Dr. Emma E. Davies

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Current Position

Austrian Space Weather Office, Graz, Austria Mar 2023–Present

- Postdoctoral Research Scholar within the Austrian Space Weather Office at GeoSphere Austria, funded by the European Union (ERC, HELIO4CAST, 101042188) grant, PI: C. Möstl.
- Investigating the evolution of interplanetary coronal mass ejections (ICMEs), specifically their in situ magnetic properties and global structure, using new multi-spacecraft observations from current missions including Solar Orbiter, Parker Solar Probe, and BepiColombo.
- Assessing how the evolution of ICMEs impacts space weather predictions, laying the groundwork for future far-upstream and sub-L1 solar wind missions.

Professional Experience

University of New Hampshire, Durham, USA May 2021–Feb 2023

- Postdoctoral Research Scholar within the Coronal Mass Ejection Research Group of the Space Science Center, funded by NASA grant 80NSSC19K0914, PI: R. Winslow.
- Investigated the evolution of ICMEs as they propagate through the heliosphere, using multi-spacecraft observations from both dedicated solar wind spacecraft and planetary mission spacecraft to track ICMEs from the Sun to 1 AU and beyond.
- Investigated how the substructure of ICMEs affect signatures observed in the galactic cosmic ray (GCR) background and how this may evolve with increasing heliocentric distance as ICMEs propagate.

European Space Operations Centre, Darmstadt, Germany Sep 2016–Sep 2017

- Validated space weather forecasting models as a Young Graduate Trainee in the Space Situational Awareness (SSA) Programme; used advanced statistics and specialised skill scores to assess performance and accuracy. Presented findings to the department and produced a final report.
- Edited and finalised technical product documentation for new services to be introduced to the SSA Space Weather online portal.

Education

Imperial College London, London, United Kingdom Oct 2017–Aug 2021

- Doctor of Philosophy (PhD), Heliospheric Physics
  PhD Thesis Title: The Evolution of Interplanetary Coronal Mass Ejections in the Heliosphere.
  Supervisor: Dr. Robert Forsyth.

Imperial College London, London, United Kingdom Oct 2012–Jul 2016

- MSci Hons Physics
  MSci Project Title: Magnetic Reconnection in Space Plasma Physics: Investigating the Motion of the X-Line during Magnetic Reconnection at the Dayside Magnetopause.
  Supervisor: Prof. Jonathan Eastwood.

Awards and Scholarships

- Awarded the Faculty of Natural Sciences Prize for Excellence in the Support of Teaching and Learning at Imperial College London.
- Received a 3.5 year fully-funded PhD studentship from UK Science & Technology Facilities Council.
- Received a Rector's Scholarship for the duration of Undergraduate degree at Imperial College London.

Publication Summary

47 Peer Reviewed Publications, 8 as First Author in internationally peer reviewed scientific journals, e.g. *The Astrophysical Journal, Solar Physics, Astronomy & Astrophysics, and Space Weather.*
H-index: 21, Total refereed citations: 911, Source: NASA ADS, Nov 2026.

First Author Peer-Reviewed:

1. **Davies, E.E.**, Weiler, E., Möstl, C., Majumdar, S., Rüdisser, H.T., Horbury, T.S., O'Brien, H., Morris, J., Crabtree, A. "Real-Time Prediction of Two Geomagnetic Storms Using Solar Orbiter as a Far Upstream Solar Wind Monitor", *Space Weather* **24**, e2026SW005013. doi:10.1029/2026SW005013.
2. **Davies, E.E.**, Rüdisser, H.T., Amerstorfer, U.V., Möstl, C., Bauer, M., Weiler, E., et al, 2024. "Flux Rope Modeling of the 2022 September 5 Coronal Mass Ejection Observed by Parker Solar Probe and Solar Orbiter from 0.07 to 0.69 au", *The Astrophysical Journal* **973**, 51. doi:10.3847/1538-4357/ad64cb.
3. **Davies, E.E.**, Scolini, C., Winslow, R.M., Jordan, A.P., and Möstl, C., 2023. "The Effect of Magnetic Field Line Topology on ICME-related GCR Modulation", *The Astrophysical Journal* **959**, 133. doi:10.3847/1538-4357/ad046a.
4. **Davies, E.E.**, Winslow, R.M., Lawrence, D.J., 2023. "Characterizing Interplanetary Coronal Mass Ejection-related Forbush Decreases at Mercury Using MESSENGER Observations: Identification of a One- or Two-step Structure", *The Astrophysical Journal* **943**, 83. doi:10.3847/1538-4357/acaca1.
5. **Davies, E.E.**, Winslow, R.M., Scolini, C., Forsyth, R.J., Möstl, C., Lugaz, N., et al., 2022. "Multi-spacecraft Observations of the Evolution of Interplanetary Coronal Mass Ejections between 0.3 and 2.2 au: Conjunctions with the Juno Spacecraft", *The Astrophysical Journal* **933**, 127. doi:10.3847/1538-4357/ac731a.
6. **Davies, E.E.**, Forsyth, R.J., Winslow, R.M., Möstl, C., and Lugaz, N., 2021. "A Catalog of Interplanetary Coronal Mass Ejections Observed by Juno between 1 and 5.4 au", *The Astrophysical Journal* **923**, 136. doi:10.3847/1538-4357/ac2ccb.
7. **Davies, E.E.**, Möstl, C., Owens, M.J., Weiss, A.J., Amerstorfer, T., Hinterreiter, J., et al., 2021. "In situ multi-spacecraft and remote imaging observations of the first CME detected by Solar Orbiter and BepiColombo", *Astronomy and Astrophysics* **656**, A2. doi:10.1051/0004-6361/202040113.
8. **Davies, E.E.**, Forsyth, R.J., Good, S.W., and Kilpua, E.K.J., 2020. "On the Radial and Longitudinal Variation of a Magnetic Cloud: ACE, Wind, ARTEMIS and Juno Observations", *Solar Physics* **295**, 157. doi:10.1007/s11207-020-01714-z.

Invited or Solicited Talks

SEMINARS and WORKING GROUPS

Space Plasma Climate Community, Imperial College London, UK Sep 2026
'Coronal Mass Ejections of Solar Cycle 25: Insights from In Situ Multi-Spacecraft Measurements.'

Centre for Mathematical Plasma Astrophysics, KU Leuven, Belgium Sep 2026
'Meet The Jurors: ICME Variability in Solar Cycle 25: Insights from Multi-Spacecraft Upstream Measurements.'

School of Physics and Astronomy, Queen Mary University of London, UK Mar 2026
'Investigating the evolution of coronal mass ejections using multi-spacecraft observations.'

Dunsink Observatory, Dublin Institute for Advanced Studies, Ireland Oct 2025
'Investigating the evolution of ICMEs using multi-spacecraft observations to improve space weather predictions.'

Centre for Mathematical Plasma Astrophysics, KU Leuven, Belgium Jun 2024
'The variability of interplanetary coronal mass ejections and forecasting their geomagnetic impact.'

Space Environment Physics Group, University of Southampton, UK Nov 2023
'Multi-point Observations and Modelling of CMEs at the Austrian Space Weather Office.'

Space Science Center, University of New Hampshire, USA Nov 2021
'The Evolution of Interplanetary Coronal Mass Ejections: Multi-spacecraft and Juno Observations Covering 0.3–5.4 AU.'

Geophysical and Astrophysical Fluid Dynamics Group, University of Exeter, UK Nov 2020
'The Evolution of Interplanetary Coronal Mass Ejections: Multi-spacecraft Observations in the Inner and Outer Heliosphere.'

CMEs, CIRs, HCS and Large-Scale Structures, Solar Orbiter In-Situ Working Group, Online
'Observations of the First CME Detected by Solar Orbiter.' Sep 2020

Mullard Space Science Laboratory, University College London, UK May 2019
'Radial Evolution of an Interplanetary Coronal Mass Ejection: ACE/WIND, Artemis and Juno Observations.'

CONFERENCES

46th COSPAR Scientific Assembly, Florence, Italy Aug 2026
'ICME Variability in Solar Cycle 25: Insights from In Situ Multi-Spacecraft Upstream Measurements.'

XVIIIth Hvar Astrophysical Colloquium, Hvar, Croatia Sep 2025
'Investigating the coherency and expansion of ICMEs using multi-spacecraft observations.'

IAGA/IASPEI Joint Scientific Meeting 2025, Lisbon, Portugal Sep 2025
'Prediction of coronal mass ejection geo-effectiveness using Solar Orbiter as a far upstream solar wind monitor in real-time.'

45th COSPAR Scientific Assembly, Busan, South Korea Jul 2024
'The variability and evolution of interplanetary coronal mass ejections.'

45th COSPAR Scientific Assembly, Busan, South Korea Jul 2024
'Space weather forecasting using STEREO-A as a sub-L1 solar wind monitor.'

Solar Orbiter Workshop 8, Belfast, UK Sep 2022
'Using In-Situ Multi-Spacecraft and Remote Imaging Observations to Understand the Evolution of ICMEs.'

WORKSHOPS

International Space Science Institute, Bern, Switzerland Jan 2026
Multi-Spacecraft Observations and their Importance for Understanding Particle Dynamics in the Inner Heliosphere.

Conference Summary

Contributed **23 first author talks and 10 posters** at American Geophysical Union (AGU) Fall Meeting, European Geosciences Union (EGU) General Assembly, Solar Heliospheric and INterplanetary Environment (SHINE), Triennial Earth-Sun Summit (TESS), European Space Weather Week (ESWW), Royal Astronomical Society (RAS), Autumn Magnetospheric, Ionospheric, and Solar-Terrestrial physics (MIST), Towards Future Research on Space Weather Drivers (FReSWeD), Europlanet Science Congress (EPSC), International Association of Geomagnetism and Aeronomy(IAGA)/ International Association of Seismology and Physics of the Earth's Interior (IASPEI), Committee on Space Research (COSPAR), International Space Weather Action Teams (ISWAT) meetings, and Solar Wind conferences.

Teaching Experience

PhD Student Assistant Supervisor May 2023–Present
Austrian Space Weather Office, GeoSphere Austria, Graz, Austria

- Assisting in the supervision of PhD students, Eva Weiler and Hannah Rüdisser, within the Austrian Space Weather Office research group:
- I supervised Eva Weiler's analysis of the May 2024 geomagnetic superstorm using STEREO-A as a sub-L1 monitor, demonstrating a 2.5-hour earlier prediction and setting a benchmark for upstream mission design with her follow-up statistical study.
- I supervised Hannah Rüdisser in developing a fully automated pipeline for short-term CME forecasting, providing an autonomous benchmark for operational forecasting.

Graduate Student Assistant Supervisor Jan 2022–Feb 2023
University of New Hampshire, Durham, USA

- Assisted in the supervision of a graduate student, Sahanaj Banu, within the Space Science Center. Conducted weekly meetings, both individually with the graduate student and as a group with other supervisors, set tasks, problem solving, and gave feedback on performance.

Teaching Roles during PhD:

Undergraduate Student Laboratory Demonstrator Oct 2017–2019

- Supervised second-year undergraduate physics laboratory sessions, guiding students through experiments on charges and fields while providing feedback and assessing reports.

Tutorial Assistant Oct 2018–2019

- Facilitated first-year undergraduate tutorials by guiding problem-solving, marking assignments, and supporting student welfare.

Summer Project Supervisor Summers 2018 & 2019

- Supervised two pairs of first-year students on space-related original projects through weekly meetings, providing guidance that resulted in well-rounded reports and posters.

Professional Service

INTERNATIONAL ORGANISATIONS

Moderator of the COSPAR International Space Weather Action Teams **(ISWAT) H2 Cluster: CME structure, evolution and propagation through the heliosphere**. Leading the cluster forward from research to operations to improve CME arrival time and parameter forecasting at Earth. Jul 2024–Present

Lead of COSPAR ISWAT Action Team **H2-05: Sub-L1 Solar Wind Monitoring for Future Space Weather Predictions**. Using spacecraft observations upstream of L1 to make more accurate and timely geomagnetic predictions, in preparation for future missions. Jul 2025–Present

PEER REVIEW ACTIVITIES

- External PhD Examiner and Juror in PhD Defense at KU Leuven. 2026
- Mail-in Reviewer for NASA HPD Program. 2025
- Panelist for NASA HGIO and NSF AGS/AST Solar Programs. 2022
- Reviewed manuscripts for international journals: Nature Communications, The Astrophysical Journal, Space Weather, Solar Physics, Monthly Notices of the Royal Astronomical Society, Atmosphere.
- Outstanding Student Presentation Awards (OSPA) judge for (1) AGU and (4) EGU Meetings.

ORGANISATIONAL ACTIVITIES

Science organising committee member for Solar Wind 17, Bath, UK Jun 2026

Session convener at EGU General Assembly, Vienna, Austria: "Observing and modelling coronal mass ejections from the Sun to the heliosphere." May 2026

Session co-convener at IAGA/IASPEI Joint Scientific Meeting 2025, Lisbon, Portugal: "Advances in understanding solar transients and particle events in the corona and heliosphere." Aug–Sep 2025

Session co-convener at EGU General Assembly, Vienna, Austria: "Observing and modelling coronal mass ejections from the Sun to the heliosphere." Apr 2024 & 2025

Session convener at Triennial Earth-Sun Summit (TESS), Dallas, USA: "The Structure and Evolution of Coronal Mass Ejections in the Heliosphere." Apr 2024

Lead of the Eruptive Events and Large-Scale Structure (IS/RS) Solar Orbiter Working Group. Invite speakers, host monthly meeting online, report meeting summaries to WG leads. Nov 2023–Present

Organiser of the Space Science Center (SSC) Seminar Series at the University of New Hampshire. Invited speakers, advertised, and hosted weekly seminars both in-person and online. Sep 2022–Feb 2023

Public Outreach

Draw the Sun Workshop, Online Apr 2021
Facilitated an online family workshop on solar activity for Imperial College London and the Science Museum, answering questions via live chat during the YouTube stream.

Insights Work Experience Interviewee, Imperial College London, UK Jul 2020
Provided career guidance and research insights to school students as part of the Department of Physics' Insights Work Experience programme.

I'm a Scientist, Get Me Out of Here, Online Jun 2019
Engaged school students in live text-based Q&A sessions about space science, placing as runner-up while inspiring interest in STEM careers.

Space Soundscapes Volunteer, Science Museum, London, UK May 2019
Engaged with families at the Space Soundscapes exhibit during the Summer of Space event celebrating Apollo 11's 50^{th} anniversary, answering space science questions.

Outreach Volunteer, New Cross & Deptford, London, UK Oct 2018
Volunteered with two space-inspired immersive camps for ages 11–15 in underrepresented South East London communities, adapting engagement to inspire diverse abilities and future careers.

Summer Schools

NASA's Living with a Star Heliophysics Summer School, Boulder, CO, USA Jul 2019
Towards Future Research on Space Weather: Concepts and Tools, San Juan, Argentina Jul 2019
STFC Advanced Solar System Plasma Physics Summer School, Southampton University, UK Sep 2018
STFC Introductory Solar System Plasma Physics Summer School, Northumbria University, UK Sep 2017