

# Greg Lewis, PhD

Associate Professor, Mathematics, Faculty of Science at University of Ontario Institute of Technology  
Oshawa, ON, CA

Understanding fundamental atmospheric flow patterns and how they relate to climate change

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Climate change is one of the greatest threats to environmental and economic health, forcing the hand of governments, academia and industry to take increasing action towards a globally sustainable future. The dynamics of the atmosphere play a central role in the climate and climate change, and yet, this role is not well understood. A search for a better understanding of the atmosphere's inherent behaviour and its relation to the climate are at the centre of the research of Greg Lewis, PhD, Associate Professor of Mathematics in the Faculty of Science. His research focuses on the mathematical analysis of geophysical fluid dynamics, the naturally occurring, large-scale flows in the ocean and atmosphere. Although many factors such as changes in temperature, rotation, topography and the formation of clouds affect the dynamics of atmospheric systems, Dr. Lewis' research centres on the effects of the primary factors, namely, heating and rotation. In particular, his research aims to determine the flow patterns that are expected as these factors are varied. A better understanding of such atmospheric dynamics may lead to improvements in the global climate models used to predict climate change. Appointed to his current role in 2008, Dr. Lewis joined UOIT in 2003 as its first Assistant Professor of Mathematics. Since then, he has been rigorously building the university's Applied and Industrial Mathematics, and Modelling and Computational Science undergraduate and graduate programs and growing the overall department. His early teaching and research influence has helped distinguish UOIT's unique mathematics-based programs. His inherent desire to understand how things work, initially led Dr. Lewis towards physics, earning his Bachelor of Science in Honours Physics and his Master of Science in Physics from McGill University, before shifting gears and completing his Doctorate in Applied Mathematics from the University of British Columbia (UBC). Subsequently, he was awarded three post-doctoral fellowships with the Peter Wall Institute for Advanced Studies in the Departments of Mathematics and Earth and Ocean Sciences at UBC, as well as NSERC and Jerrold E. Marsden fellowships with The Fields Institute of Research in Mathematical Sciences at the University of Toronto. He has been an invited Distinguished Alumni Lecturer at UBC's Institute of Applied Mathematics, and is an Adjunct Professor in the Department of Mathematics and Statistics at York University in Toronto.

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Education/Learning, Research, Program Development

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Applied Dynamical Systems, Geophysical Fluid Dynamics, Numerical Bifurcation Analysis, Quantitative Analysis, Simulation

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Canadian Applied and Industrial Mathematics Society , Society for Applied and Industrial Mathematics

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**A Numerical Study of the Effects of Inhomogeneous Media in Diffusion Weighted Imaging**  
2015 Applied Mathematics, Modelling and Computational Science-Canadian Applied and Industrial Mathematics Congress

**Invited Talk: Hopf Bifurcation with 1:2 Spatial Resonance in an Air-Filled Differentially Heated Rotating Annulus**

Dynamical Systems in Fluid Mechanics Session of the 11th World Congress on Computational Mechanics/5th European Conference on Computational Mechanics/6th European Conference on Computational Fluid Dynamics

**Invited Talk: Matrix-Free Methods for Electroconvection**

Canadian Symposium on Fluid Dynamics/2014 Canadian Applied and Industrial Mathematics Annual Meeting

**Invited Talk: The Primary Flow Transition in the Baroclinic Annulus: Prandtl Number Effects**

EUROMECH Colloquium 552

**Single Parameter Spatiotemporal Model for the Depth Perception in Weakly Electric Fish**

2013 Canadian Applied and Industrial Mathematics Annual Meeting

**Invited Talk: Secondary Transitions and Instabilities in Geophysical Fluids**

Canadian Symposium on Fluid Dynamics/2012 Annual Meeting of the Canadian Applied and Industrial Mathematics Society

**Secondary Transitions and Instabilities in Geophysical Fluids**

SHARCNet Research Day 2012

**Invited Talk: Mixed-Mode Solutions in an Air-Filled Differentially Heated Rotating Annulus. Spatial Resonance**

Fluid Dynamics Symposium of the Canadian Mathematics Society Winter Meeting

**Invited Talk: Secondary Flow Transitions in the Differentially Heated Rotating Annulus**

International Congress of Applied and Industrial Mathematics - ICIAM 2011

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**University of British Columbia**

PhD Applied Mathematics

**McGill University,**

MSc Physics

**McGill University**

BSc Honours Physics

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**Board of Directors, Canadian Applied and Industrial Mathematics Society (CAIMS)**

Since 2013, Dr. Lewis has been a Board of Directors member-at-large, and member of the CAIMS Doctoral Dissertation Awards Committee. CAIMS has a growing presence in industrial, mathematical, scientific and technological circles within and outside of Canada.

**Editor, Fields Institute Mathematics-in-Industry Case Studies Journal**

This journal aims to meet the publication needs of the burgeoning community of mathematicians who work on problems that are important to industry. Its central theme is the stimulation of innovative mathematics, statistics and related computational methods, by the modelling and analysis of such problems across engineering and the physical, biological and social sciences. Emphasis is on case studies drawn from actual applications of mathematics to industrial problems.

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