

ELOISE A. MARAIS

Gower Street, North-West Wing 114, London, UK
Tel: +44 2031082481, Email: e.marais@ucl.ac.uk

Web: <https://maraisresearchgroup.co.uk/>
ORCID: <https://orcid.org/0000-0001-5477-8051>

MAJOR RESEARCH AREA

I lead a research group that innovates the use of atmospheric chemistry transport models and ground- and space-based remote sensing platforms to interpret and determine the influence of humans on atmospheric composition, air quality and climate from Earth's surface to outer space.

EDUCATION

- 2008-2014 **Ph.D.**, Earth and Planetary Sciences, Harvard University, Cambridge MA, USA
Title: *Non-methane volatile organic compounds in Africa: A view from space.*
Supervisor: Prof. Daniel J. Jacob.
- 2006-2008 **M.Sc** (research) in Chemistry, Rhodes University, South Africa, *distinction*.
Title: *Removal & photocatalysis of 4-nitrophenol using metallophthalocyanines.*
Supervisor: Prof. Tebello Nyokong
- 2004 **B.Sc. Hons** in Chemistry, University Kwa-Zulu Natal, South Africa, *cum laude*.
- 2001-2003 **B.Sc.** in Chemistry, University of Natal, South Africa, *summa cum laude*.

ACADEMIC APPOINTMENTS AND PROFESSIONAL EXPERIENCE

University College London, London, UK

- 2024-present Professor of Atmospheric Chemistry and Air Quality, Department of Geography.
2020-2024 Associate Professor in Physical Geography, Department of Geography.

University of Pretoria, Pretoria, South Africa

- 2025-present Visiting Professor, Department of Geography, Geoinformatics and Meteorology.

University of Leicester, Leicester, UK

- 2018-2020 Associate Professor in Earth Observation, School of Physics and Astronomy.

University of Birmingham, Birmingham, UK

- 2016-2018 Tenure-track Research Fellow, School of Geography, Earth and Environmental Sciences.

Harvard University, Cambridge MA, USA

- 2014-2016 Postdoctoral Research Fellow in the Jacob group on a Schlumberger Faculty for the Future Fellowship, SEAS.

RESEARCH SUPPORT

Submitted

3. British Academy Interdisciplinary Research Project, co-I, *Protecting outer space with equitable governing standards to sustain its scarce resources for future generations*. **£75,000**.
2. Schmidt Science Polymath Award, UCL nomination selected by Schmidt to submit full application, PI. **\$2.5 million**.
1. Advanced Research + Invention Agency (ARIA) Scoping Our Planet Rolling Opportunity Seeds Call, PI, *Unlocking the potential to quantify spacecraft pollution from space-based broadband imagers*. **£400,000**.

In Progress

- 2025-2026 UK Science and Technology Facilities Council (STFC) funding administered by UCL as a Knowledge Exchange Award, co-I, *Tracking pollution from rocket launches and object re-entries in partnership with the ESA Space Sustainability Team*. **£20,000**.

Completed

- 2019-2025 European Research Council (ERC) Starting Grant, PI, *UpTrop: Fundamental understanding of reactive nitrogen in the upper troposphere*. **£1.4 million**.
- 2021-2024 UK Natural Environment Research Council (NERC) Standard Grant, co-I, *Dry deposition processes of oxygenated volatile organic compounds*. **£160,000**.
- 2024 UK STFC funding administered by UCL as a Knowledge Exchange Award, PI, *Enhanced utility of Earth Observations for monitoring air quality using research-enabled gridding techniques*. **£22,000**.
- 2023 Higher Education Funding Council for England (HEFCE) Research Capital Infrastructure Funding (RCIF) administered through the UCL Research Capital Equipment Fund, PI, *Dynamics of ozone pollution and air pollution layer height in Central London*. **£83,000**.
- 2023 Research England's Higher Education Innovation Fund (HEIF) funding administered by UCL as an Innovation Fund Award, PI, *Engaging policymakers and industry to enhance the utility of a state-of-science air quality model*. **£13,600**.
- 2021-2023 Schmidt Family Foundation grant, PI, *Health impacts and inequitable exposure to air pollution from the US oil and gas industry*. **£79,000**.
- 2018-2023 UK NERC Researcher In Residence Award, PI, *Launching urban air quality and green space monitoring into the 21st century*. **£50,000**.
- 2022 HEFCE RCIF administered through the UCL Research Capital Equipment Fund, PI, *First long-term MAX-DOAS instrument in London*. **£48,000**.
- 2019-2022 Copernicus Master's Accelerator Programme, PI, *Tool for Recording and Assessing the City Environment (TRACE)*. **£10,000**.
- 2020-2022 UK Department for Environment, Food and Rural Affairs (DEFRA) Air Quality Grant, PI, *Transboundary PM_{2.5} sources in Leicester and Leicestershire*. **£124,000**.
- 2019-2020 UK DEFRA, co-I, *Applying Earth observations to reduce uncertainties in regulatory emission inventories*. **£75,000**.
- 2019-2020 ESA, co-I, *Future EO passive optical missions for small satellites*. **£40,000**.
- 2017-2019 UK Department for International Development (DFID) East Africa Research Fund, co-I, *A systems approach to air pollution in East Africa*. **£20,000**.
- 2016-2018 University of Birmingham Independent Research Fellowship, PI. **£27,000**.
- 2016 Wallace Foundation, co-I, *Health effects of current and future fossil fuels*. **£8,000**.
- 2014-2015 Schlumberger Faculty for the Future Postdoctoral Fellowship, PI, *New regional inventory of diffuse and inefficient emissions for Africa*. **£59,000**.
- 2014-2015 South Africa National Research Foundation (NRF) Postdoctoral Fellowship for Research Abroad, PI. **£29,000**.
- 2011-2013 South Africa NRF, Graduate scholarship for study abroad. **£16,000**.
- 2011-2012 Harvard Center for the Environment Graduate Fellowship. **£12,000**.
- 2008-2011 International Fulbright Science & Technology PhD Scholarship. **£134,000**.
- 2004-2007 Multiple BSc Honours and Masters Scholarships, South Africa. **£10,000**.

PEER-REVIEWED PUBLICATIONS

Total citations: 6878, **h-index:** 38 (*Google Scholar*).

Students and postdocs supervised identified as: ** UG/MSc, * PhD, § Postdoc.

Archive of associated datasets: <https://maraisresearchgroup.co.uk/datasets.html>

2026

66. R. P. Horner*, **E. A. Marais**, R. M. Stauffer, D. E. Kollonige, A. M. Thompson, Global vertical profiles of tropospheric ozone (O₃) obtained by cloud-slicing TROPOMI, submitted, *J. Geophys. Res.: Atmos.*
65. **E. A. Marais**, N. Wei*, E. Y. P. Tan**, G. Lu, S. Keita, M. Naidoo, R. M. Garland, Urban and power plant NO_x emissions in Sub-Saharan Africa inferred from TROPOMI, in review, *J. Geophys. Res.: Atmos.*, preprint: <https://doi.org/10.22541/essoar.176374481.17612655/v2>.
64. C. R. Barker[§], **E. A. Marais**, E. Y. P. Tan**, S. D. Eastham, G. S. Diskin, J. P. DiGangi, Y. Choi, A. Rollins, E. Waxman, T. P. Bui, C. Gatebe, J. Dean-Day, Radiative forcing and ozone depletion of a decade of satellite megaconstellation missions, in review, *Earth's Future*, preprint: <https://doi.org/10.22541/essoar.175978287.77438242/v1>.

2025

63. K. Vohra[§], **E. A. Marais**, P. Achakulwisut, S. Anenberg, C. Harkins, The health burden and racial-ethnic disparities of air pollution from the major oil and gas lifecycle stages in the United States, *Science Advances*, 11, eadu2241, doi:10.1126/sciadv.adu2241. **Extensive media coverage:** <https://scienceadvances.altmetric.com/details/180522045>.
62. N. Wei*, **E. A. Marais**, G. Lu[§], R. G. Ryan[§], B. Sauvage, Characterization of reactive nitrogen in the global upper troposphere using recent and historical commercial and research aircraft campaigns and GEOS-Chem, *Atmos. Chem. Phys.*, 25, 7925–7940, doi:10.5194/acp-25-7925-2025.
61. R. Dang, D. J. Jacob, H. Wang, C. R. Nowlan, G. Gonzalez Abad, H. Chong, X. Liu, V. Shah, L. H. Yang, Y. J. Oak, **E. A. Marais**, R. P. Horner*, A. W. Rollins, J. H. Crawford, K. Li, H. Liao, High-resolution geostationary satellite observations of free tropospheric NO₂ over North America: Implications for lightning emissions, *PNAS*, 122, e2510535122, doi:10.1073/pnas.2510535122.
60. **E. A. Marais**, M. Van Damme, L. Clarisse, C. Wiedinmyer, K. Murphy, G. van der Werf, Subtropical southern Africa fire emissions of nitrogen oxides and ammonia obtained with satellite observations and GEOS-Chem, *Environ. Sci.: Atmos.*, 5, 906–920. *Invited*, doi:10.1039/d5ea00041f.
59. B. Opacka, T. Stavrou, J.-F. Müller, I. De Smedt, J. van Geffen, **E. A. Marais**, R. P. Horner*, D. B. Millet, K. C. Wells, A. B. Guenther, Natural emissions of VOC and NO_x over Africa constrained by TROPOMI HCHO and NO₂ data using the MAGRITTEv1.1 model, *Atmos. Chem. Phys.*, 25, 2863–2894, doi:10.5194/acp-25-2863-2025.
58. T.-L. He, G.-M. Oomen, and 26 authors including **E. A. Marais**, Challenges and opportunities offered by geostationary space observations for air quality research and emission monitoring, *BAMS*, doi:10.1175/BAMS-D-23-0145.1.
57. G. Lu[§], **E. A. Marais**, K. Vohra[§], R. P. Horner*, D. Zhang, R. V. Martin, S. Guttikunda, Near-automated estimate of city nitrogen oxides emissions applied to South and Southeast Asia, *J. Geophys. Res.: Atmos.*, 130, e2024JD041000, doi:10.1029/2024JD041000.

2024

56. C. R. Barker[§], **E. A. Marais**, J. C. McDowell, Global 3D rocket launch and re-entry air pollutant and CO₂ emissions at the onset of the megaconstellation era, *Nature Scientific Data.*, 11, 1–15, doi:10.1038/s41597-024-03910-z. **19 citations.**
55. R. P. Horner*, **E. A. Marais**, N. Wei*, R. G. Ryan[§], V. Shah, Vertical profiles of global tropospheric nitrogen dioxide (NO₂) obtained by cloud-slicing TROPOMI, *Atmos. Chem. Phys.*, 24, 13047–13064, doi:10.5194/acp-24-13047-2024.
54. K. Vohra[§], **E. A. Marais**, P. Achakulwisut, G. Lu[§], J. M. Kelly[§], C. Harkins, B. McDonald, Influence of oil and gas end-use on summertime particulate matter and ozone pollution in the eastern US, *Environ. Sci. & Technol.*, 58, 19736–19747, doi:10.1021/acs.est.4c10032.

2023

53. **E. A. Marais**, J. M. Kelly[§], K. Vohra[§], Y. Li^{**}, G. Lu[§], N. Hina, E. C. Rowe, Impact of legislated and best available emission control measures on UK particulate matter pollution, premature mortality, and nitrogen-sensitive habitats, *GeoHealth*, 7(10), e2023GH000910, doi:10.1029/2023GH000910. **12 citations.**
52. R. G. Ryan[§], **E. A. Marais**, E. Gershenson-Smith*, R. Ramsay, J.-P. Muller, J.-L. Tirpitz, U. Friess, Measurement Report: MAX-DOAS measurements characterise Central London ozone pollution episodes during 2022 heatwaves, *Atmos. Chem. Phys.*, 23, 7121–7139, doi:10.5194/acp-23-7121-2023. **25 citations.**
51. J. M. Kelly[§], **E. A. Marais**, G. Lu[§], J. Obszynska, M. Mace, J. White, R. J. Leigh, Diagnosing domestic and transboundary sources of fine particulate matter (PM_{2.5}) in UK cities using GEOS-Chem, *City & Environ. Interac.*, 18, doi:10.1016/j.cacint.2023.100100. **24 citations.**

2022

50. R. G. Ryan[§], **E. A. Marais**, C. J. Balhatchet**, S. D. Eastham, Impact of rocket launch and space debris air pollutant emissions on stratospheric ozone and global climate, *Earth's Future*, 10, e2021EF002612, doi:10.1029/2021EF002612. **Extensive media coverage:** <https://wiley.altmetric.com/details/129725006>. **Wiley certificate for most downloaded article in 2022. 135 citations.**
49. K. Vohra*, **E. A. Marais**, W. J. Bloss, J. Schwartz, L. J. Mickley, M. Van Damme, L. Clarisse, P.-F. Coheur, Rapid rise in premature mortality due to anthropogenic air pollution in fast-growing tropical cities from 2005 to 2018, *Science Advances*, 8, doi:10.1126/sciadv.abm4435. **96 citations.**
48. **E. A. Marais**, O. Akker**, C. Wiedinmyer, Greenhouse gas and air pollutant emissions from power barges (powerships), *Roy. Soc. Chem. Environ. Sci.: Adv.*, 1, 164-169, doi:10.1039/D1VA00049G.
47. R. Pope, R. Kelly, **E. A. Marais**, A. M. Graham, C. Wilson, J. J. Harrison, S. J. A. Moniz, M. Ghalaieny, S. R. Arnold, M. P. Chipperfield, Exploiting satellite measurements to reduce uncertainties in UK bottom-up NO_x emission estimates, *Atmos. Chem. Phys.*, 22, 4323–4338, doi:10.5194/acp-22-4323-2022.
46. A. Mazzeo, M. Burrow, A. Quinn, **E. A. Marais**, A. Singh, D. Ng'ang'a, M. J. Gatari, F. D. Pope, Evaluation of WRF-CHIMERE coupled models for the simulation of PM_{2.5} in large East African urban conurbations, *Atmos. Chem. Phys.*, 22, 10677–10701, doi:10.5194/acp-22-10677-2022.
45. B. Langford, E. House, A. Valach, C. N. Hewitt, P. Artaxo, M. P. Barkley, J. Brito, E. Carnell, B. Davison, A. R. MacKenzie, **E. A. Marais**, M. J. Newland, A. R. Rickard, M. D. Shaw, A. M. Yáñez-Serrano, E. Nemitz, Seasonality of isoprene emissions and oxidation products above the remote Amazon, *Environ. Sci.: Atmos.*, doi:10.1039/D1EA00057H.

2021

44. **E. A. Marais**, A. Pandey[§], M. Van Damme, L. Clarisse, P.-F. Coheur, M. W. Shephard, K. E. Cady-Pereira, T. Misselbrook, L. Zhu, G. Luo, F. Yu, UK ammonia emissions estimated with satellite observations and GEOS-Chem, *J. Geophys. Res.: Atmos.*, 126, doi:10.1029/2021JD035237, **Wiley certificate for most downloaded article in 2021. 43 citations.**
43. **E. A. Marais**, J. F. Roberts[§], R. G. Ryan[§], H. Eskes, K. F. Boersma, S. Choi, J. Joiner, N. Abuhassan, A. Redondas, M. Grutter, A. Cede, L. Gomez, M. Navarro-Comaset, New observations of upper tropospheric NO₂ from TROPOMI, *Atmos. Meas. Tech.*, 14, 2389-2408, doi:10.5194/amt-14-2389-2021. **48 citations.**
42. K. Vohra*, **E. A. Marais**, S. Suckra**, L. Kramer, W. J. Bloss, R. Sahu, A. Gaur, S. N. Tripathi, M. Van Damme, L. Clarisse, P.-F. Coheur, Long-term trends in air quality in major cities in the UK and India: A view from space, *Atmos. Chem. Phys.*, 21, 6275–6296, doi:10.5194/acp-21-6275-2021. **66 citations.**

41. K. Vohra*, A. Vodonos, J. Schwartz, **E. A. Marais**, M. P. Sulprizio, L. J. Mickley, Global mortality from outdoor fine particle pollution generated by fossil fuel combustion: Results from GEOS-Chem, *Environ. Res.*, 195, 110754 doi:10.1016/j.envres.2021.110754. **Extensive media coverage:** <https://www.altmetric.com/details/99822433>, **ISI Web of Science (WoS) Hot & Highly Cited Paper. 1031 citations.**
40. D. A. Potts, **E. A. Marais**, H. Boesch, R. J. Pope, J. Lee, W. Drysdale, M. P. Chipperfield, B. Kerridge, R. Siddans, D. P. Moore, J. Remedios, Diagnosing air quality changes in the UK during the COVID-19 lockdown using TROPOMI and GEOS-Chem, *Environ. Res. Lett.*, 16, 054031, doi:10.1088/1748-9326/abde5d. **50 citations.**
39. B. Nault and 37 authors including **E. A. Marais**, Chemical transport models often underestimate inorganic aerosol acidity in remote regions of the atmosphere, *Nature Comm. Earth & Environ.*, 2, doi:10.1038/s43247-021-00164-0. **66 citations.**

2020

38. A. S. Bockarie*, **E. A. Marais**, A. R. MacKenzie, Air pollution and climate forcing of the charcoal industry in Africa, *Environ. Sci. & Technol.*, 54, 13429–13438, doi:10.1021/acs.est.0c03754. **39 citations.**
37. P. deSouza, R. A. Kahn, J. A. Limbacher, **E. A. Marais**, F. Duarte, C. Ratti, Combining low-cost, surface-based aerosol monitors with size-resolved satellite data for air quality applications, *Atmos. Meas. Technol.*, 13, 5319–5334, doi:10.5194/amt-13-5319-2020.
36. E. E. McDuffie, S. J. Smith, P. O'Rourke, K. Tibrewal, C. Venkataraman, **E. A. Marais**, B. Zheng, M. Crippa, M. Brauer, R. V. Martin, A global anthropogenic emission inventory of atmospheric pollutants from sector- and fuel-specific sources (1970-2017): An application of the Community Emissions Data System (CEDS), *Earth Sys. Sci. Data*, 12, 3413-3442, doi:10.5194/essd-12-3413-2020. **541 citations.**
35. Y. Zheng, J. A. Thornton, N. L. Ng, H. Cao, D. K. Henze, E. E. McDuffie, W. Hu, J. L. Jimenez, **E. A. Marais**, E. Edgerton, J. Mao, Long-term observational constraints of organic aerosol dependence on inorganic species in the southeast US, *Atmos. Chem. Phys.*, 20, 13091–13107, doi:10.5194/acp-20-13091-2020.
34. S. J. Pai, C. L. Heald, J. R. Pierce, S. C. Farina, **E. A. Marais**, J. L. Jimenez, P. Campuzano-Jost, B. A. Nault, A. M. Middlebrook, H. Coe, J. E. Shilling, R. Bahreini, J. H. Dingle, K. Vu, An evaluation of global organic aerosol schemes using airborne observations, *Atmos. Chem. Phys.*, doi: 10.5194/acp-20-2637-2020. **174 citations.**

2019

33. **E. A. Marais**, R. F. Silvern, A. Vodonos, E. Dupin**, A. S. Bockarie*, L. J. Mickley, J. Schwartz, Air quality and health impact of future fossil fuel use for electricity generation and transport in Africa, *Environ. Sci. & Technol.*, 53, 13524-13534, doi:10.1021/acs.est.9b04958. **98 citations.**
32. H. M. Worden, A. A. Bloom, J. R. Worden, Z. Jiang, **E. A. Marais**, T. Stavrou, B. Gaubert, F. Lacey, New constraints on biogenic emissions using satellite-based estimates of carbon monoxide fluxes, *Atmos. Chem. Phys.*, 19, 13569-13579, doi:10.5194/acp-19-13569-2019.
31. R. F. Silvern, D. J. Jacob, L. J. Mickley, M. P. Sulprizio, K. R. Travis, **E. A. Marais**, R. C. Cohen, J. L. Laughner, S. Choi, J. Joiner, L. N. Lamsal, Using satellite observations of tropospheric NO₂ columns to infer long-term trends in US NO_x emissions: The importance of accounting for the free tropospheric NO₂ background, *Atmos. Chem. Phys.*, 19, 8863-8878, doi:10.5194/acp-19-8863-2019. **158 citations.**
30. D. S. Jo, A. Hodzic, L. K. Emmons, **E. A. Marais**, Z. Peng, B. A. Nault, W. Hu, P. Campuzano-Jost, J. L. Jimenez, A simplified parameterization of isoprene-epoxydiol-derived secondary organic aerosol (IEPOX-SOA) for global chemistry and climate models, *Geosci. Model Dev.*, 12, 2983-3000, doi:10.5194/gmd-12-2983-2019. **38 citations.**

29. J. Liao, T. F. Hanisco, G. M. Wolfe, J. St. Clair, J. L. Jimenez, P. Campuzano-Jost, B. A. Nault, A. Fried, **E. A. Marais**, G. Gonzalez Abad, K. V. Chance, H. T. Jethva, T. B. Ryerson, C. Warneke, A. Wisthaler, Towards a satellite-in situ hybrid estimate for organic aerosol abundance, *Atmos. Chem. Phys.*, 19, 2765–2785, doi:10.5194/acp-19-2765-2019. **26 citations.**

2018

28. **E. A. Marais**, D. J. Jacob, S. Choi, J. Joiner, M. Belmonte-Rivas, R. C. Cohen, S. S. Beirle, L. T. Murray, L. Schiferl, V. Shah, L. Jaeglé, Nitrogen oxides in the global upper troposphere: Interpreting cloud-sliced NO₂ observations from the OMI satellite instrument, *Atmos. Chem. Phys.*, 18, 17017–17027, doi:10.5194/acp-18-17017-2018. **48 citations.**
27. C. L. Weagle and 40 authors, including **E. A. Marais**, Chemical sources of fine particulate matter: Interpretation of PM_{2.5} chemical composition observed by SPARTAN using a global chemical transport model, *Environ. Sci. & Technol.*, 52, 11670–11681, doi:10.1021/acs.est.8b01658. **220 citations.**

2017

26. C. Li, R. V. Martin, A. Van Donkelaar, B. L. Boys, M. S. Hammer, J.-W. Xu, **E. A. Marais**, A. Reff, M. Strum, D. A. Ridley, M. Crippa, M. Brauer, Q. Zhang, Trends in chemical composition of global and regional population-weighted fine particulate matter over the recent 25 years, *Environ. Sci. & Technol.*, 51, 11185–11195, doi:10.1021/acs.est.7b02530. **113 citations.**
25. F. G. Lacey, **E. A. Marais**, D. K. Henze, C. J. Lee, A. van Donkelaar, R. V. Martin, M. P. Hannigan, C. Wiedinmyer, Improving present day and future estimates of anthropogenic sectoral emissions and the resulting air quality impacts in Africa, *Faraday Discuss.*, 200, 397–412, doi:10.1039/C7FD00011A. **39 citations.**
24. L. Zhu, L. J. Mickley, D. J. Jacob, **E. A. Marais**, J. Sheng, L. Hu, G. González Abad, K. V. Chance, Long-term (2005–2014) trends in formaldehyde (HCHO) columns across North America as seen by the OMI satellite instrument: Evidence of changing emissions of volatile organic compounds, *Geophys. Res. Lett.*, 44, 7079–7086, doi:10.1002/2017GL073859. **131 citations.**
23. K. E. Cady-Pereira, V. Payne, J. Neu, K. Bowman, K. Miyazaki, **E. A. Marais**, S. Kulawik, Z. Tzompa-Sosa, J. Hegarty, Seasonal and spatial changes in trace gases over megacities from Aura TES observations: Two case studies, *Atmos. Chem. Phys.*, 17, 9379–9398, doi:10.5194/acp-17-9379-2017.
22. C. Chan Miller, D. J. Jacob, **E. A. Marais**, K. Yu, K. R. Travis, P. S. Kim, J. A. Fisher, L. Zhu, G. M. Wolfe, T. F. Hanisco, F. N. Keutsch, *et al.*, Glyoxal yield from isoprene oxidation and relation to formaldehyde: Chemical mechanism, constraints from SENEX aircraft observations, and interpretation of OMI satellite data, *Atmos. Chem. Phys.*, 17, 8725–8738, doi:10.5194/acp-17-8725-2017. **105 citations.**
21. H. M. Horowitz, D. J. Jacob, Y. Zhang, T. S. Dibble, F. Slemr, H. M. Amos, J. A. Schmidt, E. S. Corbitt, **E. A. Marais**, E. M. Sunderland, A new mechanism for atmospheric mercury redox chemistry: Implications for the global mercury budget, *Atmos. Chem. Phys.*, 17, 6353–6371, doi:10.5194/acp-17-6353-2017. **ISI WoS Hot & Highly Cited Paper. 458 citations.**
20. **E. A. Marais**, D. J. Jacob, J. R. Turner, L. J. Mickley, Evidence of 1991–2013 decrease of biogenic secondary organic aerosol in response to SO₂ emission controls, *Environ. Res. Lett.*, 12 054018, doi:10.1088/1748-9326/aa69c8. **57 citations.**
19. R. F. Silvern, D. J. Jacob, P. S. Kim, **E. A. Marais**, J. R. Turner, P. Campuzano-Jost, J. L. Jimenez, Inconsistency of ammonium-sulfate aerosol ratios with thermodynamic models in the eastern US: A possible role of organic aerosol, *Atmos. Chem. Phys.*, 17, 5107–5118, doi:10.5194/acp-17-5107-2017. **85 citations.**

2016

18. **E. A. Marais**, D. J. Jacob, J. L. Jimenez, P. Campuzano-Jost, D. A. Day, W. Hu, J. Krechmer, L. Zhu, P. S. Kim, C. Chan Miller, J. A. Fisher, K. R. Travis, K. Yu, T. F. Hanisco, G. M. Wolfe, H. L. Arkinson, H. O. T. Pye, K. D. Froyd, J. Liao, V. F. McNeill, Aqueous-phase mechanism for secondary organic aerosol formation from isoprene: Application to the Southeast United States and co-benefit of SO₂ emission controls, *Atmos. Chem. Phys.*, 16, 1603-1618, doi:10.5194/acp-16-1603-2016. **ISI WoS Highly Cited Paper. 342 citations.**
17. **E. A. Marais**, C. Wiedinmyer, Air quality impact of Diffuse and Inefficient Combustion Emissions in Africa (DICE-Africa), *Environ. Sci. & Technol.*, 50, 10739-10745, doi:10.1021/acs.est.6b02602. **170 citations.**
16. K. R. Travis, D. J. Jacob, J. A. Fisher, P. S. Kim, **E. A. Marais**, L. Zhu, K. Yu, C. Chan Miller, R. M. Yantosca, M. P. Sulprizio, *et al.*, Why do models overestimate surface ozone in the Southeast United States?, *Atmos. Chem. Phys.*, 16, 13561-13577, doi:10.5194/acp-16-13561-2016. **ISI WoS Hot & Highly Cited Paper. 457 citations.**
15. J. A. Fisher, D. J. Jacob, K. R. Travis, P. S. Kim, **E. A. Marais**, C. Chan Miller, K. Yu, L. Zhu, R. M. Yantosca, M. P. Sulprizio, *et al.*, Organic nitrate chemistry and its implications for nitrogen budgets in an isoprene- and monoterpene-rich atmosphere: Constraints from aircraft (SEAC⁴RS) and ground-based (SOAS) observations in the Southeast US, *Atmos. Chem. Phys.*, 16, 5969-5991, doi:10.5194/acp-16-5969-2016. **250 citations.**
14. K. Yu, D. J. Jacob, J. A. Fisher, P. S. Kim, **E. A. Marais**, C. Chan Miller, K. R. Travis, L. Zhu, R. M. Yantosca, M. P. Sulprizio, R. C. Cohen, J. E. Dibb, A. Fried, T. Mikoviny, T. B. Ryerson, P. O. Wennberg, A. Wisthaler, Sensitivity to grid resolution in the ability of a chemical transport model to simulate observed oxidant chemistry under high-isoprene conditions, *Atmos. Chem. Phys.*, 16, 4369-4378, doi:10.5194/acp-16-4369-2016. **80 citations.**
13. B. Franco, **E. A. Marais**, B. Bovy, W. Bader, B. Lejeune, G. Roland, C. Servais, E. Mahieu, Diurnal cycle and multi-decadal trend of formaldehyde in the remote atmosphere near 46°N, *Atmos. Chem. Phys.*, 16, 4171-4189, doi:10.5194/acp-16-4171-2016. **38 citations.**

2015

12. B. Franco, F. Hendrick, M. V. Roozendael, J.-F. Müller, T. Stavrou, **E. A. Marais**, B. Bovy, W. Bader, C. Fayt, C. Hermans, B. Lejeune, G. Pinardi, C. Servais, E. Mahieu, Retrievals of formaldehyde from ground-based FTIR and MAX-DOAS observations at the Jungfraujoch station and comparisons with GEOS-Chem and IMAGES model simulations, *Atmos. Meas. Tech.*, 8, 1733-1756, doi:10.5194/amt-8-1733-2015. **65 citations.**
11. **E. A. Marais**, K. V. Chance, A geostationary air quality monitoring platform for Africa, *The Clean Air Journal*, 25, 40-45, doi:10.17159/2410-972X/2015/v25n1a3.

2014

10. **E. A. Marais**, D. J. Jacob, K. Wecht, C. Lerot, L. Zhang, K. Yu, T. P. Kurosu, K. V. Chance, B. Sauvage, Anthropogenic emissions in Nigeria and implications for ozone air quality: A view from space, *Atmos. Environ.*, 99, 32-40, doi:10.1016/j.atmosenv.2014.09.055. **115 citations.**
9. L. Zhu, D. J. Jacob, L. J. Mickley, **E. A. Marais**, D. S. Cohan, Y. Yoshida, B. N. Duncan, G. González Abad, K. V. Chance, Anthropogenic emissions of highly reactive volatile organic compounds in eastern Texas from oversampling of satellite (OMI) measurements of HCHO columns, *Environ. Res. Lett.*, 9, 114004, doi:10.1088/1748-9326/9/11/114004. **169 citations.**
8. C. R. Nowlan, R. V. Martin, S. Philip, L. N. Lamsal, N. A. Krotkov, **E. A. Marais**, S. Wang, Q. Zhang, Global dry deposition of nitrogen dioxide and sulfur dioxide inferred from space-based measurements, *Global Biogeochem. Cycles*, 28, 1025-1043, doi:10.1002/2014GB004805. **99 citations.**
7. **E. A. Marais**, D. J. Jacob, A. Guenther, K. V. Chance, T. P. Kurosu, J. G. Murphy, C. E. Reeves, and H. O. T. Pye, Improved model of isoprene emissions in Africa using Ozone Monitoring Instrument (OMI) satellite observations of formaldehyde: Implications for oxidants and

particulate matter, *Atmos. Chem. Phys.*, 14, 7693-7703, doi:10.5194/acp-14-7693-2014. **71 citations.**

6. Q. Wang, D. J. Jacob, J. R. Spackman, A. E. Perring, J. P. Schwarz, N. Moteki, **E. A. Marais**, C. Ge, J. Wang, S. R. H. Barrett, Global budget and radiative forcing of black carbon aerosol: Constraints from pole-to-pole (HIPPO) observations across the Pacific, *J. Geophys. Res.: Atmos.*, 119, 195-206, doi:10.1002/2013JD020824. *ISI WoS Highly Cited Paper*. **253 citations.**

2013

5. M. P. Barkley, I. De Smedt, M. Van Roozendael, T. P. Kurosu, K. V. Chance, A. Arneth, D. Hagberg, A. Guenther, F. Paulot, **E. A. Marais**, J. Mao, Top-down isoprene emissions over tropical South America inferred from SCIAMACHY and OMI formaldehyde columns, *J. Geophys. Res.: Atmos.*, 118, 6849-6868, doi:10.1002/jgrd.50552. **120 citations.**

2012

4. **E. A. Marais**, D. J. Jacob, T. P. Kurosu, K. Chance, J. G. Murphy, C. Reeves, G. Mills, S. Casadio, D. B. Millet, M. P. Barkley, F. Paulot, J. Mao, Isoprene emissions in Africa inferred from OMI observations of formaldehyde columns, *Atmos. Chem. Phys.*, 12, 6219-6235, doi:10.5194/acp-12-6219-2012. **211 citations.**

Prior to 2012

3. **E. A. Marais**, E. Antunes, T. Nyokong, Photocatalytic transformation of 4-nitrophenol in aqueous media using suspended, water-insoluble metallophthalocyanine complexes, *J. Coord. Chem.*, 61, 3727-3739, doi:10.1080/00958970802146056, 2008.
2. **E. A. Marais**, T. Nyokong, Adsorption of 4-nitrophenol onto Amberlite® IRA-900 modified with metallophthalocyanines, *J. Haz. Mat.*, 152, 293-203, doi:10.1016/j.jhazmat.2007.06.096, 2008. **151 citations.**
1. **E. A. Marais**, R. Klein, E. Antunes, T. Nyokong, Photocatalysis of 4-nitrophenol using zinc phthalocyanine complexes, *J. Molec. Cat. A: Chem.*, 261, 36-42, doi:10.1016/j.molcata.2006.07.055, 2007. **114 citations.**

REPORTS AND PERSPECTIVES

9. White Paper on “Atmospheric impacts of re-entry and launch (AIRL): High-priority actions and recommendations”, AIRL Working Group, not yet cleared for circulation, 2025.
8. Issues Note on “Environmental impacts of space activity”, UNEP, UNOOSA and Invited Experts, UN Office of the Chief Scientist, <https://www.unep.org/resources/emerging-issues/safeguarding-space-environmental-issues-risks-and-responsibilities>, 2025.
7. New opportunities for particulate matter measurements, UK Air Quality Experts Group (AQEG), <https://tinyurl.com/bdd3r3x8> [pdf], 2024.
6. Cornwall space launch: Why the environmental cost of rocket launches is large even when they fail, The Conversation, <https://theconversation.com/cornwall-space-launch-why-the-environmental-cost-of-rocket-launches-is-large-even-when-they-fail-197567>, 2023. **4,793 reads, 5 comments.**
5. Air pollution in fast-growing African cities presents a risk of premature death, The Conversation, <https://theconversation.com/air-pollution-in-fast-growing-african-cities-presents-a-risk-of-premature-death-183944>, 2022. **6,856 reads.**
4. Axiom launch: Why commercial space travel could be another giant leap for air pollution, The Conversation, <https://theconversation.com/axiom-launch-why-commercial-space-travel-could-be-another-giant-leap-for-air-pollution-180990>, 2022. **41,949 reads, 20 comments.**
3. Ditching fossil fuels will have immediate health benefits for millions – world leaders must seize the chance, The Conversation, <https://theconversation.com/ditching-fossil-fuels-has-immediate->

- [health-benefits-for-millions-world-leaders-must-seize-the-chance-171015](#), 2021. **9,525 reads, 2 comments.**
2. Space tourism: Rockets emit 100 times more CO₂ per passenger than flights – imagine a whole industry, The Conversation, <https://theconversation.com/space-tourism-rockets-emit-100-times-more-co-per-passenger-than-flights-imagine-a-whole-industry-164601>, 2021. **121,827 reads, 53 comments.**
 1. Household air pollution contribution to ambient air pollution in Ghana: Using available evidence to prioritize future action, Household and Ambient Air Pollution in Ghana Working Group, US Health Effects Institute (HEI), Communication 19, <https://www.healtheffects.org/system/files/Comm19-HAP-Ghana.pdf>, 2019.

INVITED PRESENTATIONS

Archive of all slides: <http://maraisresearchgroup.co.uk/presentations.html>

Conferences, Workshops and Society Events

- Speaker, International Global Atmospheric Chemistry (IGAC) Conference, Heraklion, Crete, September 7-11, 2026.
- Keynote, Royal Society of Chemistry Air Quality in the 21st Century Conference, London, UK, December 15, 2025.
- Keynote, South African National Space Agency (SANSA) and University of Pretoria Satellite Observations of Air Quality Workshop, Pretoria, South Africa, October 21, 2025.
- Keynote, 2nd International Conference on Chemical Weather and Chemical Climate, Ben Guerir, Morocco, October 14, 2025.
- Expert, Joint UNEP/UNOOSA Outer Space Expert Interdisciplinary Meeting, UN Office at Vienna, Austria, May 22-23, 2025.
- Speaker, Atmospheric Environmental Remote Sensing Society (AERSS) meeting, online, December 2, 2024.
- Speaker, Royal Society UK-South Africa Bilateral Frontiers of Science meeting, Johannesburg, South Africa, September 24-27, 2024.
- Speaker, 2nd International Space Science Institute (ISSI) Workshop on Geostationary Satellites, Beijing, China, May 28, 2024.
- Speaker, Royal Society UK-China Bilateral Air Quality and Climate Change Workshop, London, UK, May 22-23, 2024.
- Speaker, 1st ISSI Workshop on Geostationary Satellites, Bern, Switzerland, March 20-23, 2023.
- Speaker, Follow up Workshop on a Pilot Design for Air Quality in Africa, Kigali, Rwanda, January 17-18, 2023.
- Speaker, Royal Society of Chemistry Desktop Seminar series, online, June 1, 2022.
- Keynote, ERC Health, Labor and Environmental Regulation in Post-Industrial Europe (HEAL) Project Workshop, University of Mannheim, Mannheim, Germany, July 7, 2022.
- Speaker, Investigation of Air Pollution Standing Conference, online, December 1, 2021.
- Speaker, DEFRA Earth Observation Centre of Excellence Workshop, online, September 21, 2021.
- Speaker, Townhall on African Greenhouse Gas Emissions and Air Quality, organized by the Manchester Environmental Research Institute, online, March 30, 2021.
- Speaker, National Center for Atmospheric Research (NCAR) Workshop on Advancing Air Quality and Carbon Science in Africa, March 11, 2021.
- Speaker, US HEI webinar on Understanding the Sources of Outdoor Air Pollution in Sub-Saharan Africa, August 21, 2019.

Speaker, Royal Meteorological Society National Meeting on Air Pollution in Megacities, University of Leeds, Leeds, UK, March 20, 2019.

Lecturer, British Council Air Quality Capacity Building Workshop for PhD students in East Africa, University of Nairobi, Nairobi, Kenya, February 11, 2019.

Speaker and Panellist, Air Pollution Extremes Workshop, Columbia University, New York NY, November 1-2, 2018.

Lecturer, NASA/COSPAR Capacity Building Workshop for PhD students across West Africa, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, June, 12-23, 2017.

Academic and Research Institute Seminars

Department of Meteorology seminar series, University of Reading, Reading, UK, November 10, 2025.

Royal Belgian Institute for Space Aeronomy (BIRA) seminar series, Brussels, Belgium, October 23, 2025.

Institute for Atmospheric and Climate Science seminar series, ETH, Zurich, October 2, 2025.

Wolfson Atmospheric Chemistry Laboratories seminar series, University of York, York, UK, November 17, 2023.

Global Change Seminar Series, University of Edinburgh, Edinburgh, UK, November 30, 2022.

Harvard Climate Tea, Harvard University, Cambridge MA, November 9, 2022.

Lunch Hour Lecture Series, UCL, London, UK, February 1, 2022.

Global Air Quality Conversation seminar series, University of Peking, China, September 23, 2022.

Atmospheric and Environmental Chemistry seminar series, Harvard University, Cambridge MA, October 1, 2021.

Air Pollution and Atmospheric Chemistry seminar series, University of Birmingham, Birmingham, UK, April 21, 2021.

Program in Atmospheres, Oceans and Climate seminar series, MIT, Cambridge MA, April 5, 2021.

Institute for Climate & Atmospheric Science, University of Leeds, Leeds, UK, March 16, 2021.

Centre for Atmospheric Science seminar series, University of Cambridge, Cambridge, UK, November 30, 2020.

Royal Netherlands Meteorological Institute (KNMI) seminar series, De Bilt, The Netherlands, November 12, 2019.

Environment, Earth and Ecosystem Sciences seminar series, Open University, Milton Keynes, UK, February 19, 2019.

Special Atmospheric Chemistry Seminar, Harvard University, Cambridge MA, November 8, 2018.

Council for Scientific and Industrial Research, Pretoria, South Africa, August 24, 2018.

Centre for Atmospheric Science seminar series, University of Cambridge, Cambridge, UK, November 20, 2017.

School of Earth and Environmental Sciences seminar series, University of St Andrews, St Andrews, UK, November 7, 2017.

UK Centre for Ecology and Hydrology, Edinburgh, UK, October 15, 2017.

Geosciences seminar series, University of Edinburgh, Edinburgh, UK, May 17, 2017.

School of Geography, Earth and Environmental Sciences seminar series, University of Birmingham, Birmingham, UK, July 8, 2016.

Earth, Atmospheric, and Planetary Sciences seminar series, MIT, Cambridge MA, February 19, 2016.

Texas A&M Atmospheric Sciences seminar series, College Station TX, February 11, 2016.

Chemistry seminar series, Rhodes University, South Africa, November 16, 2015.

Civil and Environmental Engineering seminar series, Georgia Institute of Technology, Atlanta GA, October 28, 2015.

School of Environmental Sciences seminar series, University of East Anglia, East Anglia, UK, May 20, 2015.

Department of Chemistry and National Centre for Atmospheric Science seminar series, University of York, York, UK, May 26, 2015.

School of Chemistry seminar series, University of Leeds, Leeds, UK, May 27, 2015.

School of Earth, Atmospheric and Environmental Sciences seminar series, University of Manchester, Manchester, UK, May 28, 2015.

Cooperative Institute for Research in Environmental Sciences seminar series, University of Colorado, Boulder CO, February 11, 2015.

Atmospheric Chemistry Observations & Modeling seminar series, NCAR, Boulder CO, February 9, 2015.

Unit of Environmental Sciences and Management, North-West University, Potchefstroom, South Africa, March 28, 2014.

Stakeholders and End Users

Panellist, 5th European Union Clean Air Forum Earth Observations and Clean Air Panel, Bonn, Germany, December, 1, 2025.

Speaker, *Health burdens and racial-ethnic disparities of air pollution from US oil and gas lifecycle stages*, Sierra Club, online, November 13, 2025.

Speaker, ESA Essential Climate Variables (ECV) Climate Change Initiative (CCI) Users Workshop, online, June 11, 2025.

Speaker, UK DEFRA Deep-Dive Series, Episode 6: Detection of Ammonia from Agriculture, online, February 27, 2025.

Speaker, DEFRA Emissions Monitoring Deep-Dive Symposium, online, November 14, 2024.

Speaker, Institution of Environmental Sciences (IES) webinar series, November 22, 2022.

Speaker, Great Ormond Street Hospital (GOSH) lunchtime seminar, online, May 18, 2021.

Speaker, Joint European Environmental Information and Observation Network (EIONET) and Task Force on Emission Inventories and Projections (TFEIP) meeting, online, May 6, 2021.

Speaker, Oxford Air Quality Meeting, Keble College, University of Oxford, Oxford, UK, January 10, 2020.

Speaker, UK Connected Places Catapult Innovation Hub Lunchtime Talk Series, London, UK September 10, 2019.

PROFESSIONAL ACTIVITIES

National and International Expert Committees

2025-present Steering Committee for the Belgian Science Policy Office (BELSPO) funded Belgian Ammonia assessed using innovative Multiscale Measurements and Modelling (BEAM) project led by Université Libre de Bruxelles (ULB), Brussels, Belgium.

2024-present International GEOS-Chem Model Co-lead.

2017-present International GEOS-Chem Model Steering Committee, Co-Chair of the Emissions and Deposition Working Group.

2024-present Atmospheric Impacts of Spacecraft Re-entry and Launch (AIRL) Working Group.

2022-2023 UK AQEG contributing niche expertise in Earth Observations of particulate matter.

2020-2023 US HEI Global Health Oversight Committee.

2018 US HEI Household and Ambient Air Pollution in Ghana Working Group.

Organizer, Chair and Convener of Conferences, Workshops and Seminar Series

- 2026 Session convener, European Geophysical Union (EGU) General Assembly, Vienna, Austria, May 3-8.
- 2026 Co-organizer, ISSI Workshop on the Atmospheric Impacts of Spacecraft Re-entry, Bern, Switzerland, 2026, proposal under evaluation.
- 2025 Co-organizer, 1st UK Atmospheric Chemistry Conference, York, UK, September 9-10.
- 2025 Organizer, 3rd GEOS-Chem Europe Regional Meeting, UCL, London, UK, August 18-20.
- 2025 Session convener, EGU General Assembly, Vienna, Austria, April 28 to May 2.
- 2024 Session co-chair, American Geophysical Union (AGU) Annual Meeting, Washington DC, December 9-13.
- 2024 Session chair, 11th International GEOS-Chem User's Meeting, Washington University in St Louis, St Louis MO, June 11-14.
- 2024 Session co-convener, EGU General Assembly, Vienna, Austria, April 15-19.
- 2023 Co-organizer and session co-chair, HEI Workshop on Air Quality in East Africa, Nairobi, Kenya, March 29-31.
- 2023 Organizer, 2nd GEOS-Chem Europe Regional Meeting, UCL, London, UK, August 14-16.
- 2023 Session co-chair, AGU Annual Meeting, San Francisco CA, December 11-15.
- 2022 Session co-chair, HEI Workshop on Health Applications for Satellite-Derived Air Quality, online, April 29.
- 2022 Session chair, 10th International GEOS-Chem User's Meeting, Washington University in St Louis, St Louis MO, June 7-10.
- 2021 Session co-chair, HEI Annual Conference, online, April 20.
- 2020 Session co-chair, AGU Annual Meeting, online, December 7-11.
- 2020 Co-organizer, 1st GEOS-Chem Europe Regional Meeting, online, September 1-2.
- 2019 Session chair, 9th International GEOS-Chem User's Meeting, Harvard University, Cambridge MA, May 6-19.
- 2018 Session co-chair, AGU Annual Meeting, Washington DC, December 10-14.
- 2018 Session co-chair, UK National Centre for Earth Observation conference, September 4-7.
- 2017 Session co-chair, AGU Annual Meeting, New Orleans LA, December 11-15.
- 2017 Organizer, Air Pollution and Atmospheric Chemistry seminar series, University of Birmingham, Birmingham, UK.
- 2015 Organizer, Atmospheric Chemistry seminar series, Harvard University, Cambridge MA.

Grant Review

- 2025 UK Natural Environment Research Council (NERC) Future Leaders Fellow review
- 2024 UK NERC Highlights Topics review
- 2024 UK NERC Pushing the Frontiers review panel
- 2022 BELSPO BRAIN-be 2.0 Research Programme review
- 2022 UK Engineering and Physical Sciences Research Council (EPSRC) review panel
- 2020 Canada Foundation for Innovation's (CFI) Innovation Fund review panel
- 2020 UK NERC Strategic Priorities Fund review panel
- 2020 BELSPO BRAIN-be 2.0 Research Programme review
- 2019 US EPA STAR Grant reviewer and review panel
- 2019 Irish Research Council Government of Ireland Postdoctoral Fellowship Scheme reviewer
- 2017 UK NERC National Capability: Official Development Assistance call review
- 2017 US National Oceanic and Atmospheric Association (NOAA) Atmospheric Chemistry, Carbon Cycle and Climate (AC4) Program review

- 2016 European Research Council (ERC) Advanced Grant review
- 2015 NOAA AC4 Program review
- 2015 BELSPO STEREO Research Programme review
- 2013 NASA Research Opportunities in Earth and Space Science Carbon Cycle Science call review

Peer Review

Frequent reviewer for general readership and discipline-specific science journals:

Proceedings of the National Academy of Sciences; Science Advances; Nature Communications; Scientific Reports; Environmental Science & Technology; Atmospheric Environment; Atmospheric Chemistry and Physics; Atmospheric Measurement Techniques; Journal of Air & Waste Management; Environmental Science & Technology Letters; Geoscientific Model Development; Journal of Geophysical Research; Aerosol & Air Quality Research; Environment International; Science of the Total Environment; GeoHealth; NPJ Climate & Atmospheric Science, Royal Society of Chemistry's Environment Science: Atmospheres, Elementa: Science of the Anthropocene.

Assessment Reports Review

- 2022 European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) Atmospheric Composition Monitoring Satellite Application Facilities (AC SAF) Infrared Atmospheric Sounding Interferometer (IASI) ammonia (NH₃) data products
- 2018 IGAC project Tropospheric Ozone Assessment Report (TOAR) on Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation by A. Gaudel *et al.*

Consultancy

- 2025-2026 Consultant to Industrial Economics, Incorporated (IEc) for the C40 Cities funded "Air Quality Baseline Emissions, Health and Equity Impact Assessment in Freetown" study.
- 2025 Follow-on expert critique of resubmitted Climate Change and Environment Impact Assessments (CCIA, EIA) by Tetra4 following my 2023 critique, commissioned by lawyers at South African firms Natural Justice and the Centre for Environmental Rights.
- 2023 Expert critique of CCIA and EIA for proposed Tetra4 natural gas production at a UNESCO Heritage site in South Africa, commissioned by lawyers at South African firms Natural Justice and the Centre for Environmental Rights.
- 2023 Expert critique of CCIA and EIA submitted by Total for proposed offshore natural gas production along the Southern Cape Coast of South Africa, commissioned by lawyers at Earthjustice (US) and Natural Justice (South Africa).

Institutional Service

- 2025-present Institutional Space Domain Stakeholder Group, Faculty representative, UCL.
- 2023-present Departmental Graduate Tutor, pastoral support for 100+ PhD students in Human and Physical Geography, Department of Geography, UCL.
- 2023-present Organize and deliver training for first-year PhD cohort and teaching assistants, Department of Geography, UCL.
- 2023-present Departmental Management Committee, Department of Geography, UCL.
- 2023-present Departmental Education Committee, Department of Geography, UCL.
- 2023-present Postgraduate Taught Examine Board, Department of Geography, UCL.
- 2023-present Faculty Research Degrees Committee, Social and Historical Sciences, UCL.
- 2023 Hiring Committee, Lecturer in Earth Observation, Department of Geography, UCL.
- 2019 Coordinator, First Leicester chapter of the International Pint of Science Festival, University of Leicester, Leicester, UK.

RESEARCH SUPERVISION

Professional Development

Advancing Principal Investigators, multiday intensive research team leadership training, UCL, 2022.

Current Supervision

- 2026- Yiyuan Jia (**PhD**) *Drivers and environmental impacts of ammonia trends in Central Africa*. Self funded.
- 2024- Huilin Zhan (**PhD**) *Biogenic small acids from multiphase processing of isoprene epoxydiols*. Self funded.
- 2023- Connor Barker (**postdoc**) *Influence of megaconstellations on climate and air quality; Dry deposition of oxygenated VOCs*, funded by the ERC, NERC, and UCL.
- 2022- Eleanor Gershenson-Smith (**PhD**) *Reactive nitrogen in London: From chemistry to air quality to public health*, funded by the ERC.
- 2022- Terrence Sepuru (**PhD**), *Quantifying air pollutant emissions over the industrial highveld region in South Africa*, funded by the South African NRF.

Past Supervision

- 2021-2025 Rebekah Horner (**PhD**). Now a research scientist at Ember (think tank), London.
- 2025 Eric Tan (**UG**). Now a Master's student at UCL.
- 2019-2025 Nana Wei (**PhD**). Now a postdoc at University of Birmingham.
- 2017-2024 Karn Vohra (**PhD, postdoc**). Now a postdoc at University of Birmingham.
- 2017-2023 Gongda Lu (**MSc, PhD, postdoc**). Now at data scientist at the Centre for Research on Energy and Clean Air (CREA) (independent research organization).
- 2020-2022 Robert Ryan (**postdoc**). Now a postdoc at University of Melbourne, Australia.
- 2021-2022 Jamie Kelly (**postdoc**). Now a research scientist at the CREA.
- 2022 Yifan Li (**UG**). Now a PhD student at Princeton University.
- 2022 Marco Barnfield (**UG**). Now a PhD student at UCL.
- 2021-2022 Kavitha Mottungan (**postdoc**). Now a senior researcher at the UK National Physical Laboratory, London.
- 2021 Orianna Akker (**UG**). Now a data analyst at Lloyds.
- 2020 Alok Pandey (**postdoc**). Now a lecturer at University of Delhi.
- 2017-2021 Alfred Bockarie (**PhD**). Now a lecturer at University of Njala.
- 2020 Chloe Balhatchet (**UG**). Now a PhD student at University of Cambridge.
- 2019 Junju Ng (**MSc**). Now a Meteorologist at the Singapore National Environment Agency.
- 2018 Shannen Suckra (**MSc**). Now a research scientist at the National Environment and Planning Agency in Jamaica.
- 2018 Isobel Ward (**MSc**). Now at AECOM.

PhD Examination

- 2025 B.A.H. Gutierrez, University of Toronto, Canada.
- 2025 C. Poraicu, Université Libre de Bruxelles, Belgium.
- 2023 L. Fakes, University of York, UK.
- 2023 R. Abeer, Laboratoire Atmosphères, Observations Spatiales (LATMOS), France.
- 2022 C. Mogno, University of Edinburgh, UK.
- 2022 I. Riádigos Sánchez, University of Santiago de Compostela, Spain.
- 2022 Y. Liu, University of Helsinki, Finland.
- 2022 C. K. Segakweng, North-West University, South Africa.
- 2021 D. Oyarzun, Department of Geography, UCL.
- 2020 A. de Lange, University of Pretoria, South Africa.
- 2019 L. Gonzalez Alonso, University of Sheffield, UK.

TEACHING

Training and Accreditation

- 2020 Fellow of the UK Higher Education Academy (FHEA).
2010 Harvard Bok Center Teaching Assistant Training, Harvard University, Cambridge MA.
2009 Scientists Teaching Science, graduate course on effective science teaching, Harvard-Smithsonian Center for Astrophysics, Cambridge MA.

Current

- 2026 Convener and Lecturer, GEOG0187: Quantitative Skills, 1st year module.
2025 Lecturer, GEOG0109: Models in Environmental Science, Master's module.
2025 Lecturer, GEOG0040: Principles and Practice of Remote Sensing, Master's module.
2020-2025 Supervisor, GEOG0042: Independent Study Project, 3rd year module.
2021-2026 Supervisor, GEOG0105: Research Project and Dissertation, Master's module.

Past

- 2024 Lecturer, BIOS0045: Foundations of Nature and Climate-Friendly Urban Design, Master's module, Department of Biosciences, UCL.
2022-2023 Convener and Lecturer, GEOG0170: Environmental Consequences of Human Activity, 3rd year module, Department of Geography, UCL.
2020-2023 Lecturer, GEOG0005: Understanding Our Planet, 1st year module, Department of Geography, UCL.
2019-2020 Lecturer, Waves and Quanta, 1st year module, Department of Physics and Astronomy, University of Leicester.
2019 Course Developer, Master's in Satellite Data Science, Department of Physics and Astronomy, University of Leicester.
2017 Lecturer, Environmental Protection, 3rd year module, School of Geography, Earth and Environmental Science, University of Birmingham.
2009-2013 Postgraduate Teaching Assistant for multiple courses (Energy Technology, Introduction to Environmental Science, Environmental Science & Technology, and Atmospheric Chemistry), Harvard University.

SELECTED MEDIA ENGAGEMENT

Extensive record of media engagement: https://maraisresearchgroup.co.uk/media_coverage.html

Environmental impacts of spacecraft launches and re-entries:

- Yale Environment 360, Amid a satellite boom, scientists warn of emissions risks, <https://undark.org/2025/12/15/emissions-satellite-surge/>, December 15, 2025.
Aljazeera The Stream panel show, How will the space race affect our environment?, <https://www.aljazeera.com/video/the-stream/2025/6/12/how-will-the-space-race-affect-our-environment>, June 12, 2025.
BBC Radio 4 Inside Science Series, Will the hole in the ozone layer close?, <https://www.bbc.co.uk/programmes/m002c3cg>, May 19, 2025.
Bloomberg, Thousands of falling satellites put the atmosphere at risk, <https://www.bloomberg.com/graphics/2025-space-orbit-satellites-pollution>, May 1, 2025.
Nature Magazine News Feature, Swarms of satellites are harming astronomy. Here's how researchers are fighting back, <https://www.nature.com/articles/d41586-025-00792-y>, March 18, 2025.
The Guardian, Inventory counts air pollution cost of space launches and re-entries, <https://www.theguardian.com/environment/2024/nov/01/pollutionwatch-air-pollution-inventory-space-launches-reentries>, November 1, 2024.

- BBC News, Elon Musk's Starship booster captured in world first, <https://www.bbc.co.uk/news/articles/c8xe7exjy1go>, October 13, 2024.
- BBC Radio 4 Rare Earth Series, The Final Frontier, <https://www.bbc.co.uk/programmes/m0025bzm>, November 29, 2024.
- The New York Times, The new space race is causing new pollution problems, <https://www.nytimes.com/2024/01/09/science/rocket-pollution-spacex-satellites.html>, January 9, 2024.
- BBC Radio 4 Inside Science Series, Rocket launch pollution, <https://www.bbc.co.uk/programmes/m00112fl>, April 20, 2023.
- NPR's Science Friday, The private space race takes a toll on Planet Earth, <https://www.sciencefriday.com/segments/private-space-launches-pollution/>, May 5, 2023.
- The Wall Street Journal, As rocket launches take off, so do concerns about emissions, <https://www.wsj.com/articles/rocket-launches-emissions-concerns-11675445394>, February 8, 2023.
- France24, Rise in space tourism, rocket launches pose new threat to ozone layer, researchers warn, <https://www.france24.com/en/environment/20230207-rise-in-space-tourism-rocket-launches-poses-new-threat-to-ozone-layer-researchers-warn>, February 7, 2023.
- Aljazeera, The battle over space emissions in Cornwall, <https://www.aljazeera.com/features/2022/10/23/the-battle-over-space-emissions-in-cornwall>, October 23, 2022.
- BBC Future, The pollution caused by rocket launches, <https://www.bbc.co.uk/future/article/20220713-how-to-make-rocket-launches-less-polluting>, July 15, 2022.
- Forbes, Bezos vs Musk: Which billionaire's rockets are worse for the climate?, <https://www.forbes.com/sites/davidrvetter/2022/07/05/bezos-vs-musk-which-billionaires-rockets-are-worse-for-the-climate/>, July 5, 2022.
- Sky News, Space tourism from companies like SpaceX, Virgin Galactic and Blue Origin could undo work to repair ozone layer, study finds, <https://news.sky.com/story/space-tourism-from-companies-like-spacex-virgin-atlantic-and-blue-origin-could-undo-work-to-repair-ozone-layer-study-finds-12640296>, June 27, 2022.
- BBC The Climate Question Series, Is space travel a problem for the climate?, <https://www.bbc.co.uk/programmes/w3ct3khq>, April 11, 2022.
- ABC (Australia) Future Tense Series, Space Pollution, <https://www.abc.net.au/listen/programs/futuretense/space-pollution,-stunted-high-rise-and-the-joy-of-missing-out/13736086>, February 13, 2023.
- Associated Press, Posts misinterpret space travel carbon emissions finding, <https://apnews.com/article/fact-checking-558398031858>, December 13, 2021.
- ABC (US) News, Experts say climate impact is a question mark if space tourism takes off, <https://abcnews.go.com/Technology/experts-climate-impacts-question-mark-space-tourism-takes/story?id=81609878>, December 9, 2021.
- Sky News, Space tourism/travel – Both sides of pollution argument (Earth/Space), https://www.youtube.com/watch?v=At7D7_LhsyA, October 15, 2021.
- Channel4 News, SpaceX launch makes history as four amateur astronauts orbit Earth, <https://www.channel4.com/news/spacex-launch-makes-history-as-four-amateur-astronauts-orbit-earth>, September 16, 2021.
- ABC (Australia) News, Billionaires in Space, <https://www.abc.net.au/listen/programs/abc-news-daily/billionaires-space-race/13597636>, October 21, 2021.

BBC Science Focus, Billionaire space race: What does it mean for climate change and the environment?, <https://www.sciencefocus.com/news/billionaire-space-race-what-does-it-mean-for-climate-change-and-the-environment>, August 12, 2021.

Business Insider, Expensive trips to the edge of space could have big effects on the atmosphere, <https://www.businessinsider.com/emissions-from-space-tourism-could-quickly-add-up-2021-7>, July 29, 2021.

The Guardian, Billionaire space cowboys could become heroes by focusing on the climate crisis, <https://www.theguardian.com/business/2021/jul/25/billionaire-space-cowboys-could-become-heroes-by-focusing-on-the-climate-crisis>, July 25, 2021.

The Guardian, How the billionaire space race could be one giant leap for pollution, <https://www.theguardian.com/science/2021/jul/19/billionaires-space-tourism-environment-emissions>, July 19, 2021.

NPR's 1A Podcast, Branson, Bezos, and the Billionaires: The future of space tourism, <https://www.abc.net.au/listen/programs/abc-news-daily/billionaires-space-race/13597636>, July 20, 2021.

Time Magazine, Billionaires are racing to space, and the climate is paying the price, <https://time.com/6191846/billionaire-space-race-climate/>, June 28, 2022.

Mashable, Space tourism sounds fun, but it could be terrible for the planet, <https://mashable.com/article/space-tourism-environmental-costs>, June 16, 2021.

Air pollution and health:

The Guardian, Air pollution from oil and gas causes 90,000 premature US deaths each year, says new study, <https://www.theguardian.com/us-news/2025/aug/22/air-pollution-oil-gas-health-study>, August 22, 2025.

Time Magazine, Scientists link U.S. air pollution from oil and gas to 91,000 premature deaths each year, <https://time.com/7311655/us-oil-gas-air-pollution-health-impacts-study/>, August 22, 2025.

LA Times, Deaths, illness from air pollution related to gas and oil hit people of color hardest, study finds, <https://www.latimes.com/environment/story/2025-08-22/deaths-illness-from-gas-oil-hit-people-of-color-hardest-study>, August 22, 2025.

The Standard, Air pollution measures 'will reduce thousands of premature adult deaths in the UK', <https://www.standard.co.uk/news/health/air-pollution-measures-reduce-thousands-deaths-uk-b1115838.html>, October 25, 2023.

The Guardian Pollutionwatch, Satellite imagery shows air pollution rise in tropical 'megacities', <https://www.theguardian.com/environment/2022/jun/03/satellite-imagery-air-pollution-rise-tropical-megacities>, June 3, 2022.

BBC Science in Action, Premature deaths rising in polluted tropical cities, <https://www.bbc.co.uk/programmes/w3ct368t>, April 17, 2022.

The Times, Pollution from fossil fuels twice as deadly as thought, scientists warn, <https://www.thetimes.com/uk/healthcare/article/pollution-from-fossil-fuels-twice-as-deadly-as-thought-scientists-warn-lxbgtp6pc>, February 14, 2021.

The New York Times, A 'new era of air pollution' in the tropics could have a huge toll, <https://www.nytimes.com/2022/04/08/climate/air-pollution-cities-tropics.html>, April 8, 2022.

The Guardian, 'Invisible killer': Fossil fuels caused 8.7m deaths globally in 2018, research finds, <https://www.theguardian.com/environment/2021/feb/09/fossil-fuels-pollution-deaths-research>, February 9, 2021.

Reuters, Fossil fuel pollution causes one in five premature deaths globally: study, <https://www.reuters.com/article/us-health-pollution-fossil/fossil-fuel-pollution-causes-one-in-five-premature-deaths-globally-study-idUSKBN2A90UB/>, February 9, 2021.

Bloomberg, Fossil fuel pollution kills 8.7 million a year, twice previous estimates, <https://www.bloomberg.com/news/articles/2021-02-09/fossil-fuel-pollution-kills-millions-more-than-scientists-knew>, February 9, 2021.

CBS News, Fossil fuel air pollution causes nearly 1 in 5 deaths worldwide each year, research shows, <https://www.cbsnews.com/news/fossil-fuel-air-pollution-emissions-1-in-5-deaths-worldwide-each-year/>, February 9, 2021.

Boston Globe, Burning fossil fuels kills an estimated 350,000 Americans a year, including 7,600 in Massachusetts, study finds, <https://www.bostonglobe.com/2021/02/09/metro/burning-fossil-fuels-kills-an-estimated-350000-people-year-study-finds/>, February 9, 2021.

Forbes, Fossil fuel pollution caused nearly 1 in 5 global deaths in 2019, groundbreaking study suggests, <https://www.forbes.com/sites/carlieporterfield/2021/02/09/fossil-fuel-pollution-caused-nearly-1-in-5-global-deaths-in-2018-groundbreaking-study-suggests/>, February 9, 2021.

Huffington Post, Fossil fuel air pollution linked to 1 in 5 deaths worldwide, new Harvard study finds, https://www.huffingtonpost.co.uk/entry/fossil-fuel-air-pollution_n_6022a51dc5b6c56a89a49185, February 9, 2021.

BBC Pollutionwatch, Africa increases its reliance on fossil fuels, <https://www.theguardian.com/environment/2019/nov/07/pollutionwatch-africa-increases-reliance-fossil-fuels>, November 7, 2019.

Ammonia pollution from agriculture:

ENDS Report, 'Regulatory capture': NFU lobbied DEFRA lower its global air quality ambitions, <https://www.endsreport.com/article/1846831/regulatory-capture-nfu-lobbied-defra-lower-its-global-air-quality-ambitions>, November 8, 2023.

BBC Radio 4 Farming Today Series, Dartmoor management, farm waste and ammonia emissions, <https://www.bbc.co.uk/programmes/m001kgsb>, March 27, 2023.

The Guardian's Pollutionwatch, UK farming causes over a quarter of cities' particle pollution, study finds, <https://www.theguardian.com/environment/2023/mar/24/uk-farming-causes-over-quarter-cities-particle-pollution-study>, March 24, 2023.

The Independent, A quarter of particle pollution in UK cities come from farms, study warns, <https://www.independent.co.uk/news/uk/home-news/farms-particles-pollution-ucl-environment-b2307616.html>, March 24, 2023.