Fernando E. Camelli, Ph.D.

Professional Preparation

George Mason University	Ph.D. in Computational Sciences and Informatics	2002
University of Buenos Aires	Undergraduate Studies in Physics	1990

Appointments

2014-present	Associate Professor in the Department of Physics and Astronomy, College of Science, George Mason University
2007-2014	Assistant Professor in the School of Physics, Astronomy and Computational and Sciences, College of Science, George Mason University
2003-2007	Research Assistant Professor in the Center for Computational Fluid Dynamics at the Department of Computational Data and Sciences (CDS), College of Science, George Mason University
2002-2003	Assistant Research Scientist in the Laboratory for Computational Fluid Dynamics at the School of Computational Science (SCS), George Mason University
1998-2009	Instructor of undergraduate level courses in the Physics Department, George Mason University

Field of Expertise and Research Overview

My research pioneered the application of Computational Fluid Dynamics (CFD) to the study of transport and dispersion of pollutants in large urban environments. I have extensive experience porting finite-element CFD codes to diverse high-performance computing (HPC) platforms and developing scalable numerical methodologies for complex, real-world flow problems.

I develop CFD models and techniques to analyze pollutant dispersion around ship superstructures and the transport of gaseous emissions from ship stacks. These methodologies were applied to studies of flow and thermal behavior for the San Antonio–class LPD-17 and later extended to the T-AKE 1, a new generation of U.S. Navy transport ships. This work included the detection and analysis of critical flow features in helicopter landing areas.

I have also led the development of datasets supporting applied research, including datasets used in helicopter flight simulators for the LPD-17. In parallel, I have developed algorithms to automate geometry extraction of buildings and complex terrain, significantly accelerating CAD reconstruction for dense urban environments and triangulated terrains. These technologies have been integrated into FEFLO-PC with AT Planner and VAPO, as part of the Center for Blast Mitigation at George Mason University.

In 2005, I provided computational support to the Department of Homeland Security (DHS) dispersion experiments in New York City, performing simulations of atmospheric transport and dispersion around Madison Square Garden.

Research Areas

- Transport and dispersion of pollutants in urban environments
- Turbulence modeling: Large Eddy Simulation (LES) and Very Large Eddy Simulation (VLES)
- Time-dependent inflow boundary conditions for LES
- Flow patterns on ship decks for helicopter and unmanned vehicle operations
- CAD and computational geometry for automated urban and terrain modeling
- High-performance computing and parallel algorithms
- Subway climatology

Scholarly Output: Over 35 peer-reviewed journal publications and 40+ conference presentations.

Teaching Experience

Since 1998, I have taught at the College of Science and the School of Computational Science at George Mason University. Prior to this appointment, I taught in the Department of Physics at the University of Buenos Aires. Teaching is central to my professional identity, and I emphasize both conceptual understanding and the development of computational and analytical skills.

Primary Teaching Focus: Computational Physics

- PHYS 251: Introduction to Computer Methods in Physics.
- PHYS 325: Intermediate Computer Methods in Physics.
- PHYS 410: Computational Physics Capstone.
- PHYS 408: Senior Research

Additional Courses Taught

- PHYS 244, 246, and 161.
- PHYS 613: Computational Physics II.
- CDS 351: Introduction to Scientific Programming.
- CSI 501: Introduction to Scientific Programming.
- CSI703: Scientific and Statistical Visualization.
- CSI603 and CSI604: Introduction to Scientific Programming.

- CSI729: Topics in Continuum Systems.
- CSI 999: Doctoral Dissertation.
- CSI 998: Doctoral Dissertation Proposal.

A core aspect of my teaching philosophy is individualized instruction. I maintain flexible office hours and an open-door policy, encouraging ongoing dialogue with both undergraduate and graduate students. Throughout my career, I have remained committed to excellence in teaching and to fostering critical thinking skills.

Teaching Assistant Experience

- Classical Mechanics (Goldstein level), University of Buenos Aires (1990–1992)
- Undergraduate Mathematics, University of Buenos Aires (1986)

Skills and Professional Accomplishments

- Extensive experience in physical and numerical modeling of atmospheric turbulence and pollutant dispersion
- Expertise in numerical methods for PDEs: FEM, FVM, FDM
- Development of automated geometry extraction algorithms for buildings and complex terrain
- Lead investigator on U.S. Navy CFD studies for ship-stack gas dynamics (LPD-17 and T-AKE 1)
- Principal Investigator, College of Science Seed Grant (GMU), for automated building extraction from high-resolution remote sensing data
- System administrator for the College of Science High-Performance Computing system (five years)
- Service on departmental committees: Information Technology, Distance Learning, Affiliate Committees
- Administration of the CDS Computer Laboratory, Research Building I, Room 249
- Research on alternative energy systems (solar cells) at the Argentinean Nuclear Energy Commission (CNEA)
- Development of graphical user interfaces for FEFLO codes (Motif, OpenGL, C)
- Porting of legacy GL graphics calls to OpenGL for Linux platforms

Reviewer for Peer-Review Journal

- International Journal of Computational Fluid Dynamics (IJCFD)
- International Journal of Numerical Methods in Fluids (IJNMF)
- Journal of Applied Meteorology (JAM)
- Physics of Fluids (PF)
- Journal of Zhejiang University Science (JZUS)

Computational Skills

- High-performance computing on IBM, CRAY, and SGI platforms
- Operating systems: AIX, IRIX, Linux
- Programming: C/C++, Fortran 77/90, Python, Julia, Ma
- Parallel computing: MPI, PVM, OpenMP
- Graphics: OpenGL, Motif

Languages

- English (fluent).
- Spanish (fluent).

Publications and Conference Proceedings

Publication in Journals

Camelli, F., Byrne, G., & Löhner, R. (2014). Modeling Subway Air Flow Using CFD. *Tunneling and Underground Space Technology* 43: 20–31

Corrigan, A., R. Löhner, **F. Camelli**, and J. Wallin. "Running Unstructured Grid Based CFD Solvers on Modern Graphics Hardware." *International Journal for Numerical Methods in Fluids* Accepted (2009).

Stück, A., **F. Camelli**, and R. Löhner. "Adjoint-Based Design of Shock Mitigation Devices." *International Journal for Numerical Methods in Fluids* Accepted (2009).

Löhner, R., J. R. Cebral, **F. Camelli**, S. Appanaboyina, J .D. Baum, E. L. Mestreau, and O. Soto. "Adaptive Embedded and Immersed Unstructured Grid Techniques." *Computer Methods in Applied Mechanics and Engineering* 197, no. 25-28 (2008): 2173-97.

Löhner, R., J. R. Cebral, **F. Camelli**, J .D. Baum, E. L. Mestreau, and O. Soto. "Adaptive Embedded/Immersed Unstructured Grid Techniques." *Archives of Computational Methods in Engineering* 14 (2007): 279-301.

Löhner, R., C. Yang, J. R. Cebral, **F. Camelli**, O. Soto, and J. Waltz. "Improving the Speed and Accuracy of Projection-Type Incompressible Flow Solvers." *Computer Methods in Applied Mechanics and Engineering* 195, no. 23 (2006): 3087-109.

Hanna, S. R., M. J. Brown, **F. Camelli**, S. T. Chan, W. J. Coirier, O. R. Hansen, A. H. Huber, S. Kim, and M. Reynolds. "Detailed Simulations of Atmospheric Flow and Dispersion in Downtown Manhattan. An Application of Five Computational Fluid Dynamics Models." *Bulletin of the American Meteorological Society* 87, no. 12 (2006): 1713-26.

Löhner, R., and **F. Camelli**. "Optimal Placement of Sensors for Contaminant Detection Based on Detailed 3D CFD Simulations." *Engineering Computations* 22, no. 3 (2005): 260 - 73.

Camelli, F., and R. Löhner. "Assessing Maximum Possible Damage for Contaminant Release Events." *Engineering Computations* 21, no. 7 (2004): 748 - 60.

Soto, O., R. Löhner, J. R. Cebral, and **F. Camelli**. "A Stabilized Edge-Based Implicit Incompressible Flow Formulation " *Computer Methods in Applied Mechanics and Engineering* 193, no. 23-26 (2004): 2139-54.

Löhner, R., and **F. Camelli**. "Dynamic Deactivation for Advection-Dominated Contaminant Transport." *Communications in Numerical Methods in Engineering* 20, no. 8 (2004): 639-46.

Cebral, J. R., **F. Camelli**, and R. Löhner. "A Feature-Preserving Volumetric Technique to Merge Surface Triangulations." *International Journal for Numerical Methods in Engineering* 55 (2002): 177-90.

Soto, O., R. Löhner, and **F. Camelli**. "A Linelet Preconditioner for Incompressible Flow Solvers." *International Journal for Numerical Methods for Heat and Fluid Flow* 13, no. 1 (2002): 133-47.

AIAA Publications

Löhner, R., **F. Camelli**, J .D. Baum, and O. Soto. "Simulation of Multiphase Blast-Structure Interaction Via Coupled CFD and CSD Codes." *AIAA Paper 2010-0096* (2010).

Stück, A., **F. Camelli**, and R. Löhner. "Adjoint-Based Design of Passive and Active Shock Mitigation Devices." *AIAA Paper 2010-1430* (2010).

Corrigan, A., **F. Camelli**, and R. Löhner. "Porting of an Edge-Based CFD Solver to GPUs." *AIAA Paper 2010-0523* (2010).

Corrigan, A., **F. Camelli**, R. Löhner, and J. Wallin. "Running Unstructured Grid Based CFD Solvers on Modern Graphics Hardware." *AIAA Paper 2009-4001* (2009).

Stück, A., **F. Camelli**, and R. Löhner. "Adjoint-Based Design of Shock Mitigation Devices." *AIAA Paper 2009-1666* (2009).

Camelli, F., R. Löhner, J. R. Cebral, and E. Mestreau. "Timings of an Unstructured-Grid CFD Code on Common Hardware Platforms and Compilers." *AIAA Paper 2008-0477 [Invited]* (2008).

Camelli, F., R. Löhner, and E. L. Mestreau. "Timings of an Unstructured-Grid CFD Code on Common Hardware Platforms and Compilers." *AIAA Paper 2007-1107* (2007).

Camelli, F., R. Löhner, and S. Hanna. "VLES Study of Flow and Dispersion Patterns in Heterogeneous Urban Areas." *AIAA Paper 2006-1419* (2006).

Camelli, F., R. Löhner, and S. Hanna. "VLES Study of MUST Experiment." *AIAA Paper 2005-1279* (2005).

Camelli, F., R. Löhner, W. C. Sandberg, and R. Ramamurti. "VLES Study of Ship Stack Gas Dynamics." *AIAA Paper 2004-0072* (2004).

Camelli, F., O. Soto, R. Löhner, W. C. Sandberg, and R. Ramamurti. "Topside LPD17 Flow and Temperature Study with an Implicit Monolithic Scheme." *AIAA Paper 2003-0969* (2003).

Löhner, R., C. Yang, J. Cebral, O. Soto, **F. Camelli**, and J. Waltz. "Improving the Speed and Accuracy of Projection-Type Incompressible Solvers." *AIAA Paper 2003-3991-CP* (2003).

Soto, O., R. Löhner, J. R. Cebral, and **F. Camelli**. "A Stabilized Edge-Based Implicit Incompressible Flow Solver." *AIAA Paper 2003-3836-CP* (2003).

Camelli, F., and R. Löhner. "Combining the Baldwin-Lomax and Smagorinsky Turbulence Models." *AIAA Paper 2002-0426* (2002).

Cebral, J. R., **F. Camelli**, and R. Löhner. "Unstructured Grid Generation over Buildings Intersecting Terrain Data Using a Feature-Preserving Volumetric Technique." *AIAA Paper 2002-0860* (2002).

Löhner, R., C. Yang, J. Cebral, O. Soto, **F. Camelli**, J. D. Baum, H. Luo, E. Mestreau, and Sharov. "Advances in FEFLO." *AIAA Paper 2002-1024* (2002).

Löhner, R., C. Yang, J. Cebral, O. Soto, **F. Camelli**, J. D. Baum, H. Luo, E. Mestreau, D. Sharov, R. Ramamurti, W. Sandberg, and C. Oh. "Advances in FEFLO." *AIAA Paper 2001-0592* (2001).

Conferences

Camelli, F., D. W. Wong, R. Löhner, and M. Sonwalkar. "The Importance of Terrain and Building Definitions for Transport and Dispersion CFD Simulations of Pollutants." Paper presented at the 89th American Meteorological Society Annual Meeting, Phoenix, AZ 2009.

Löhner, R., **F. Camelli**, J. D. Baum, and O. Soto. "Simulation of Multiphase Blast-Structure Interaction Via Coupled CFD and CSD Codes." In *Proc. 3rd Int. Conf. Comp. Methods for Coupled Problems in Engineering*. Ischia, Italy, 2009.

Löhner, R., A. Stück, and **F. Camelli**. "Adjoint-Based Design of Passive and Active Shock Mitigation Devices." In *Proc. Int. Symp. 21st Century Challenges in Computational Engineering and Science*. Princeton, NJ, 2009.

Frank, D. , R. Löhner, **F. Camelli**, R. Frank, and A. Amini. "Comparison of a Fast-Running Engineering Model and Coarse Mesh 3d Euler Predictions for Airblast in an Urban Environment." In *Proc. MABS-20 Conf.* Oslo, Norway, 2009.

Rice, D., J .D. Baum, R. Löhner, **F. Camelli**, and A. Amini. "First-Principles Blast Diffraction Simulations on a Laptop Computer: Further Investigation of Resolution and Accuracy." In *Proc. 13th ISIEMS Conf.* Bruhl, Germany, 2009.

Rice, D., J. D. Baum, R. Löhner, **F. Camelli**, and A. Amini. "First Principles Blast Diffraction Simulations on a Laptop Computer: Further Investigation of Resolution Accuracy." In *Proc. 13th ISIEMS Conf.* Bruhl, Germany, 2009.

Löhner, R., **F. Camelli**, R. Frank, and A. Amini. "Comparison of a Fast-Running Engineering Model and Coarse Mesh 3-D Euler Predictions for Airblast in an Urban Environment." In *Proc. MABS-20 Conf.* Oslo, Norway, 2008

Camelli, F., D. W. Wong, M. Sonwalkar, and R. Löhner. "Coupling Computational Fluid Dynamic Models (CFD) and Geographic Information Systems (GIS)." In *11th Annual George Mason University Conference on Atmospheric Dispersion Modeling*. Fairfax, VA, 2007.

Löhner, R., **F. Camelli**, J .D. Baum, and E. Mestreau. "Maximizing Emerging HPC Hardware for Blast and Dispersion Simulations." In *IDA Colloquium on Future Landscape of Computing*. Alexandria, VA, 2007.

Wong, D. W., **F. Camelli**, and M. Sonwalkar. "Integrating Computational Fluid Dynamics (CFD) Models with GIS: An Evaluation on Data Conversion Formats." Paper presented at the Geoinformatics, China 2007.

Camelli, F., S. Hanna, and R. Löhner. "FEFLO CFD Model Study of Flow and Dispersion as Influenced by Tall Buildings in New York City." Paper presented at the Sixth Symposium on the Urban Environment, Atlanta, GA 2006.

Camelli, F., B. Coirier, A. Huber, O. Hansen, S. Kim, S. Hanna, and M. Brown. "An Intercomparison of Four Computational Fluid Dynamics Models: Transport and Dispersion around Madison Square Garden." Paper presented at the 14^{th} Joint Conference on the Applications of Air Pollution Meteorology with the Air and Waste Management Assoc, Atlanta, GA 2006.

Camelli, F., R. Löhner, and S. Hanna. "Dispersion Patterns in a Heterogeneous Urban Area." In *DHS R&D Conference*. Boston, MA, 2005.

Camelli, F., R. Löhner, and S. Hanna. "Dispersion Patterns in a Heterogeneous Urban Area." Paper presented at the VIII Argentinean Congress on Computational Mechanics, Buenos Aires, Argentina 2005.

Camelli, F., S. Hanna, and R. Löhner. "VLES Study of Flow and Dispersion Patterns in Midtown Manhattan." Paper presented at the 9^{th} Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling, Fairfax, VA 2005.

Löhner, R., C. Yang, J. R. Cebral, **F. Camelli**, F. Togashi, J .D. Baum, H. Luo, E. Mestreau, and O. Soto. "Moore's Law, the Life Cycle of Scientific Computing Codes and the Diminishing Importance of Parallel Computing." Paper presented at the Proc. Parallel CFD 2005, College Park, MD 2005.

Sandberg, W., R. Ramamurti, J. Kellogg, and **F. Camelli**. "Challenges for Launch and Recovery Computational Analyses of Novel Unmanned Air and Underwater Vehicles." Paper presented at the American Society of Naval Engineers and Recovery Meeting, Annapolis, MD 2005.

Camelli, F., S. Hanna, and R. Löhner. "Simulation of Must Using FEFLO-Urban CFD Model." Paper presented at the 8th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling, Fairfax, VA 2004.

Camelli, F., S. R. Hanna, and R. Löhner. "Simulation of the MUST Field Experiment Using the FEFLO-Urban CFD Model." Paper presented at the Fifth Symposium on the Urban Environment, Vancouver, Canada, August 2004.

Camelli, F., R. Löhner, and S. Hanna. "FEFLO-Urban CFD Model Evaluation of the MUST Experiment." Paper presented at the XIV Congress on Numerical Methods and their Applications, Bariloche, Argentina 2004.

Löhner, R., C. Yang, J. R. Cebral, O. Soto, and **F. Camelli**. "Improving the Speed and Accuracy of Projection-Type Incompressible Flow Solvers." In *Proc. 1st LNCC Meeting on Computational Modeling*. Petropolis, Brazil, 2004.

Sandberg, W., **F. Camelli**, R. Ramamurti, and R. Löhner. "Ship Topside Air Contamination Analysis: Unsteady Computations and Experimental Validation." Paper presented at the American Society of Naval Engineers Day 2004, Crystal City, VA 2004.

Camelli, F., and R. Löhner. "Assessing Maximum Possible Damage for Release Events." In *7th Annual George Mason University Conference on Transport and Dispersion Modeling*. Fairfax, VA, 2003.

Löhner, R., **F. Camelli**, W. Sandberg, and R. Ramamurti. "VLES Study of Temperature and Concentration for a Ship." Paper presented at the 7th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling, Fairfax, VA 2003.

Löhner, R., C. Yang, J. R. Cebral, O. Soto, and **F. Camelli**. "On Incompressible Flow Solvers." In *Numerical Simulations of Incompressible Flows*, edited by M. Hafez, 50-71: World Scientific, 2003.

Camelli, F., S. Hanna, and R. Löhner. "Atmospheric Dispersion at Local Scales Using CFD." Paper presented at the 6th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling, Fairfax, VA 2002.

Camelli, F., and R. Löhner. "Reproducing Prairie Grass Experiment with CFD Techniques." Paper presented at the 4th Annual George Mason University Transport and Dispersion Modeling Workshop, Fairfax, VA, July 2000.

Camelli, F., and R. Löhner. "Flow and Dispersion around Buildings: An Application with FEFLO." In *Proc. For ECCOMAS 2000, European Congress on Computational Methods*. Barcelona, Spain, 2000.

Löhner, R., O. Soto, and **F. Camelli**. "On Implicit Projection Schemes." Paper presented at the Annual GMU Transport and Dispersion Modeling Workshop, 2000.

Camelli, F., and R. Löhner. "Flow and Dispersion around Buildings: An Application with FEFLO." Paper presented at the 3rd Annual George Mason University Transport and Dispersion Modeling Workshop, Fairfax, VA 1999.

Wegman, E. J., J. Symanzik, J. P. Vandersluis, Q. Luo, **F. Camelli**, A. Dzubay, X. Fu, N. Khumbah, R. E. A. Moustafa, R. L. Wall, and Y. Zhu. "The Minicave - a Voice-Controlled Environment." Paper presented at the International Immersive Projection Technology Workshop, Center of the Fraunhofer Society Stuttgart IZS 1999.

Books Contribution

Löhner, R., C. Yang, J. R. Cebral, **F. Camelli**, F. Togashi, J. D. Baum, H. Luo, E. L. Mestreau, and O. Soto. "Moore's Law, the Life Cycle of Scientific Computing Codes and the Diminishing Importance of Parallel Computing." In *Parallel Computational Fluid Dynamics 2005: Theory and Applications*, edited by Anil Deane, Akin Ecer, James McDonough, Nobuyuki Satofuka, Gunther Brenner, David R. Emerson, Jacques Periaux and Damien Tromeur-Dervout, 41-49, 2006.