.
2. **Scott CE**, "The role of agricultural expansion, land cover and land-use change in contributing to climate change", **2020**, in: Deryng D (eds.), [Climate Change and Agriculture](#), Burleigh Dodds Series in Agricultural Science.