Denis Sergeev

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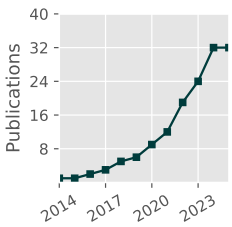

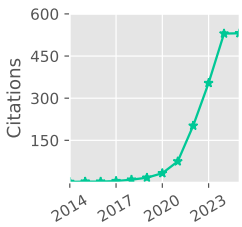

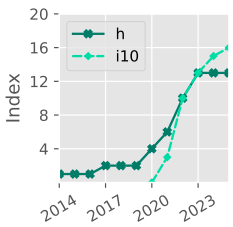

Total Pub.	**32**
Refereed	**31**
First Author	**7**
Citations	**531**
h-index	**13**

Updated: 15 Jan 2025

Research Interests

Planetary Climates • Exoplanets • Atmospheric Convection • Cloud Microphysics • General Circulation Models

Academic Career

Jan 2025–	Lecturer in Astrophysics, School of Physics, **University of Bristol**
Sep 2021–Dec 2024	Postdoctoral Researcher, Department of Physics & Astronomy, **University of Exeter**
Sep 2018–Aug 2021	Postdoctoral Researcher, Department of Mathematics & Statistics, **University of Exeter**
Oct 2014–Aug 2018	PhD in Meteorology, School of Environmental Sciences, **University of East Anglia** Supervisors: Ian A. Renfrew, Thomas Spengler, Stephen Dorling Thesis title (shortened): "Characteristics of Polar Lows in the Nordic Seas"
Sep 2009–May 2014	Specialist Diploma in Meteorology & Climatology (1st class equiv.), **Moscow State University** Supervisor: Victor Stepanenko Thesis title: "Idealised Numerical Modelling of Polar Mesocyclone Dynamics"

Funding and Awards

		Est. Total Value
Direct Funding, PI		
2024	Above & Beyond Silver Award | University of Exeter	£1000
2023	Meeting Organisation Funding (Exoclimes VI and ExoSLAM) | RAS	£5000
2022	Undergraduate Student Bursary (awarded; student declined) | RAS	£1200
2017	Best Presentation Award | CEEDA Symposium	~£100
2016	Travel Bursary | Polar Prediction School	~£1000
2015	Travel Award | High-Latitude Dynamics workshop	~£1000
2014	Lord Zuckerman PhD scholarship | School of Environmental Sciences, UEA	~£112 000
2014	Young Scientist Travel Award | EGU General Assembly	~£200
2014	Russian Academy of Sciences Young Scientist Medal	~£1000
Direct Funding, co-I		
2024	Research Software Engineer Support | DiRAC HPC	~£45 000
Observational Facilities Resources		
2023	JWST: 49.21 Primary Spacecraft Hours in Cycle 2 (GO 3838, PI: J. Kirk)	•

Publications

Citations (preprints in **grey**)

- Renfrew, I. A., & **Sergeev, D. E.**, 2024, Polar lows, Encyclopedia of Atmospheric Sciences, 3rd Ed (in press)
2 Penzlin, A. B. T., Booth, R. A., Kirk, J., Owen, J. E., et al. (incl. **Sergeev, D. E.**), 2024, BOWIE-ALIGN: how formation and migration histories of giant planets impact atmospheric compositions, MNRAS
1 Kirk, J., Ahrer, E., Claringbold, A. B., Zamyatina, M., et al. (incl. **Sergeev, D. E.**), 2024, BOWIE-ALIGN: JWST reveals hints of planetesimal accretion and complex sulphur chemistry in the atmosphere of the misaligned hot Jupiter WASP-15b, arXiv:2410.08116
4 **Sergeev, D. E.**, Boutle, I. A., Lambert, F. H., Mayne, N. J., et al., 2024, The Impact of the Explicit Representation of Convection on the Climate of a Tidally Locked Planet in Global Stretched-mesh Simulations, ApJ
- Natchiar, S. R. M., Webb, M. J., Lambert, F. H., Vallis, G. K., et al. (incl. **Sergeev, D. E.**), 2024, Reduction in the Tropical High Cloud Fraction in Response to an Indirect Weakening of the Hadley Cell, JAMES

6 Zamyatina, M., Christie, D. A., Hébrard, E., Mayne, N. J., et al. (incl. **Sergeev, D. E.**), 2024, Quenching-driven equatorial depletion and limb asymmetries in hot Jupiter atmospheres: WASP-96b example, MNRAS

1 Mak, M. T., **Sergeev, D. E.**, Mayne, N., Banks, N., et al., 2024, 3D simulations of TRAPPIST-1e with varying CO_2, CH_4, and haze profiles, MNRAS

4 Villanueva, G. L., Fauchez, T. J., Kofman, V., Alei, E., et al. (incl. **Sergeev, D. E.**), 2024, Modeling Atmospheric Lines by the Exoplanet Community (MALBEC) Version 1.0: A CUISINES Radiative Transfer Intercomparison Project, Planet. Sci. J.

1 Kirk, J., Ahrer, E., Penzlin, A. B. T., Owen, J. E., et al. (incl. **Sergeev, D. E.**), 2024, BOWIE-ALIGN: A JWST comparative survey of aligned versus misaligned hot Jupiters to test the dependence of atmospheric composition on migration history, RAS Techniques and Instruments

3 Mak, M. T., Mayne, N. J., **Sergeev, D. E.**, Manners, J., et al., 2023, 3D Simulations of the Archean Earth Including Photochemical Haze Profiles, J. Geophys. Res.: Atmospheres

10 **Sergeev, D. E.**, Mayne, N. J., Bendall, T., Boutle, I. A., et al., 2023, Simulations of idealised 3D atmospheric flows on terrestrial planets using LFRic-Atmosphere, Geosci. Model Dev.

6 Cohen, M., Bollasina, M. A., **Sergeev, D. E.**, Palmer, P. I., et al., 2023, Traveling Planetary-scale Waves Cause Cloud Variability on Tidally Locked Aquaplanets, Planet. Sci. J.

3 Eager-Nash, J. K., Mayne, N. J., Nicholson, A. E., Prins, J. E., et al. (incl. **Sergeev, D. E.**), 2023, 3D Climate Simulations of the Archean Find That Methane has a Strong Cooling Effect at High Concentrations, J. Geophys. Res.: Atmospheres

4 McCulloch, D., **Sergeev, D. E.**, Mayne, N., Bate, M., et al., 2023, A modern-day Mars climate in the Met Office Unified Model: dry simulations, Geosci. Model Dev.

13 Braam, M., Palmer, P. I., Decin, L., Ridgway, R. J., et al. (incl. **Sergeev, D. E.**), 2022, Lightning-induced chemistry on tidally-locked Earth-like exoplanets, MNRAS

7 Christie, D. A., Lee, E. K. H., Innes, H., Noti, P. A., et al. (incl. **Sergeev, D. E.**), 2022, CAMEMBERT: A Mini-Neptunes General Circulation Model Intercomparison, Protocol Version 1.0.A CUISINES Model Intercomparison Project, Planet. Sci. J.

44 Fauchez, T. J., Villanueva, G. L., **Sergeev, D. E.**, Turbet, M., et al., 2022, The TRAPPIST-1 Habitable Atmosphere Intercomparison (THAI). III. Simulated Observables-the Return of the Spectrum, Planet. Sci. J.

47 Turbet, M., Fauchez, T. J., **Sergeev, D. E.**, Boutle, I. A., et al., 2022, The TRAPPIST-1 Habitable Atmosphere Intercomparison (THAI). I. Dry Cases-The Fellowship of the GCMs, Planet. Sci. J.

58 **Sergeev, D. E.**, Fauchez, T. J., Turbet, M., Boutle, I. A., et al., 2022, The TRAPPIST-1 Habitable Atmosphere Intercomparison (THAI). II. Moist Cases-The Two Waterworlds, Planet. Sci. J.

21 **Sergeev, D. E.**, Lewis, N. T., Lambert, F. H., Mayne, N. J., et al., 2022, Bistability of the Atmospheric Circulation on TRAPPIST-1e, Planet. Sci. J.

11 Cohen, M., Bollasina, M. A., Palmer, P. I., **Sergeev, D. E.**, et al., 2022, Longitudinally Asymmetric Stratospheric Oscillation on a Tidally Locked Exoplanet, ApJ

33 Fauchez, T. J., Turbet, M., **Sergeev, D. E.**, Mayne, N. J., et al., 2021, TRAPPIST Habitable Atmosphere Intercomparison (THAI) Workshop Report, Planet. Sci. J.

22 Terpstra, A., Renfrew, I. A., & **Sergeev, D. E.**, 2021, Characteristics of Cold-Air Outbreak Events and Associated Polar Mesoscale Cyclogenesis over the North Atlantic Region, J. Cli.

53 Renfrew, I. A., Barrell, C., Elvidge, A. D., Brooke, J. K., et al. (incl. **Sergeev, D.**), 2021, An evaluation of surface meteorology and fluxes over the Iceland and Greenland Seas in ERA5 reanalysis: The impact of sea ice distribution, Q. J. R. Meteorol. Soc.

24 Eager-Nash, J. K., Reichelt, D. J., Mayne, N. J., Hugo Lambert, F., et al. (incl. **Sergeev, D. E.**), 2020, Implications of different stellar spectra for the climate of tidally locked Earth-like exoplanets, A&A

56 **Sergeev, D. E.**, Lambert, F. H., Mayne, N. J., Boutle, I. A., et al., 2020, Atmospheric Convection Plays a Key Role in the Climate of Tidally Locked Terrestrial Exoplanets: Insights from High-resolution Simulations, ApJ

15 Joshi, M. M., Elvidge, A. D., Wordsworth, R., & **Sergeev, D.**, 2020, Earth's Polar Night Boundary Layer as an Analog for Dark Side Inversions on Synchronously Rotating Terrestrial Exoplanets, ApJ

26 Renfrew, I. A., Pickart, R. S., Våge, K., Moore, G. W. K., et al. (incl. **Sergeev, D.**), 2019, The Iceland Greenland Seas Project, BAMS

16 **Sergeev, D.**, Renfrew, I. A., & Spengler, T., 2018, Modification of Polar Low Development by Orography and Sea Ice, Mon. Wea. Rev.

6 Shestakova, A. A., Toropov, P. A., Stepanenko, V. M., **Sergeev, D. E.**, et al., 2018, Observations and modelling of downslope windstorm in Novorossiysk, Dyn. Atm. Ocean.

21 **Sergeev, D. E.**, Renfrew, I. A., Spengler, T., & Dorling, S. R., 2017, Structure of a shear-line polar low, Q. J. R. Meteorol. Soc.

6 Spengler, T., Renfrew, I. A., Terpstra, A., Tjernström, M., et al. (incl. **Sergeev, D.**), 2016, High-Latitude Dynamics of Atmosphere-Ice-Ocean Interactions, BAMS

7 Eliseev, A. V., & **Sergeev, D. E.**, 2014, Impact of subgrid-scale vegetation heterogeneity on the simulation of carbon-cycle characteristics, Izv. Atmos. Ocean. Phy.

Conferences and Seminars

Invited Talks (14)

May 2024 3D simulations of exoplanet atmospheres with the next-generation Met Office model
University of Leicester | Leicester, UK

Apr 2024 Shall I compare thee to a distant world? Inter-planet and inter-model comparative studies
EGU General Assembly | Vienna, Austria

Jul 2023 Simulations of idealised 3D atmospheric flows on terrestrial planets using LFRic-Atmosphere
NASA GISS Seminar | Online

Mar 2023 First results of using LFRic for exoplanet climate modelling
NIWA Seminar | Wellington, New Zealand

Feb 2023 Atmospheric dynamics and chemistry on exoplanets
UQ Astro Group Meeting | Brisbane, Australia

Feb 2023 Atmospheric dynamics and chemistry on exoplanets
UniSQ Exoplanet Group Seminar | Brisbane, Australia

Feb 2023 Atmospheric dynamics and chemistry on exoplanets
UNSW AstroSeminar | Sydney, Australia

Apr 2022 Dichotomy of the atmospheric circulation on TRAPPIST-1e
NASA GISS Seminar | Online

Jan 2022 Dichotomy of the atmospheric circulation on TRAPPIST-1e
NASA GSFC Extrasolar Planets Seminar | Online

Nov 2021 TRAPPIST-1 Habitable Atmosphere Intercomparison (THAI)
MPIA APEx Exocoffee | Online

May 2021 Overcast on TRAPPIST-1e
RCC MSU Geophysical Seminar | Online

Sep 2020 Simulations of convection over a range of atmospheric conditions on TRAPPIST-1e
THAI Workshop | Online

Apr 2020 Atmospheric convection plays a key role in the climate of tidally locked exoplanets
University of Reading Meteorology Seminar | Online

Apr 2020 Atmospheric convection plays a key role in the climate of tidally locked exoplanets
NASA GISS Seminar | Online

Contributed Talks (12)

Sep 2023 Introducing GeoVista - Cartographic rendering and mesh analytics powered by PyVista (joint talk)
Met Office Seminar | Exeter, UK

Jul 2022 Bistability of the atmospheric circulation on TRAPPIST-1e
Rocky Worlds II | Oxford, UK

Apr 2022 Dichotomy of the atmospheric circulation on TRAPPIST-1e
Exoplanet Modelling in the James Webb Era II: Terrestrial planets and sub-Neptunes | Online

Nov 2020 Explicit convection on tidally locked rocky exoplanets simulated with the UM nesting suite
Unified Model users workshop | Online

Aug 2019 Simulations of moist convection on tidally-locked rocky exoplanets

Exoclimes V | Oxford, UK

Jun 2019 North Atlantic polar mesoscale cyclones in ERA5 and ERA-Interim reanalyses
IGP workshop | Norwich, UK

Apr 2019 Atmospheric convection on tidally-locked Earth-like exoplanets
UK Exoplanet Community Meeting | London, UK

Jun 2018 Modification of Polar Low Development by Sea Ice and Svalbard Orography
POLAR2018 | Davos, Switzerland

Oct 2017 The influence of Svalbard orography and sea ice on polar low development
18th Cyclone Workshop | Sainte-Adèle, Canada

Apr 2017 Polar lows and how background environment can influence their development
Cambridge Earth Systems Science EnvEast Doctoral Alliance Symposium | Cambridge, UK

May 2016 Structure of the shear-line polar low south of Svalbard
NORPAN meeting | Tokyo, Japan

Apr 2016 Structure of the shear-line polar low south of Svalbard
13th European Polar Lows Working Group Workshop | Paris, France

Poster Presentations (9)

Jun 2024 The impact of convection on the climate of a tidally locked planet in stretched-mesh simulations
Exoplanets 5 | Leiden, Netherlands

Apr 2024 The impact of convection on the climate of TRAPPIST-1e in global stretched-mesh simulations
EGU General Assembly | Vienna, Austria

Apr 2024 The impact of convection on the climate of a tidally locked planet in stretched-mesh simulations
UK Exoplanet Community Meeting | Birmingham, UK

Nov 2022 Dry Modern-Day Mars Climate in the Met Office Unified Model
UK Solar System Planetary Atmospheres | London, UK

Sep 2022 Bistability of the Atmospheric Circulation on TRAPPIST-1e
UK Exoplanet Community Meeting | Edinburgh, UK

Jul 2015 Structure and dynamics of a shear-line polar low during a cold-air outbreak over the Norwegian Sea
Royal Meteorological Society Student Conference | Birmingham, UK

Mar 2015 Structure and dynamics of a shear-line polar low during a cold-air outbreak over the Norwegian Sea
Dynamics of Atmosphere-Ice-Ocean Interactions in the High Latitudes workshop | Rosendal, Norway

May 2014 Numerical modelling of polar mesocyclones dynamics diagnosed by the energy budget
EGU General Assembly | Vienna, Austria

Apr 2013 Impact of subgrid-scale vegetation heterogeneity on the carbon cycle
EGU General Assembly | Vienna, Austria

Apr 2013 Numerical modelling of polar mesocyclones generation mechanisms
EGU General Assembly | Vienna, Austria

Supervision

I am an integral member of the Exeter Exoplanet Theory Group (EETG), and have been actively involved in the supervision of students — both as a **lead supervisor** and as a co-supervisor. Undergraduate and Masters students who continued their academic career are marked with *.

PhD Supervision (1)

Sep 2021–Sep 2025 Martha (Mei Ting) Mak
Project: Hazes in Planetary Atmospheres
Co-supervisors: N. J. Mayne, J. Manners, E. Hébrard

Masters Supervision (12)

Jan 2023–May 2024 Tom Batchelor, Luke Benzing, & Alex McGinty*
Project: Mars Atmosphere Modelling
Co-supervisors: M. Bate, N. J. Mayne, D. McCulloch

Sep 2020–Sep 2022 Danny McCulloch* (MSci by Research)

	Project: Climate Modelling of Modern-Day Mars
	Co-supervisors: M. Bate, N. J. Mayne
Apr 2021–Sep 2022	Meghan Plumridge* (MSci by Research)
	Project: Climate Modelling of Early Mars
	Co-supervisors: M. Bate, N. J. Mayne
Jan 2021–May 2022	Jasper Chadwick & Esse Sellwood
	Project: Ocean Heat Transport on Rocky Exoplanets
	Co-supervisors: F. H. Lambert, J. Eager-Nash
Jan 2021–May 2022	Isabelle Browne & Oakley Young
	Project: Greenhouse Effect on Early Mars
	Co-supervisors: F. H. Lambert, N. J. Mayne, J. Eager-Nash
Jan 2020–May 2021	Toby Ferrison
	Project: Titan Climate Modelling
	Co-supervisor: F. H. Lambert
Oct 2018–May 2019	Jake Eager-Nash* & David Reichelt
	Project: Implications of Stellar Type on the Climate of Tidally Locked Terrestrial Exoplanets
	Co-supervisors: F. H. Lambert, N. J. Mayne

Undergraduate and Summer Internship Supervision (8)

Feb–Jun 2024	Milo Whale
	Project: Sparse Atmospheric Modelling with the UM
	Co-supervisors: M. Braam, D. McCulloch, F. H. Lambert
Jul–Sep 2022	Oakley Young
	Project: Ekman Ocean Model
	Co-supervisors: J. Eager-Nash, F. H. Lambert
Jun–Sep 2022	**James McDermott* & Lottie Woods***
	Project: Simulations of Lightning Storms on Tidally Locked Rocky Exoplanets
Jun–Aug 2021	Oakley Young
	Project: Climate Modelling of Archean Earth
	Co-supervisors: J. Eager-Nash, N. J. Mayne
Jun–Aug 2021	Joshua Parkin* & Esse Sellwood
	Project: The Impact of Host Star Spectrum on the Climate of Rocky Exoplanets
	Co-supervisors: J. Eager-Nash, N. J. Mayne
Jun–Aug 2019	Isobel Parry*
	Project: Water Cycle on Proxima Centauri b
	Co-supervisor: F. H. Lambert

Teaching and Mentoring

Jul 2024	Algorithms For Exascale Summer School
	Invited lecturer | University of Exeter | ∼20 students
Feb 2024	Physics of Climate Change (PHY2222)
	Workshop lead | University of Exeter | ∼30 students
Jul 2023	Climatematch Academy
	Mentor | Online | 3 groups of ∼5 students
Jul 2023	International Sustainability Summer School
	Lecturer | University of Exeter | ∼10 students
Jun 2023	Exoclimes Summer School in Atmospheres and Modelling (ExoSLAM)
	Co-chair & lecturer | University of Exeter | ∼50 students
Jan 2018	ECR course "Introduction to Python in Environmental Sciences"
	Course creator & lead | University of East Anglia | ∼50 students
2015–2017	Modelling Environmental Processes; Meteorology; Numerical Skills
	Teaching assistant | University of East Anglia
Apr 2017	Field Course in Meteorology

Teaching assistant | Slapton / University of East Anglia
Nov 2016 Python Training Course
Course creator & lead | University of East Anglia | ∼30 students

Academic Community

- Awards and Recognition
  - Above & Beyond Award (x2) | University of Exeter, 2023
- Organisation of Scientific Meetings
  - Exoclimes VII (Member of SOC) | Montreal, 2025
  - Idealised modelling with LFRic (Chair) | Exeter, 2025
  - BUFFET-4: Building a Unified Framework For Exoplanet Treatments (Co-chair) | Online, Oct 2024
  - What's Cookin' Doc? A CUISINES meeting (Chair) | Leiden, Jun 2024 | ∼20 attendees
  - ExoSLAM Summer School (Co-chair) | Exeter, Jun 2023 | ∼50 attendees
  - Exoclimes VI (Member of LOC) | Exeter, Jun 2023 | ∼200 attendees
  - Challenge of Science Leadership Short Course | Exeter, Mar 2023 | 11 attendees
  - Exeter Exoplanet Theory Group Summer Retreat | Mawgan Porth, Aug–Sep 2022 | 15 attendees
- Committees and steering groups
  - Co-lead of Climates Using Interactive Suites of Intercomparisons Nested for Exoplanet Studies (CUISINES)
- Reviewing
  - Journals: Planet. Sci. J., Geophys. Res. Lett., Nat. Astron., ApJ, Planet. Space Sci., Q. J. R. Meteorol. Soc.
  - Grants: STFC (Consolidated)
  - Facilities: JWST (Exoplanets & Disks, Cycle 3)
- Professional Memberships: Royal Astronomical Society, Europlanet Society

Impact and Outreach

- Press Releases
  - Joint PR from the University of Exeter, American University, & INSU CNRS on the THAI project
- Visualisation
  - "Cloudy Skies of Distant Exoplanets", University of Exeter Images of Research 2023
  - "A refined look at tidally locked exoplanets", DiRAC HPC Research Image Competition 2023
  - "Exoplanetary Atmospheres" at Science as Art Gallery (Exeter Science Centre)
  - 3D visualisation of dusty atmospheres for a Nature press release
  - Visualisation for the 360° VR video "Virtual Reality Exploration of Exoplanets"
- Interviews
  - UoE interview about my research
  - UKRI/STFC interview about outreach
  - Featured in the PRI podcast on the IGP campaign
- Science Exhibitions
  - Expert Scientist at the Climate Exhibition (part of British Science Festival 2023)
- STEM Ambassador
- School Visits
  - Visit to Pool Academy as part of the "Exoplanet Explorers" programme
- Scientific Consulting
  - Videogame "Exoplanet Explorers" (STFC Nucleus grant "4EP", PI N. J. Mayne)
- Blogging
  - Disastrous Disaster Movies
  - Polar Lows: What Fuels Arctic Hurricanes?
  - Worldwide Weird Weather Words
- Miscellaneous
  - AtmosSciBot: Twitter bot that generates word clouds of open access publications in atmospheric sciences

Skills

Languages	English (fluent), French (basic), Russian (native)
Numerical models	LFRic, Unified Model, SOCRATES, LAGRANTO, Isca
Programming languages	Python, Bash, FORTRAN, MATLAB, NCL
Python libraries (user)	cartopy, cython, iris, matplotlib, numpy, pandas, pyvista, xarray
Python libraries (creator/contributor)	aeolus, cartopy, pyvista, geovista
Parallel computing	Dask, MPI, OpenMP
Version control	Git, Subversion
Document preparation	LaTeX, Jupyter Notebooks, Markdown, HTML, CSS, reST

Vocational Training

Sep 2023	Belbin Training
Mar 2023	Challenge of Science Leadership
Dec 2022	Interview Training
Jul 2020	Writing Workshop for Climate Scientists
Mar 2020	ESA JWST Master Class
Jul 2019	ICTP Summer School on Convective Organization and Climate Sensitivity
Apr 2018	Fortran Modernisation Workshop
Jan 2018	Helicopter Underwater Escape Training Course (CA-EBS)
Dec 2017	Sea Survival Course
Jun 2017	Weather Presenting
Feb 2017	Level 1 First Aid for Field Work Course
Jan 2017	Raspberry Pi Basics
Apr 2016	WWRP/WCRP/Bolin Center Polar Prediction School
Dec 2014	UK Met Office Unified Model Training

Vocational Experience

Apr–Jun 2018	Data Technician Processing of meteorological data collected in the IGP field campaign | University of East Anglia
2015–2018	Founder and Leader Python Users Group | University of East Anglia
Feb–Mar 2018	Member of the Meteorology Team The Iceland-Greenland Seas Project (IGP) field campaign | Akureyri, Iceland
Mar 2015	Rapporteur Dynamics of Atmosphere-Ice-Ocean Interactions in the High-Latitudes | Rosendal, Norway
Oct 2013	Research Intern Geophysical Institute | University of Bergen, Norway
Aug–Sep 2013	Trainee Forecaster Forecast and Briefing Service | Main Aviation Meteorological Centre, Vnukovo Airport
Jul 2012	Research Intern A.M. Obukhov Institute of Atmospheric Physics | Moscow, Russia