

CHRISTOPHER EMERSIC

CURRICULUM VITAE, NOVEMBER 2018

RESEARCH FELLOW

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EDUCATION

PhD (2006) Physics University of Manchester (UK)

- Investigations into Thunderstorm Electrification Processes. Supervisor: Dr Clive Saunders
Designed and conducted laboratory cold room experiments and developed theoretical work into thunderstorm charging mechanisms, focusing on the Relative Growth Rate hypothesis.

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

Apr 2018–Present **Research Fellow**, Electrical Energy and Power Systems, The University of Manchester, UK.

- Promoted to Research Fellow. Contracted as the Rolls Royce UTC researcher, assessing challenges for next generation aircraft.

Apr 2016–Apr 2018 **Postdoctoral Research Associate**, Electrical Energy and Power Systems, The University of Manchester, UK.

- 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 **Postdoctoral Research Associate**, Electrical Energy and Power Systems, The University of Manchester, UK.

- 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 **Postdoctoral Research Associate**, 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 **Postdoctoral Research Associate**, 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 and presentations produced.

Nov. 2008–May 2009 **Postdoctoral Research Associate**, 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 **Postdoctoral Research Associate**, 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 (PEER REVIEWED)

1. **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
2. **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
3. **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
4. **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
5. **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
6. 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, DOI: 10.5194/acpd-11-25655-2011, 2012.
7. **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
8. **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.

9. **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.
10. 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
11. **Emersic, C.**, Investigations into thunderstorm electrification processes, Ph.D. thesis, The University of Manchester, Manchester, UK, 2006

CONFERENCE PROCEEDINGS AND PRESENTATIONS

1. **Emersic, C.**, Cotton, I., Smith, A., 2017, High Voltage Systems – Challenges For Future Aircraft, Symposium: Hybrid-electric and Electric Aircraft – research dissemination, Woburn House, London, 30 May 2017.
2. **Emersic, C.**, Lowndes, R., Cotton, I., Rowland, S., Freer, R., 2015, Degradation of printed circuit board coatings due to partial discharge, 2015 IEEE Electrical Insulation Conference (EIC), Renaissance Seattle Hotel, Seattle, Washington, USA, 7–10 June.
3. R. Lowndes, I. Cotton, **C. Emersic**, S. Rowland, and R. Freer, 2015, Thermal Stresses of conformal coatings on Printed Circuit Boards, 2015 IEEE Electrical Insulation Conference (EIC), pp. 106–109.
4. **Emersic, C.**, Heinselman, P., MacGorman, D. R., 2009, High Temporal-Resolution Analysis of Electrical Activity in a Severe Hailstorm Scanned Using Phased Array Radar, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract AE43B-0275
5. **Emersic, C.**, MacGorman, D. R., Schurr, T., Ramig-Lund, N., Payne, C., Bruning, E. (2007), Lightning Activity Relative to the Microphysical and Kinematic Structure of Storms during a Thunder-Snow Episode on 29-30 November 2006, *Eos Trans. AGU*, 88(52), Fall Meet. Suppl., Abstract AE43A-01
6. Saunders, C. P. R. and **Emersic, C.**, Thunderstorm Electrification: Asymmetric Charging, Ice Crystal/Graupel Charging and Anomalous Zones. Abstract ICAE Beijing 2007.
7. **Emersic, C.**, Saunders, C. P. R. 2006. An extension and new interpretations of the Dash theory of the molecular dynamics of vapour growth in the Relative Growth Rate mechanism of thunderstorm charging. EGU General Assembly, Vienna.

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

- 2014–2018** Supported 8 MSc and 3 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

- 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

- 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.

OTHER LEADERSHIP AND ROLES

- 2017–2018** **Development of laboratory large walk-in environmental chamber:** Prior experience with cold room environmental chambers provided an opportunity to lead design and development of a major new laboratory facility partly funded by a £1.9m EPSRC equipment award. This facility provides a unique and significant opportunity in aerospace research and testing under a range of relevant atmospheric conditions. Designs requiring new technology were successfully developed over a year after liaising with multiple national companies.
- 2012–2016** **Faculty Researcher Development Ambassador:** Was hand-selected for appointed role of Faculty Researcher Development Ambassador. The leadership position principally involved acting as a two-way liaison between research staff and faculty in addition to championing the professional and career development of fellow research staff. Successful initiatives included the creation of a much loved 60+ page website supporting development and containing everything a postdoc could need to go about their day-to-day work, and hosting regular open forums to engage with postdocs to share ideas and feedback. Successfully bid for and awarded funding for initiatives.
- 2012–2013** **Practical class demonstration:** Two years assisting statistics course practical lab for second year students, involving use of Microsoft Excel and Matlab.
- 2012** **Scientific meeting organisation:** Organised and hosted a successful small day-long national scientific meeting as part of a consortium grant project. Responsibilities ranged from planning agenda, booking room & catering, to facilitating sessions.

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

COLLABORATORS

- The University of Manchester** Professor Ian Cotton, Professor Simon Rowland, Professor Robert Freer, Dr Clive Saunders, Dr David Schultz, Professor Ann Webb
- The University of Oklahoma** Dr Donald MacGorman, Dr Dave Rust, Dr Ted Mansell, Dr Eric Bruning, Dr Pamela Heinselman
- New Mexico Institute of Mining and Technology**
Dr Graydon Aulich, Dr Paul Krehbiel, Dr Ron Thomas, Dr Bill Rison, Dr Bill Winn, Dr Richard Sonnenfeld
- Other** Dr Romyana Mitzeva (University of Sofia, Bulgaria), Dr Phil Krider (University of Arizona), Drs Eldo Avila and Nesvit E. Castellano (FaMAF, Universidad Nacional de Córdoba, IFEG-CONICET, Córdoba, Argentina)

REFEREES

- Professor Ian Cotton, University of Manchester, UK: ian.cotton@manchester.ac.uk
- Dr Clive Saunders, University of Manchester, UK: clive.saunders@manchester.ac.uk
- Professor Ann Webb, University of Manchester, UK: ann.webb@Manchester.ac.uk
- Professor Simon Rowland, University of Manchester, UK: s.rowland@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