

CURRICULUM VITAE

JAMES O'DONOGHUE, PH.D

james.odonoghue@reading.ac.uk ◇ odonoghuespace.github.io

Professional Summary

I am a planetary scientist specialising in observations of Jupiter and Saturn with the world's largest observatories. My research examines planetary upper-atmosphere processes like aurorae and Saturn's ring erosion and is widely covered by international media. I create educational animations to make astronomy accessible, with hundreds of millions of views across platforms (e.g. [YouTube](#)), and have contributed to documentaries for the BBC, PBS, and NHK Japan.

Research Experience

University of Reading, UK *STFC ERF Fellow & Research Associate Prof.*

November 2023 – present

- Q To understand global energy drivers at Jupiter and estimate precisely the decay rate of Saturn's rings.

Japanese Space Agency (JAXA), Japan *JAXA Fellow & Research Associate Prof.*

May 2019 – October 2023

- Q Observing Jupiter's upper atmosphere to find heat sources and investigating the detectability of H_3O^+ at Saturn.
- ✓ Discovery that Jupiter's aurorae globally heat the upper atmosphere. H_3O^+ not detected at Saturn.

NASA Goddard Space Flight Center, USA *NASA Postdoctoral Program Fellow*

January 2017 – March 2019

- Q Led a study on 'ring rain' at Saturn, supported Juno spacecraft observations.
- ✓ Estimated Saturn's rings' decay rate limits their lifetime to 300 million years.

Boston University, USA *Research Scientist*

May 2014 – January 2017

- Q Investigation into Jupiter's upper-atmospheric energy balance and Saturn's ring influence on the planet.
- ✓ Discovered Jupiter's Great Red Spot heats the upper atmosphere; Saturn's temperature too low to detect emissions.

Education

University of Leicester, UK

Ph.D. in Planetary Space Science

Thesis: *The response of gas giant ionospheres to their local space environments*

Discoveries: Saturn's rings fall into the ionosphere & differences between Saturn's northern and southern aurorae.

October 2010 – May 2014

Supervisor: Dr. Tom Stallard

Aberystwyth University

B.Sc. Planetary & Space Science

Dissertation: *A Study of Lunar Impact Flashes*

2006 – 2010

Grade: First-class honours

Awards

Recognition Award: University of Reading.

2024

Achieving results, demonstrating excellence, working together and finding innovative solutions.

Finalist: American Association for Advancement of Science Award for Public Engagement with Science.

2022

Winner: Europlanet Society Prize for Public Engagement with Science.

2021

For work in creating high-quality space science animations and sharing them globally.

Prize: Elsie Pritchard Prize for achievement in physics.

2010

Technical Skills

Programming Languages

Interactive Data Language (IDL), Python, LaTeX, TensorFlow (computer vision)

Digital Tools

Adobe Creative Suite, Blender 3D, MS Office 365 Suite

Further Skills

Animation creation, home astronomy, digital imaging

Grants Awarded

2024 Keck Observatory award of \$14,000 as part of the award for Keck telescope time.

2023 Science and Technology Facilities Council Ernest Rutherford Fellowship over 5 years, \$850,000.

2022 Keck Observatory award of \$14,000 as part of the award for Keck telescope time.

2021 Keck Observatory award of \$12,750 as part of the award for Keck telescope time.

2020 Keck Observatory award of \$12,750 as part of the award for Keck telescope time.
2019 JAXA International Top Young Fellowship, PI, grant of \$460,000.
2018 Keck Observatory award of \$12,750 as part of the award for Keck telescope time.
2017 NASA grant NNH16ZDA001N-SSO: Solar System Observations, Science PI, \$395,969.
2017 NASA Postdoctoral Program Fellowship, PI, award of \$250,000 (not including overheads).
2017 Keck Observatory award of \$11,000 as part of the award for Keck telescope time.
2016 Keck Observatory award of \$15,000 as part of the award for Keck telescope time.
2014 NASA grant NNH13ZDA001N-PAST: Planetary Astronomy, main Co-I, \$351,052.
2012 Royal Astronomical Society (United Kingdom) travel grant of \$600.
Total: \$2,399,900

Teaching and Mentoring

Mentoring

2024 – present Ph.D. Student, University of Reading – assisting with project
2023 – present Ph.D. Student, University of Northumbria – External Supervisor
2020 – 2021 Undergraduate Student, Tohoku University – Research Project Support
2016 – 2017 Master's Student, Boston University – Co-Mentor

University Teaching

2012–2014 Experimental Physics 1 (PA1900) – Led lab-based classes on telescope construction and use.
2013 Mathematical Physics 1.1 (PA1710) – Supported teaching and grading in foundational concepts.

Academic Service

Peer-Reviewer

Reviewed literature for *Geophysical Research Letters*, *Journal of Geophysical Research*, *Icarus*, *Nature Astronomy*, *Monthly Notices of the Royal Astronomical Society*, *Planetary Science Journal*, and the *Oxford Research Encyclopedia*.

Grant Proposal Reviewer

Yearly panelist and/or reviewer for NASA ROSES grant proposals and for the NASA Postdoctoral Program Fellowship. Served as a reviewer on a NASA Planetary Mission Senior Review.

Telescope Proposal Reviewer

I regularly serve as a reviewer for proposals to both the Hubble Space Telescope and the James Webb Space Telescope.

Conference Leadership

JpGU 2025: Co-convener, P-PS01 - Outer Solar System Exploration Today, and Tomorrow
JpGU 2024: Co-convener, P-PS01 - Outer Solar System Exploration Today, and Tomorrow
AbSciCon 2022: Co-convener, 109 - From Prebiotic Chemistry to Astrobiology: Rise of Life On & Beyond Earth
EPSC-DPS 2019: Co-convener, EXO11 - Astrobiology: The Rise of Life on and Beyond Earth
AGU Fall 2018: Judge, Outstanding Student Poster Awards
AGU Fall 2017: Co-convener, SM41D - Moon-Plasma Interactions Throughout the Solar System II
AGU Fall 2016: Co-convener, SM41C - Moon-Plasma Interactions Throughout the Solar System I

PhD Examiner

Examined the PhD thesis of Mia Mace, University of Bristol, 2021.

Awarded Telescope Time

Year	Telescope	Nights (proposals)	Role	Topic
2025	JWST Cyc 4	12.5 (2)	Co-I	Jupiter, Uranus and Neptune upper atmospheres
2025	W.M. Keck	1.5 (2)	Co-I	Uranus aurora drivers, Jupiter Juno support
2024	W.M. Keck	1.5	PI	Saturn: Auroras and Ring Rain with JWST
	W.M. Keck	6.5	Co-I	Jupiter: Juno support
	JWST Cyc 3	2.5 (2)	Co-I	Saturn and Uranus: auroral drivers
2023	JWST Cyc 2	1.9	Co-I	Jupiter: upper atmosphere study
	NASA IRTF	4.0 (2)	Co-I	Jupiter, Uranus: energy crisis, ionosphere study
2022	W.M. Keck	1.0	PI	Exoplanet: aurora/ionosphere detection attempt
	W.M. Keck	6.0 (2)	Co-I	Jupiter, Uranus: Juno support, aurora mapping
	JWST Cyc 1	2.6	Co-I	Giant planets: early release science
2021	W.M. Keck	1.0	PI	Saturn: H ₃ O ⁺ detection attempt
	W.M. Keck	1.0	PI	Exoplanet: aurora/ionosphere detection attempt
	NASA IRTF	7.0 (2)	Co-I	Jupiter, Uranus: Juno support, aurora mapping
2020	W.M. Keck	1.0	PI	Saturn: ring rain search
	NASA IRTF	2.0	PI	Exoplanet: aurora/ionosphere detection attempt
	NASA IRTF	10.0 (2)	Co-I	Saturn, Jupiter: aurorae, Ganymede shadow
2019	NASA IRTF	2.5 (2)	Co-I	Saturn, Jupiter: ring rain, Juno support
2018	W.M. Keck	1.5	PI	Jupiter: Juno support
	W.M. Keck	1.5	Co-I	Jupiter: Juno support
	NASA IRTF	3.0	PI	Jupiter: Juno support
2017	W.M. Keck	1.5	PI	Jupiter: Juno support
	NASA IRTF	5.0 (2)	Co-I	Jupiter: Juno support
2016	W.M. Keck	2.0	PI	Jupiter: Juno support
	NASA IRTF	1.0	PI	Mars: H ₃ ⁺ search
	W.M. Keck	1.5	Co-I	Saturn: Cassini support
	NASA IRTF	2.0	Co-I	Jupiter: Juno support
2015	Gemini N.	3.0	Co-I	Saturn: solar influence on ionosphere
	NASA IRTF	6.0	PI	Jupiter: low-latitude heating
	NASA IRTF	8.5 (4)	Co-I	Saturn, Jupiter, Uranus and Titan
2014	W.M. Keck	2.0	Co-I	Saturn: Cassini support
	Gemini N.	4.0	Co-I	Saturn: auroral energy flows
	NASA IRTF	16.5 (3)	Co-I	Saturn, Jupiter: Cassini, Hisaki support
2013	W.M. Keck	4.0	Co-I	Saturn: Cassini support
	NASA IRTF	8.5 (2)	Co-I	Jupiter, Saturn: Cassini, Hisaki support
	Gemini N.	2.0	Co-I	Uranus: energy drivers in upper atmosphere
2012	NASA IRTF	5.5	PI	Jupiter: global ionosphere mapping
2011	NASA IRTF	18.0	Co-I	Jupiter, Saturn, Uranus: various topics
Total:		151.9 (50)		

Spacecraft Mission Support

Juno Mission to Jupiter (2016–present): Submitted proposals for telescope time on Keck observatory and NASA’s Infrared Telescope Facility (IRTF) to support the Juno mission’s observations of Jupiter’s atmosphere and magnetosphere. These observations often required letters of support from NASA HQ, which were resourcefully obtained. Our observations continue to complement Juno in-situ data by providing contextual observations and ground-truth data, enhancing the science return of the mission.

James Webb Space Telescope ERS Program (2022): Selected as a collaborator in JWST’s Early Release Science (ERS) observations of giant planets, which provided the first-ever data on Jupiter’s ionosphere and auroral regions.

Cassini Mission to Saturn (2011–2017): Proposed and conducted observations using Keck and IRTF to support the Cassini spacecraft’s exploration of Saturn. Observations focused on Saturn’s aurorae and ring-planet coupling processes, providing ground-truths and contextual observations, again enhancing the return of the Cassini mission.

37. J. O'Donoghue, L. Moore, T. Stallard, B. Kurth, et al. Sub-auroral Heating at Jupiter Following a Solar Wind Compression. *Geophys. Res. Lett.*, Accepted Mar 2025.
36. Wang, R., Stallard, T. S., Melin, H., Baines, K. H., Moore, L., O'Donoghue, J., Johnson, R. E., Thomas, E. M., Knowles, K. L., Tiranti, P. I., & Miller, S. Simultaneous Infrared Observations of the Jovian Auroral Ionosphere and Thermosphere. *J. Geophys. Res. Space Physics*, doi:10.1029/2024JA032891, 2024.
35. Melin, H., O'Donoghue, J., Moore, L., et al. Ionospheric irregularities at Jupiter observed by JWST. *Nat. Astron.* 8, 1000–1007, doi:10.1038/s41550-024-02305-9, 2024.
34. Agiwal, O., Cao, H., Hsu, H-W., Moore, L., .. O'Donoghue, J. [6], et al. Current Events at Saturn: Ring–Planet Electromagnetic Coupling. *Planet. Sci. J.* 5, 134, doi:10.3847/PSJ/ad4343, 2024.
33. Bockelee-Morvan, D., Lellouch, E., Poch, O., Quirico, E., .. O'Donoghue, J. [7], et al. Composition and thermal properties of Ganymede's surface from JWST/NIRSpec and MIRI observations. *Astronomy & Astrophysics* 681, p. A27, doi:10.1051/0004-6361/202347326, 2024.
32. Cao, X., Chu, X., Hsu, H-W., Cao, H., .. O'Donoghue, J. [6], et al. Science return of probing magnetospheric systems of ice giants. *Front. Astron. Space Sci.* 11:1203705, doi:10.3389/fspas.2024.1203705, 2024.
31. Wang, R., Stallard, T. S., Melin, H., Baines, K. H., .. O'Donoghue, J. [6], et al. Asymmetric ionospheric jets in Jupiter's aurora. *J. Geophys. Res. Space Phys.* 128, 12, doi:10.1029/2023JA031861, 2023.
30. J. O'Donoghue, Stallard, T., What the Upper Atmospheres of Giant Planets Reveal. *Remote Sensing*, 14, 6326, doi:10.3390/rs14246326, 2022.
29. Chowdhury, M. N., Stallard, T. S., Baines, K. H., Provan, G., .. O'Donoghue, J. [6], et al. Saturn's weather-driven aurorae modulate oscillations in the magnetic field and radio emissions. *Geophys. Res. Lett.*, doi:10.1029/2021GL06492, 2022.
28. O'Donoghue, J., Moore, L., Melin, H., Stallard, T. S., et al. Global upper-atmospheric heating on Jupiter by the polar aurorae. *Nature*, doi:10.1038/s41586-021-03706-w, 2021.
27. Moore, L., Moses, J. I., Melin, H., Stallard, T. S., .. O'Donoghue, J. [5], et al. Atmospheric implications of the lack of H_3^+ detection at Neptune. *Phil. Trans. R. Soc. A.* 37820200100, doi:10.1098/rsta.2020.0100, 2020.
26. Yurchenko, S. N., Tennyson, J., Miller, S., Melnikov, V. V., .. O'Donoghue, J. [5], et al. ExoMol line lists – XL. Rovibrational molecular line list for the hydronium ion (H_3O^+). *Monthly Notices of the Royal Astronomical Society*, 497(2), Pages 2340–2351, doi:10.1093/mnras/staa2034, 2020.
25. O'Donoghue, J., Moore, L., Connerney, J. E. P., Melin, H., et al. Observations of the chemical and thermal response of 'ring rain' on Saturn's ionosphere. *Icarus*, 322, Pages 251–260, doi:10.1016/j.icarus.2018.10.027, 2019.
24. Moore, L., Melin, H., O'Donoghue, J. [5], et al. Modelling H_3^+ in planetary atmospheres: effects of vertical gradients. *Phil. Trans. R. Soc. A.* 377, 20190067, doi:10.1098/rsta.2019.0067, 2019.
23. Ray, L. C., Lorch, C. T. S., .. O'Donoghue, J. [5], et al. Why is the H_3^+ hot spot above Jupiter's Great Red Spot so hot? *Phil. Trans. R. Soc. A.* 377, 20180407, doi:10.1098/rsta.2018.0407, 2019.
22. Melin, H., Fletcher, L. N., Stallard, T. S., .. O'Donoghue, J. [5], et al. The H_3^+ ionosphere of Uranus: decades-long cooling and local-time morphology. *Phil. Trans. A.*, doi:10.1098/rsta.2018.0408, 2019.
21. Stallard, T., Baines, K., Melin, H., Bradley, T., .. O'Donoghue, J. [6], et al. Local-time averaged maps of H_3^+ emission, temperature and ion winds. *Phil. Trans. A.*, doi:10.1098/rsta.2018.0405, 2019.
20. Moore, L., Galand, M., Kliore, A., Nagy, A., .. O'Donoghue, J. [5], et al. Saturn's ionosphere: ring rain and other drivers. *In book chapter: Saturn in the 21st Century*, Cambridge University Press, doi:10.1017/9781316227220, 2018.
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Invited Talks: Conferences and Seminars

- 2025** (upcoming) Speaker for Spectroscopy of Exoplanets Over All Wavelengths on 'Solar system giant planet upper atmospheres' Broxbourne, UK.
- 2025** Speaker at student-led Space Exe 2025 conference, University of Exeter.
- 2024** Keynote speaker at a Department of Meteorology event, University of Reading.
- 2024** Graduate Student Invited Seminar Speaker, Boston University (US).
- 2024** Talk at the International Space Science Institute (ISSI), Bern, Switzerland, 'Jupiter's non-auroral Upper Atmosphere'.
- 2023** Talk at Japan Geoscience Union (JpGU), Investigations of Giant Planet Upper Atmospheres: Past, Present and Future'.
- 2023** Talk for JAXA/ISAS Diversity Promotion, The Experience of Researching Internationally'.
- 2022** Seminar at JAXA/ISAS Coffee Talk, A planetary-scale heat wave in Jupiter's upper atmosphere'.
- 2022** Talk at ISSI, Bern, Switzerland, New and future observations of Saturn and insights for Jupiter, Uranus and Neptune' as part of 'ring-planet interactions' meeting.
- 2021** Seminar at JAXA/ISAS Planetary Exploration Workshop, Future Science at the Outer Planets'.
- 2021** Keynote Speaker for Outer Planet Systems, EuroPlanet Science Congress (EPSC), What the upper atmospheres of Giant Planets reveal'.
- 2021** Talk at EPSC, Global upper-atmospheric heating at Jupiter by the recirculation of auroral energy'.
- 2021** Award-acceptance talk at EPSC for the Europlanet Prize for Public Engagement.
- 2021** Talk at Royal Astronomical Society, Observational evidence for upper-atmospheric heat transfer to Jovian equatorial latitudes from the auroral regions'.
- 2020** Seminar at Japan Science Communication Forum, 'Animated Science Communication'.
- 2019** Seminar at Earth-Life Sciences Institute, Tokyo, 'Saturn's Rings and Jupiter's Great Red Spot: an animated discussion'.
- 2018** Seminar at Catholic University of America, Revealing the inner-workings of Saturn's Rings and Jupiter's Great Red Spot with ionospheric measurements'.
- 2018** Talk at EPSC, Ground-based observations of Giant Planet upper atmospheres'.
- 2017** Seminar at NASA Goddard Space Flight Center, 'Heating of Jupiter's upper atmosphere by the Great Red Spot'.
- 2016** Talk at American Geophysical Union (AGU) conference, Searching for sources of planet-wide heating in Jupiter's upper atmosphere: new clues from the Great Red Spot'.
- 2016** Seminar at University of New Hampshire, Ground-based observations of Jupiter and Saturn: aurora, ring rain and Jupiter's Great Red Spot'.
- 2015** Seminar at Georgia Institute of Technology, Observations of gas giant ionospheres'.
- 2015** Talk at Magnetospheres of the Outer Planets (MOP) conference, Ground-based observations of planetary aurorae'.
- 2013** Talk at ISSI, Bern, Switzerland, part of the second 'Comparative Jovian Aeronomy' meeting on 'Saturn's ring rain'.
- 2012** Talk at ISSI, Bern, Switzerland, Saturn's auroral energy balance' as part of Comparative Jovian Aeronomy' meeting.
- One invited talk declined due to scheduling constraints: Asia Oceania Geosciences Society (AOGS) 2025

Science Communication

Space-Themed Educational Animations

Overview and Impact: Produced approximately 75 original space-themed animations to explain complex space science and physics concepts, achieving over 300 million views across social media platforms (Twitter, YouTube, Reddit, Instagram, LinkedIn) and generating hundreds of news articles.

Educational Use: Incorporated as educational resources at all levels, from elementary schools to Ivy League institutions (e.g., Stanford University), and featured in prominent planetariums and museums, including the Smithsonian Air and Space Museum.

Distribution and Following: Released via Twitter @physicsJ and YouTube to an amassed following of ~250,000.

Engagement and Media Appearances

- 2025** Invited Speaker for the Shropshire Astronomical Society April meeting on the topic of Saturn's rings.
- 2024** Documentary appearance for BBC's Solar System with Prof. Brian Cox, Episode 5, Strange Worlds.
- 2024** Documentary appearance, on location in the Canary Islands, for PBS NOVA in the USA, Strange Worlds.
- 2024** Led NASA Observe the Moon Night at University of Reading: audience 200 in person, 1,100 online.
- 2024** Delivered two public lectures at the Royal Astronomical Society, Burlington House, London.
- 2023** Consultant and featured expert, Space chapter of Britannica's Encyclopedia Infographica.
- 2023** Animation featured in Cosmic Front, a documentary by NHK (Japan).
- 2022** Animation featured in Are You Smarter than a 5th Grader (Japan edition).
- 2022** Created fly-by animations for the BepiColombo mission's June 2022 flyby of Mercury.
- 2022** Organised Observe the Moon Night, serving as JAXA–NASA liaison.
- 2022** Chaired Hayabusa2 and Beyond live event for JAXA, British Science Museum.
- 2021** Organised Observe the Moon Night, serving as JAXA–NASA liaison.
- 2021** Created fly-by animations for BepiColombo's August 2021 flyby of Venus.
- 2021** Co-hosted live Uranus-observing event with the Royal Astronomical Society.
- 2021** Co-organised public outreach broadcast, JAXA Institute of Space and Astronautical Science Open Day.
- 2020** Presented seminar at American School in Japan, An Animated Tour of the Solar System.
- 2019** Hosted an exhibit using animations at JAXA Institute of Space and Astronautical Science Open Day.
- 2019** Appeared in Strip the Cosmos, Discovery Channel documentary on Saturn's rings.
- 2018** Appeared in Space's Deepest Secrets, Science Channel documentary on Saturn's rings.
- 2017** Interviewed by The New York Times on historic Juno spacecraft close-up images of the Great Red Spot.
- 2017** Appeared in NHK Japan's Cosmic Front, discussing Jupiter's Great Red Spot.
- 2016** Press release after Nature publication on Jupiter's Great Red Spot, featured by over 100 news outlets.
- 2014** Volunteer for BBC's Stargazing Live, promoting the study of Jupiter and Saturn.
- 2014** Invited speaker at Stratford-upon-Avon Astronomical Society, Saturn's Ring Rain.
- 2014** Participated in Live at the Observatory at the Keck telescope, with live Q&A for an audience of 1,000.
- 2013** Invited appearance on BBC Radio Leicester as a panel expert on space.
- 2013** Press release on Nature publication on Saturn's ring rain discovery; covered by over 100 news outlets.
- 2012** Conducted live outreach from NASA's Infrared Telescope Facility (IRTF) to schools and universities.

Services to Education

- 2025** Presented a specialist solar system talk to Higher Project Qualification students in London (high school)
- 2024** Gave a solar system talk with a Q&A session to the Astronomy Education and Outreach Network (AEON), a national network of GCSE Astronomy teachers in the UK (high school)
- 2024** Gave a career talk to students and gave telescope demonstration at two local schools (primary schools)

Training

- 2024** MediaFirst media interview training. Including mock TV, radio, print news interviews.
- 2024** Writing for REF workshop at University of Reading.
- 2023** James Webb Space Telescope Proposal Workshop.
- 2020** Coursera course in *Python For Everybody* by the University of Michigan.
- 2012** STFC Summer school in Solar System Plasmas at Armagh Observatory
- 2010** STFC Summer school in Solar Physics at Leeds University