

CHRISTOPHER EMERSIC

CURRICULUM VITAE, JUN 2023

RESEARCHER

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EDUCATION

PhD (2006) Physics University of Manchester (UK)

- “Investigations into Thunderstorm Electrification Processes”. Supervisor: Dr Clive Saunders
Primarily experimental laboratory investigations, with theoretical and computational elements, advancing understanding of how thunderstorms become electrified.

MPhys (2003) Physics University of Manchester Institute of Science and Technology (UMIST) (UK)

- The MPhys degree is a 4-year combined BSc and Masters degree

APPOINTMENTS HELD

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| Jan 2021–Sep 2023 | Researcher , Electrical Energy and Power Systems, The University of Manchester, UK. <ul style="list-style-type: none">• Various industry-funded projects covering areas associated with offshore floating wind cables and insulation. Experimental investigations relating to mechanical strain, electrical treeing, water treeing, and volume conductivity. Involved supporting postgraduate and undergraduate students. |
| Jan 2019–Jan 2021 | Researcher , Electrical Energy and Power Systems, The University of Manchester, UK. <ul style="list-style-type: none">• EPSRC-funded project (dVdt) investigating influence of high voltage rise times on partial discharge inception voltage and understanding the fundamental physics of partial discharge. Experimental and theory. |
| Apr 2018–Jan 2019 | Researcher , Electrical Energy and Power Systems, The University of Manchester, UK. <ul style="list-style-type: none">• Promoted to Research Fellow. Contracted as the Rolls Royce UTC researcher, assessing challenges for next generation aircraft. |
| Apr 2016–Apr 2018 | Researcher , Electrical Energy and Power Systems, The University of Manchester, UK. <ul style="list-style-type: none">• Worked on several overlapping projects in Power and Energy group including thermal resistivity analysis of backfill materials for underground cables, cable sealing ends, replacements to switchgear SF6 gas, and two projects (ATI and Rolls Royce) assessing challenges for next generation aircraft. |
| Feb 2014–Apr 2016 | Researcher , Electrical Energy and Power Systems, The University of Manchester, UK. <ul style="list-style-type: none">• Changing schools and scientific area, worked on an EU funded project PECOAT, investigating novel coatings for aerospace high voltage power electronics. Developed skills in thermal imaging, microscopy, and high voltage use. Involved supervision support of undergraduate, summer intern, and Masters students. |
| June 2013–Feb 2014 | Researcher , Centre for Atmospheric Science, The University of Manchester, UK. |

- This industry-funded project consisted of two related experimental laboratory projects regarding the visibility of LED lighting technology through fog using a large cloud chamber facility. New skills included learning to use optical spectrometers and working under non-disclosure agreements. Co-supervised MPhys students.
- June 2009–Jun 2013** **Researcher**, Centre for Atmospheric Science, The University of Manchester, UK.
- This post involved several projects and a range of responsibilities, including designing and implementing many laboratory studies into several areas of cloud microphysics using the large cloud chamber facility, low temperature freezers, the vertical wind tunnel, and high-speed video recording. Took responsibility for general management of the laboratory, supported other projects, and mentored numerous students. Several publications produced.
- Nov. 2008–May 2009** **Researcher**, University of Oklahoma, CIMMS, OK, USA
- Successfully bid for an NSF research grant (ATM-0813767). Led a project involving lightning and phased array radar analysis of an Oklahoma hailstorm. This was the first of such studies globally to use high temporal resolution phased array radar in combination with 3D lightning mapping data for storm electrical analysis. Published in 2011.
- March 2008–Nov. 2008** **Researcher**, New Mexico Institute of Mining and Technology, NM, USA
- Responsible for contributing to preparations and execution of a several-month field program in West Virginia, USA, during the summer of 2008, working with Drs Paul Krehbiel and Graydon Aulich. This later involved maintaining continuous operation of a rural mobile lightning mapping array network in addition to lengthy experiments in an underground mine to detect lightning transients. The sensitive nature of the project prevented publications.
- Feb. 2007–Feb. 2008** **NRC Postdoctoral Research Associate**, University of Oklahoma, NOAA, NSSL, OK, USA
- Successfully awarded the NRC fellowship by The National Academies in the United States. The project involved lightning and dual polarimetric radar analysis of the electrical evolution of an Oklahoma winter storm.

PUBLICATIONS (FIRST-AUTHORED, PEER-REVIEWED, JOURNAL)

1. **Emersic, C.**, Cotton, I., 2022, “Experimental comparison of partial discharge between fast-switching pulse waves and square waves”, *J. Phys. D: Appl. Phys.*
<https://doi.org/10.1088/1361-6463/ac7e06>
2. **Emersic, C.** and C. P. R. Saunders, “The influence of supersaturation at low rime accretion rates on thunderstorm electrification from field-independent graupel-ice crystal collisions,” *Atmos. Res.*, vol. 242, no. February, p. 104962, Sep. 2020., 10.1016/j.atmosres.2020.104962
3. **Emersic, C.**, Lowndes, R., Cotton, I., Rowland, S., Freer, R., 2017, The Effects of Pressure and Temperature on Partial Discharge Degradation of Silicone Conformal Coatings, *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 24, pp. 2986–2994, DOI: 10.1109/TDEI.2017.006466
4. **Emersic, C.**, Lowndes, R., Cotton, I., Rowland, S., Freer, R., 2017, Observations of Breakdown through Printed Circuit Board Polymer coatings via a Surface Pollution Layer, *IEEE Transactions on Dielectrics and Electrical Insulation*, vol. 24, pp. 2570–2578, DOI: 10.1109/TDEI.2017.005814

5. **Emersic, C.**, P. J. Connolly, Microscopic Observations of Riming on an Ice Surface Using High Speed Video, 2017, Atmospheric Research, vol. 185, pp. 65-72
6. **Emersic, C.**, Lowndes, R., Cotton, I., Rowland, S., Freer, R., 2016, Degradation of Conformal Coatings on Printed Circuit Boards due to Partial Discharge, IEEE Transactions on Dielectrics and Electrical Insulation, vol. 23, pp. 2232-2240, DOI: 10.1109/TDEI.2016.7556499
7. **Emersic, C.**, Connolly, P. J., Boulton, S., Campana, M., and Li, Z. Investigating the discrepancy between wet-suspension and dry-dispersion-derived ice nucleation efficiency of mineral particles, Atmos. Chem. Phys., 15, 11311-11326, 2015, www.atmos-chem-phys.net/15/11311/2015/, DOI: 10.5194/acp-15-11311-2015
8. **Emersic, C.**, P. J. Connolly, 2011, The breakup of levitating water drops observed with a high-speed camera, Atmos. Chem. Phys. Discuss., doi:10.5194/acpd-11-11739-2011
9. **Emersic, C.**, P. L. Heinselman, D. R. MacGorman, and E. C. Bruning, 2011, Lightning Activity in a Hail-Producing Storm Observed with Phased-Array Radar. Mon Weather Rev, 139, 1809–1825, DOI: 10.1175/2010MWR3574.1.
10. **Emersic, C.**, and C. P. R. Saunders, 2010, Further laboratory investigations into the Relative Diffusional Growth Rate theory of thunderstorm electrification. Atmos Res, 98, 327–340, DOI: 10.1016/j.atmosres.2010.07.011.
11. **Emersic, C.**, Investigations into thunderstorm electrification processes, Ph.D. thesis, The University of Manchester, Manchester, UK, 2006W

OTHER PUBLICATIONS (PEER-REVIEWED, JOURNAL)

1. Zhang, X., Cotton, I., Li, Q., Rowland, S., **Emersic, C.**, Lian, C., Li, W., 2022, “Experimental verification of the potential of superhydrophobic surfaces in reducing audible noise on HVAC overhead line conductors”, High Voltage, <https://doi.org/10.1049/hve2.12200>
2. Diab, M., Zhou, W., **Emersic, C.**, Yuan, X., Cotton, I., 2021, “Impact of PWM Voltage Waveforms on Magnet Wire Insulation Partial Discharge in SiC-Based Motor Drives”, IEEE Access, 10.1109/ACCESS.2021.3129266
3. Lian, C., **Emersic, C.**, Rajab, F. H., Cotton, I., Zhang, X., Lowndes, R., Li, L., 2021, “Assessing the Superhydrophobic Performance of Laser Micropatterned Aluminium Overhead Line Conductor Material”, IEEE Transactions on Power Delivery
4. Connolly, P. J., **Emersic, C.**, and Field, P. R. “A laboratory investigation into the aggregation efficiency of small ice crystals”, Atmos. Chem. Phys. Discuss., 11, 25655-25707, 10.5194/acpd-11-25655-2011, 2012.
5. Saunders, C.P.R., H. Bax-Norman, **C. Emersic**, E.E. Avila, and N.E. Castellano, “Laboratory studies of the effect of cloud conditions on graupel/crystal charge transfer in thunderstorm electrification”, Quart. J. Roy. Meteor. Soc., 132, 2653–2673, 2006, <https://doi.org/10.1256/qj.05.218>

FELLOWSHIPS

- 2007** United States NRC Research Associateship Program. One of only 28 scholars from the UK to receive the award in over 50 years since the program started.
<http://sites.nationalacademies.org/PGA/RAP/index.htm>

RESEARCH GRANTS

- 2008** NSF (ATM-0813767): **Emersic, C.**, Heinselman, P. (2008), High Temporal-Resolution Analysis of Electrical Activity in a Severe Hailstorm Scanned Using Phased Array Radar

SUPERVISION

- 2014–2022** Supported 8 MSc and 4 PhD students. This has involved training on best practice for laboratory equipment (e.g., microscopes and goniometers), guidance on research direction into new areas, data analysis, and 1:1 coaching on report structure in the context of the research they have been doing. The support for reporting in particular

has resulted in positive personal feedback from students who indicate it was especially helpful to them in understanding an area they have typically struggled with.

2009–2014 Co-supervised the research projects of several MPhys students using large and smaller-scale facilities in the ice labs. One student won the school award for highest project performance and best report.

JOURNAL ASSOCIATIONS

2009–Present Regularly peer-review manuscripts, principally in thunderstorm electrification

2011–2015 Associate Editor for Monthly Weather Review journal

2009–2016 Peer reviewer for: Journal of Atmospheric Chemistry and Physics, Monthly Weather Review, and large consortium NSF proposals

INVITED TALKS

2019 (Nov) **CTR Wilson Meeting 2019 for Atmospheric Electricity:** Presented research from the latest publication into thunderstorm electrification

2015 (Feb) **Rolls-Royce, Derby, UK:** Research on novel coatings for aircraft power electronics

2012 **Met Office, Exeter, UK:** Latest in laboratory studies of thunderstorm electrification

PROFESSIONAL TRAINING AND DEVELOPMENT

2014 **HEA Associate Fellowship:** Completed an accredited several-month course on teaching in higher education, involving reflective practice on principles and planning of teaching and learning for small and large groups, supervising students, and practical teaching experience.

KNOWLEDGE TRANSFER, OUTREACH, AND EDUCATION

2018-2019 **UHVNET conference support:** Member of organisation committee for the UHVNET 2019 conference, supporting students to present their research.

2015–2018 **IET HVET course support:** Presented and demonstrated current research accessibly to a wide audience of delegates, including non-experts, at an annual national meeting hosted by our group and university. Feedback from delegates praised the demonstrations.

2015 **Myth or Science: In the Eye of the Storm:** Recorded demonstrations and interviews on atmospheric physics for Canadian media company Myth 4 Productions Inc.

2014 **Wild Weather with Richard Hammond:** Conducted atmospheric physics related experiments and provided explanations for a BBC One weather series.

2013 **Science spectacular Science Fair:** Led a subdivision science public engagement demonstration representing the university and school. Outreach activities involved practical experimental engagement of research with the public and doubled up as a co-supervised MPhys undergraduate student project. Hundreds of people attended and feedback showed the event was both enjoyable and educational.

2012 **Local high school careers fair:** Was selected by the Institute of Physics Teacher Network Coordinator for Greater Manchester to participate in a local high school's careers fair for Year 10 students to encourage a career in science.

2010–2013 **Facility website:** Produced an extensive interactive educational website for the public on the MICC facility. Received considerable interest and feedback from the public.

2012 **Channel 5 “The World’s Scariest Weather”:** Interview covering flash floods, hail, tornadoes, and dust storms.

2012 **Winstanley College:** Invited to participate in a question time panel discussion representing the science voice.

- 2012** **BBC1 “The One Show”**: Interviewed about frost and ice. Performed several cold room and low temperature freezer experiments.
- 2012** **BBC1 “The One Show”**: Interviewed about thunder shockwaves. Suggested and supported spectacular demonstrations at Abingdon Lightning Test Facility, Oxford.
- 2011** **BBC1 “Will it snow?”**
- 2011** **BBC1 “The Weather: Snow”**
- 2010** **BBC1 “Bang Goes the Theory”**
- 2003–2006** Four documentaries for BBC and Discovery channel on thunderstorms and lightning

OTHER

- Experience using high speed cameras (Photron Fastcam MC1 & MC3) and filming in very challenging environments (low temperatures, microscopic conditions)
- Experienced in thermal camera imaging
- Proficient with Microsoft Office software, particularly Word, Excel, PowerPoint, OneNote
- Experienced with EndNote bibliography software
- Some experience with Matlab, C++, COMSOL multiphysics
- Proficient with Microsoft operating systems; familiar with Linux

REFEREES

- Professor Ian Cotton, University of Manchester, UK: ian.cotton@manchester.ac.uk
- Dr Clive Saunders, University of Manchester, UK: clive.saunders@gmx.com
- Professor Ann Webb, University of Manchester, UK: ann.webb@Manchester.ac.uk
- Dr Donald MacGorman, University of Oklahoma, USA: don.macgorman@noaa.gov
- Dr Paul Krehbiel, New Mexico Institute of Mining and Technology, USA: krehbiel@ibis.nmt.edu
- Dr Graydon Aulich, New Mexico Institute of Mining and Technology, USA: aulich@grosbeak.nmt.edu