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About

Dr Andrew Quinn is a Senior Lecturer and previously RCUK Research Fellow in Civil Engineering and Environmental Science. His research focuses on the interactions between infrastructure, particularly transport systems, renewable energy and extreme weather events/climate change and how these impact on the resilience of communities and services.

Prior to this appointment he was part of the internationally recognised Wind Engineering group at the former BBSRC Silsoe Research Institute. He has been investigator on projects for EPSRC, BBSRC, NERC, defra , EU and industry funded work for many organisations including the UK Met Office and Network Rail. This work has included complex full-scale measurement campaigns supporting high profile projects such as the main Olympic stadium in Stratford, mathematical modelling, and statistical treatments to combine observations and modelling in risk analysis. Further information can be found at **www.windresearch.org (http://www.windresearch.org/)** .

The results of this work have been published in over 25 research papers in scientific journals and a similar number of conference presentations. His work has been recognised with several awards including two for outstanding quality and innovation in teaching undergraduate students.

Qualifications

- Fellow of the Higher Education Academy, 2008
- Post Graduate Certificate in Learning and Teaching in Higher Education, 2008
- Chartered Scientist, 2005
- Chartered Mathematician and Member of the Institute of Mathematics and its Applications, 2001
- PhD in Civil Engineering, 1996
- BSc (Hons) in Mathematical Physics, 1992

Biography

Dr Quinn read Mathematical Physics at the University of Nottingham before undertaking a PhD in Civil Engineering in conjunction with the Wind Engineering group at the former BBSRC Silsoe Research Institute. After successfully completing this work he remained at SRI for almost 10 years working on a wide range of multi-disciplinary projects funded by EPSRC, BBSRC and the EU as well as industrially funded projects including diagnosing the “wobbly” Millennium footbridge in London. These led to improvements in the understanding of ventilation, wind conditions, vehicle aerodynamics and pollution movement as well as new guidelines for farm animal welfare through improved ventilation.

Dr Quinn moved to the University of Birmingham as RCUK Research Fellow in Civil Engineering in 2005. Since taking up this role he has been involved in a wide range of research and teaching activities. These include developing new approaches to teaching engineers about climate change and natural hazards such as wind and storms. These contributions have recently been recognised by two awards for Excellence in Teaching and Student Support.

Teaching

Teaching Programmes

- BEng/MEng Civil Engineering

Postgraduate supervision

Dr Quinn is interested in supervising doctoral research students in the following areas:

- Wind structure and statistics
- Wind effects on transport systems and vehicles
- Wind Energy resource assessment
- Climate change impact assessment on infrastructure and utilities
- Resilience of infrastructure and communities to extreme weather events

Research

RESEARCH THEMES
Resilience; Climate Change; Vehicle Aerodynamics (Road and Rail) and Infrastructure; Transport Systems; Wind Engineering and Wind Energy resource assessment

RESEARCH ACTIVITY

Dr Quinn's research interests cover the broad field of resilience to environmental factors, such as climate change and extreme weather events, and the field of transport systems including pollution and air-quality issues. In resilience to climate change there are significant potential long-term implications for infrastructure adaptation and use that a changing climate and changing social usage patterns will mean. In the short-term there are also significant disruptive potentials from extreme weather events, near- or beyond-capacity usage and aging infrastructure with faster or heavier vehicles. Underpinning both of these fields is an interest in the fundamental study of wind features in the atmospheric boundary layer including coherent structures, extreme wind gusts and the role of topography on wind conditions.

Dr Quinn is currently involved in the EPSRC CDFA project Resilience through Innovation: critical local transport and utility infrastructure (EP/I016163/1), the EPSRC ARCC **FUTURENET project (http://www.arcc-futurenet.org)** (EP/G060762/1), the EU FP7 **AeroTRAIN project (http://www.triotrain.eu)**, the NERC systematic review of wind climate impacts on building design and operations and a multi-disciplinary project on the Persistent Resilience of communities.

Previous projects include EU WEATHER – Wind Early Alarm System for Terrestrial Transport Handling Evaluation of Risks which was a ground-breaking EU project seeking to improve road safety through an understanding of the side-wind forces on large vehicle which are a major cause of accidents. This work complimented several studies of road and rail vehicle slipstreams and the effect on road/trackside objects that Dr Quinn has undertaken for UK and international clients.

He is also involved in a number of initiatives in the field of Wind Energy, particularly the testing of micro-scale wind turbines and wind energy resource assessment at all scales. Underpinning this is an interest in the study of vortex structure identification, and other types of non-synoptic wind features, in the atmospheric boundary layer and their impacts on transport systems, structures and pollutant movement through the environment. This has led to several projects evaluating the risk to vehicles in exposed locations and the potential for local recapture of pollution by vegetation.

Previous studies have also included the study of extreme wind characteristics for Network Rail, wind structure characterisation, the effects of topography on local wind conditions and vehicle slipstream effects. These studies have been geared toward the improvement of safety for road and rail workers as well as the general public. For example in the EPSRC LINK project "the measurement of wind forces on large temporary road signs" research was undertaken to ascertain the relative importance of local wind conditions and passing vehicles on the aerodynamic forces impinging on temporary safety road signage equipment.

The research indicated that vehicle induced forces play a key role in temporary signage system failures and that such failures can be counter-intuitive in nature. The main outcome of the project was the development of a new draft British Standard for such signage which was supported by the industry as being more realistic of actual roadside conditions.

A second project highlighted the link between the aerodynamics of high-speed trains and the maintenance costs of damage by flying ballast stones to both vehicle and infrastructure.

An important element of all these studies has been the interplay between full-scale measurements, computational modelling and complex data assimilation during the analysis phase. Bringing these elements together in a coherent and sensible way is a challenge because of the very different backgrounds each has developed from and the very diverse assumptions each therefore makes. This raises a number interesting practical and statistical issues for future research.

Other activities

- UK Wind Engineering Society committee (2005-2007)
- EACWE 2013 international conference organising committee (since 2009)

Publications

Martinez-Vazquez P., Sterling M., Baker C.J., Quinn A.D., Richards P.J., (2011) Autorotation of Square Plates, with Applications to Windborne Debris. **Wind and Structures** 14(2).

Gil, N., Baker, C.J., Roberts, C. and Quinn, A.D. (2010) Passenger Train Slipstreams Characterization Using a Rotating Rail Rig. **ASME Journal of Fluids Engineering** 132(6) doi:10.1115/1.4001577.

Quinn, A.D. and Baker, C.J. (2010) Spatial and temporal correlations of wind speeds. **Proceedings of ICE, Structures and Buildings** 163(2) 65-72. doi: 10.1680/stbu.2010.163.2.65

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Kakimpa, B., Martinez-Vazquez, P., Hargreaves, D. M., Owen, J. S., Baker, C.J., Sterling, M. and Quinn, A. D. (2010) CFD Modelling of Plate Free-Flight and Auto-Rotation. **Wind and Structures** 13(2) 169-189.

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Sterling, M., Quinn, A.D., Hargreves, D.M., Cheli, F., Sabbioni, E., Tomasini, G., Delaunay, D., Baker, C.J. and Morvan, H. (2010) A comparison of different methods to evaluate the wind induced forces on a high sided lorry. **Journal of Wind Engineering and Industrial Aerodynamics** 98(1) 10-20 (doi: 10.1016/j.jweia.2009.08.008).

Dobney, K., Baker, C.J., Chapman, L. and Quinn, A.D. (2010) The Future Cost to the UK's Railway Network of Heat Related Delays and Buckles Caused by the Predicted Increase in High Summer Temperatures Due to Climate Change. **Proceedings of the Institution of Mechanical Engineers Part F- Journal of Rail and Rapid Transit** 224(1) 25-34 (doi: 10.1243/09544097JRRT292).

Baker, C.J., Chapman, L., Quinn, A.D. and Dobney, K. (2010) Climate Change and the Railway Industry. **Proceedings of the Institution of Mechanical Engineers, Part C- Journal of Mechanical Engineering Science** 224(3) 519-528 (doi: 10.1243/09544062JMES1558).

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Sterling, M., Baker, C.J., Richards, P.J., Hoxey, R.P., Quinn, A.D. (2006) An investigation of the wind statistics and extreme gust events at a rural site. **Wind and Structures** 9 (3), 193-215.

Yang, T., Wright, N.G., Etheridge, D.W. and Quinn, A.D. (2006) A Comparison of CFD and Full-scale Measurements for Analysis of Natural Ventilation**. International Journal of Ventilation**, 4(4), 337-348

Sterling, M., Baker, C. J., Quinn, A. D., and Hoxey, R. P., (2005) Pressure and Velocity Fluctuations in the Atmospheric Boundary Layer. **Wind and Structures**, 8(1), 13-34

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