

# Curriculum Vitae

## MELISSA A GREEN

Office Address: 253 Link Hall  
Mechanical and Aerospace Engineering  
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Date of CV: January 2017

**Research interests** Biological fluid mechanics, specifically fish swimming; fluid structure interactions; vortex dynamics; turbulence; turbulent combustion

### Education/Employment

2012 – Assistant Professor  
Syracuse University, Syracuse, NY, USA  
Mechanical and Aerospace Engineering

2009 – 2011 NAS/NRC Postdoctoral Research Associate  
Naval Research Laboratory, Washington, DC, USA  
Laboratory for Computational Physics and Fluid Dynamics  
Advisor: Elaine Oran

2009 Postdoctoral Research Associate, Princeton University, Princeton, NJ, USA  
Mechanical and Aerospace Engineering  
*ONR MURI: Toward a Mission-Configurable Stealth Underwater Batoid*  
Advisor: Alexander J. Smits

2009 Ph.D. Princeton University, Princeton, NJ, USA  
Mechanical and Aerospace Engineering  
*Analysis of bio-inspired propulsors*  
Advisors: Clarence W. Rowley and Alexander J. Smits

2003 B.S. University of Notre Dame, Notre Dame, IN, USA  
Aerospace Engineering

### Honors and Awards

2016 Dean's Award for Excellence in Engineering Education (Syracuse University)

2016 Senior Member, American Institute of Aeronautics and Astronautics

2015 The Filtertech, Pi Tau Sigma, and Sigma Gamma Tau Award for Excellence in Education in Mechanical and Aerospace Engineering (Syracuse University)

2014 Air Force Office of Scientific Research Young Investigator Award

2009 National Research Council Research Associateship

2007 Wu Prize for Excellence (Princeton University School of Engineering and Applied Science)

2004 – 2007 National Science Foundation Graduate Research Fellowship

2006 Larisse Rosentweig Klein Memorial Award (Princeton Mechanical and Aerospace Engineering department)

**Teaching experience**

Assistant Professor, Syracuse University

- 2016 Spring Dynamics of Mechanical Systems (MAE 321)
- 2015 Fall Aircraft Performance and Dynamics (AEE 427)
- 2015 Spring Dynamics of Mechanical Systems (MAE 321)
- 2014 Fall Aircraft Performance and Dynamics (AEE 427)
- 2014 Spring Fluid Dynamics Measurements (MAE 645)
- 2013 Fall Aircraft Performance and Dynamics (AEE 427)
- 2012 Fall Aircraft Performance and Dynamics (AEE 427)

**Current funding**

- 2016 1. Office of Naval Research, Sea Based Aviation  
Award shared with co-PI Dr. David Rival, Queen's University, Kingston, Ontario, Canada  
*The topology of force production in unsteady flow around swept wings*  
Dates: 7/1/2016 - 6/30/2019  
Total award: \$710,740
- 2014 2. Air Force Office of Scientific Research Young Investigator Program  
*Using Lagrangian coherent structures to characterize vortex shedding on bluff bodies in cross-flow*  
Dates: 8/15/2014 - 8/14/2017  
Total award: \$355,160
- 2014 3. Office of Naval Research, Biologically Inspired Underwater Propulsion Program  
*Lagrangian methods in unsteady propulsion: characterizing vortex wake structure and force production*  
Dates: 5/15/2014 - 5/14/2017  
Total award: \$671,706

**Publications**

Peer-reviewed publications

- 2017 1. Magstadt, A. S., Kan, P., Berger, Z. P., Ruscher, C. J., Berry, M. G., Green, M. A., Lewalle, J. & Glauser, M. N. "Turbulent flow physics and control: The role of big data analyses tools," in *Whither Turbulence in and Big Data in the 21st Century?* Ed. Pollard, A., Castillo, L., Danaïla, L., & Glauser, M. N. Springer, pp. 295-322. Online.
- 2016 2. Kumar, R., King, J. T. & Green, M. A. *Momentum distribution in the wake of a trapezoidal pitching panel*, Marine Technology Society Journal, **50**, 5, pp. 9-23.
- 2016 3. Rockwood, M.P., Taira, K., & Green, M. A. *Detecting vortex formation and shedding in cylinder wakes using Lagrangian coherent structures*, AIAA Journal, (in print, doi: 10.2514/1.J055051).
- 2015 4. Huang, Y. & Green, M. A. *Detection and tracking of vortex phenomena using Lagrangian coherent structures*, Experiments in Fluids **56**, 7, pp. 1-12
- 2011 5. Buchholz, J.H.J., Green, M. A., & Smits, A. J. *Scaling the circulation shed by a pitching panel*, J. Fluid Mech. **688**, pp. 591-601.
- 2011 6. Green, M. A. Rowley, C. W., & Smits, A. J. *The unsteady three-dimensional wake produced by a trapezoidal pitching panel*, J. Fluid Mech. **685**, pp. 117-145

- 2010 7. Green, M. A. Rowley, C. W., & Smits, A. J. *Using hyperbolic Lagrangian coherent structures to investigate vortices in bioinspired fluid flows*, *Chaos* **20**, 017510.
- 2008 8. Green, M. A. & Smits, A. J. *Effects of three-dimensionality on thrust production by a pitching panel*, *J. Fluid Mech.* **615**, pp. 211–220.
- 2007 9. Green, M. A., Rowley, C. W., & Haller, G. *Detection of Lagrangian coherent structures in three-dimensional turbulence*, *J. Fluid Mech.* **572**, pp. 111–120.

## Conference extended abstracts (peer-reviewed and/or invited)

- 2017 10. Dannenhoffer, J. F. & Green, M. A. *Use of a Full-motion Flight Simulator for Teaching Aircraft Performance and Dynamics*, AIAA Science and Technology Forum 2017, Grapevine, TX, USA. 9–13 January 2017.
- 2016 11. Krishna, S., Mulleners, K. & Green, M. A. *Effect of rotational phase on the flow topology of a flapping flat-plate wing*, AIAA Science and Technology Forum 2016, San Diego, CA, USA. 4–8 January 2016.
- 2016 12. King, J. T., Kumar, R. & Green, M. A. *Experimental Study of the Three-Dimensional Wake of a Trapezoidal Pitching Panel*, AIAA Science and Technology Forum 2016, San Diego, CA, USA. 4–8 January 2016.
- 2016 13. Rockwood, M. P. & Green, M. A. *Correlation of the Surface Pressure Distribution on a Circular Cylinder with Objective Identification of Vortex Formation and Shedding*, AIAA Science and Technology Forum 2016, San Diego, CA, USA. 4–8 January 2016.
- 2016 14. Huang, Y. & Green, M. A. *Comparing leading and trailing edge vortex circulation history with vortex identification and tracking methods*, AIAA Science and Technology Forum 2016, San Diego, CA, USA. 4–8 January 2016.
- 2016 15. Rossetti, J. S., Dannenhoffer, J., & Green, M. A. *Snapshot Lagrangian Proper Orthogonal Decomposition of Cylinder Wake Flow*, AIAA Science and Technology Forum 2016, San Diego, CA, USA. 4–8 January 2016.
- 2015 16. Huang, Y., Rockwood, M.P. & Green, M. A. *Tracking coherent structures in massively-separated and turbulent flows*, Ninth International Symposium on Turbulence and Shear Flow Phenomena, The University of Melbourne, Melbourne, AUS. 30 June – 3 July 2015.
- 2015 17. Rockwood, M.P. & Green, M. A. *An Analysis of the Unsteady Wake Behind a Circular Cylinder using Lagrangian Coherent Structures*, AIAA Science and Technology Forum 2015, Kissimmee, FL, USA. 5–9 January 2015.
- 2015 18. Huang, Y. & Green, M. A. *Eulerian and Lagrangian methods for detecting vortex formation and shedding*, AIAA Science and Technology Forum 2015, Kissimmee, FL, USA. 5–9 January 2015.
- 2015 19. Rice, T. T. & Green, M. A. *Three dimensional unsteady wake of a trapezoidal pitching panel*, AIAA Science and Technology Forum 2015, Kissimmee, FL, USA. 5–9 January 2015.
- 2014 20. Rockwood, M.P. & Green, M. A. *An Analysis of the Unsteady Wake Behind a Circular Cylinder using Lagrangian Coherent Structures*, AIAA Science and Technology Forum 2014, National Harbor, MD, USA. 13–17 January 2014.
- 2013 21. Green, M. A. *Eulerian and Lagrangian methods for coherent structure analysis in both computational and experimental data*, 51st AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition, Grapevine, TX, USA. 7–10 January 2013.

- 2013 22. Rockwood, M.P. & Green, M. A. *An experimental analysis of the unsteady wake behind a circular cylinder using Eulerian and Lagrangian techniques*, 51st AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition, Grapevine, TX, USA. 7–10 January 2013.
- 2009 23. Green, M. A., Rowley, C. W., & Smits, A. J. *Three-dimensional wake of a biologically inspired propulsor*, 39th AIAA Fluid Dynamics Conference, San Antonio, TX, USA. 22–25 June 2009.
- 2005 24. Green, M., Parker, K., & Soria, J. *2D PIV of a Pitching Aerofoil*, Fourth Australian Conference on Laser Diagnostics in Fluid Mechanics and Combustion, The University of Adelaide, South Australia, Australia. 7–9 December 2005.

### Invited talks

- 2017 Jan AIAA Science and Technology Forum, FD-34: Special Session: Low Reynolds Number Flows, Grapevine, TX
- 2016 May AmeriMech Symposium on Fluid Transport and Nonlinear Dynamics
- 2015 Mar City College of New York, Department of Mechanical Engineering Seminar
- 2015 Feb Caltech, GALCIT Colloquium
- 2015 Feb University of California, Los Angeles, Department of Mechanical and Aerospace Engineering Seminar
- 2014 Nov Lehigh University, Department of Mechanical Engineering and Mechanics Seminar
- 2014 Oct Illinois Institute of Technology, Department of Mechanical, Materials, and Aerospace Engineering Seminar
- 2014 Oct University of Illinois, Urbana-Champaign, Fluid Mechanics Seminar
- 2014 June US Congress on Theoretical and Applied Mechanics, Session: “Bioflight I: Models (experimental, numerical and theoretical),” East Lansing, MI
- 2014 May Extreme Flows Workshop, Princeton, NJ
- 2014 Mar Johns Hopkins University, Department of Mechanical Engineering Fluid Dynamics Seminar
- 2013 Nov Vanderbilt University, Department of Mechanical Engineering Seminar
- 2013 Nov Frontiers in Fluid Dynamics Research Symposium, San Juan, PR
- 2013 Sep BIRS Workshop 13w5089 Uncovering Transport Barriers in Geophysical Flows
- 2013 Apr University of Buffalo, Department of Mechanical and Aerospace Engineering Seminar
- 2013 Feb Florida State University, Department of Mechanical Engineering Seminar
- 2013 Jan Syracuse University, Department of Mechanical and Aerospace Engineering Seminar
- 2013 Jan AIAA Aerospace Sciences Meeting, Visualization, AMT-10/FD-26: Analysis and Interpretation of Very Large Sets of Fluid Dynamics Data, Grapevine, TX
- 2012 July 9th American Institute of Mathematical Sciences Conference on Dynamical Systems, Special Session 27: Transport Barriers in Dynamical Systems, Orlando, FL
- 2011 May Lorentz Center Workshop: Coherent Structures in Dynamical Systems, Leiden, The Netherlands
- 2011 May Syracuse University, Department of Mechanical and Aerospace Engineering Seminar
- 2010 May 8th American Institute of Mathematical Sciences Conference on Dynamical Systems, Special Session 30: Lagrangian Coherent Structures and Invariant Manifolds: Analysis and Applications, Dresden, Germany
- 2010 Feb Stanford University, Department of Aeronautics and Astronautics Seminar
- 2009 Oct University of Iowa, Department of Mechanical Engineering Seminar
- 2009 Jan California Institute of Technology, Department of Mechanical Engineering Seminar

## Non-refereed abstracts and presentations

- 2016 25. Rockwood, M. P. & Green, M. A. *Relating surface pressure to Lagrangian wake topology around a circular cylinder in cross flow*, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, USA. 20–22 November 2016.
- 2016 26. Huang, Y. & Green, M. A. *Identification and tracking of hairpin vortex auto-generation in turbulent wall-bounded flow*, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, USA. 20–22 November 2016.
- 2016 27. Kumar, R., King, J. T., & Green, M. A. *Momentum distribution in the wake of a bio-inspired trapezoidal pitching panel*, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, USA. 20–22 November 2016.
- 2016 28. King, J. T., Kumar, R. & Green, M. A. *Experimental study of surface pattern effects on the propulsive performance and wake of a bio-inspired pitching panel*, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, USA. 20–22 November 2016.
- 2016 29. Mulleners, K., Krishna, S. & Green, M. A. *Identification of separate flow features in the shear layer*, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, USA. 20–22 November 2016.
- 2016 30. Krishna, S. Mulleners, K. & Green, M. A. *Potential flow predictions for a flapping flat plate wing*, 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, USA. 20–22 November 2016.
- 2015 31. King, J. T. & Green, M. A. *Experimental study of Strouhal number effects on the wake produced by a trapezoidal pitching panel*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2015 32. Huang, Y., Hadjighasem, A., Green, M. A., & Haller, G. *Objective detection of vortices in massively-separated flow*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2015 33. Rockwood, M. P., & Green, M. A. *Correlating Velocity Information in the Vicinity of Lagrangian Saddle Points to the Spatially and Temporally Resolved Static Pressure Distribution on a Circular Cylinder*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2015 34. Bohl, D. & Green, M. A. *Experimental Investigation of Dynamic Stall on a NACA0012 Airfoil Undergoing Sinusoidal Pitching*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2015 35. Haffner, E., Green, M. A., Hamlington, P., Poludnenko, A., & Oran, E. *Coherent structure dynamics during turbulence-flame interaction*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2015 36. Krishna, S., Mulleners, K., & Green, M. A. *A Lagrangian approach to study flow topology around a flapping flat-plate wing*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2015 37. Galvez, R. & Green, M. A. *The Finite Time Lyapunov Exponent Field of  $N$  Interacting Vortices in the Zero Viscosity Limit*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2015 38. Rossetti, J., Green, M. A., & Dannenhoffer, J. *Lagrangian Proper Orthogonal Decomposition of the Wake Downstream of a Cylinder*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.

- 2015 39. Liu, Y., Wilson, C., & Green, M. A. *Lagrangian coherent structures in the Gulf Stream*, 68th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 22–24 November 2015.
- 2014 40. Berger, Z. P., King, J. T., & Green, M. A. *Identification of Vortex Breakdown in Bio-Inspired Wakes Using Proper Orthogonal Decomposition*, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 23–25 November 2014.
- 2014 41. Huang, Y. & Green, M. A. *Eulerian and Lagrangian methods for vortex tracking in 2D and 3D flows*, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 23–25 November 2014.
- 2014 42. Rockwood, M.P. & Green, M. A. *The Effect of Phase Averaging Techniques on Lagrangian Coherent Structures in the Wake of a Circular Cylinder*, 67th Annual Meeting of the APS Division of Fluid Dynamics, San Francisco, CA, USA. 23–25 November 2014.
- 2013 43. Jeter, T. R. & Green, M. A. *Vortical wake evolution and its effect on performance using Lagrangian coherent structures*, 66th Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh, PA, USA. 24–26 November 2013.
- 2013 44. Rockwood, M.P. & Green, M. A. *A Lagrangian Coherent Structures Analysis of the Unsteady Wake Behind a Circular Cylinder*, 66th Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh, PA, USA. 24–26 November 2013.
- 2012 45. Green, M. A. *Using LCS to identify vortex shedding on a cylinder in cross-flow*, 65th Annual Meeting of the APS Division of Fluid Dynamics, San Diego, CA, USA. 18–20 November 2012.
- 2012 46. Rockwood, M.P. & Green, M. A. *2D FTLE in 3D flows: The accuracy of using two-dimensional data for Lagrangian analysis in a three-dimensional turbulent channel*, 65th Annual Meeting of the APS Division of Fluid Dynamics, San Diego, CA, USA. 18–20 November 2012.
- 2011 47. Green, M. A., Hamlington, P. E., Poludnenko, A. Y., & Oran, E. S. *Using LCS to study coherent structures in reacting flows*, 64th Annual Meeting of the Division of Fluid Dynamics, Baltimore, MD, USA. 20–22 November 2011.
- 2010 48. Green, M. A., Kaplan, C. R., Oran, E. S. & Boris, J. P. *A dynamic model of human physiology*, 63rd Annual Meeting of the Division of Fluid Dynamics, Long Beach, CA, USA. 21–23 November 2010.
- 2009 49. Green, M. A., Rowley, C. W., & Smits, A. J. *Three-dimensional wake of a biologically-inspired propulsor*, 62nd Annual Meeting of the Division of Fluid Dynamics, Minneapolis, MN, USA. 22–24 November 2009.
- 2009 50. Green, M. A., Rowley, C. W., & Smits, A. J. *Vortex Wake Structure of Rigid Panels with Biologically Inspired Geometry*, 2009 SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, USA. 17–21 May 2009.
- 2008 51. Green, M. A., & Smits, A. J. *LCS analysis of a biologically inspired wake*, 61st Annual Meeting of the Division of Fluid Dynamics, San Antonio, TX, USA. 23–25 November 2008.
- 2007 52. Green, M. A. & Rowley, C. W. *Detection of Lagrangian Coherent Structures in 3D Turbulence*, 2007 SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, USA. 28 May – 1 June 2007.
- 2007 53. Green, M. A., & Smits, A. J. *Wake structure of rigid pitching panels with biologically inspired geometry*, 60th Annual Meeting of the Division of Fluid Dynamics, Salt Lake City, UT, USA. 18–20 November 2007.

- 2006 54. Green, M. A., Rowley, C. W., & Haller, G. *Detection of Lagrangian coherent structures in 3D Turbulence*, 59th Annual Meeting of the Division of Fluid Dynamics, Tampa Bay, FL, USA. 19–21 November 2006.
- 2006 55. Buchholz, J., Green, M. A., & Smits, A. J. *Pressure distribution, thrust performance, and wake structure of a low-aspect ratio pitching panel*, 59th Annual Meeting of the Division of Fluid Dynamics, Tampa Bay, FL, USA. 19–21 November 2006.
- 2005 56. Green, M., Parker, K., & Soria, J. *2D PIV of a pitching airfoil*, 58th Annual Meeting of the Division of Fluid Dynamics, Chicago, IL, USA. 20–22 November 2005.

### Other contributions and service

- 2015 – pres    AIAA Journal  
                   *Associate Editor*

### Conference service

- 2017            AIAA Science and Technology Forum, 9–13 January  
                   *Assistant Organizer, Fluid Dynamics*  
                   *Session chair: FD-07. Low-Re and Bio-Inspired Flows I: Applications*  
                   *Session chair: FD-34. Special Session: Low Reynold's Number Flows*
- 2016            APS Division of Fluid Dynamics Annual Meeting, 23–25 November  
                   *Session chair: G3: Vortex Dynamics: Mechanisms and Plates*
- 2016            AIAA Science and Technology Forum, 4–8 January  
                   *Co-technical chair, Fluid Dynamics*  
                   *Session chair: FD-01: Special Session: Low Re & Bio-inspired Flows Discussion Group*
- 2015            AIAA Aviation, 22–26 June  
                   *Assistant Organizer, Fluid Dynamics, Fundamental Flow Phenomena Sub-topic*  
                   *Session chair: FD-02: Fundamental Fluid Flows*
- 2015            AIAA Science and Technology Forum, 5–9 January  
                   *Session chair: FD-01, Bio-inspired Flow*
- 2014            APS Division of Fluid Dynamics Annual Meeting, 23–25 November  
                   *Session chair: D18: Vortex Dynamics: Flow Induced Vibrations and Interactions*
- 2014            AIAA Science and Technology Forum, 13–17 January  
                   *Assistant Organizer, Fluid Dynamics, Fundamental Flow Phenomena Sub-topic*  
                   *Session chair: FD-07: Bioinspired Aerodynamics: Numerical*  
                   *Session chair: FD-34: Vortex Flows*
- 2013            APS Division of Fluid Dynamics Annual Meeting, 24–26 November  
                   *Session chair: G12, Vortex Dynamics and Vortex Flows IV*
- 2013            AIAA Fluid Dynamics Meeting, 24–27 June  
                   *Session chair: FD-04, Flapping-Wing Aerodynamics*
- 2013            1000 Island Fluid Dynamics Meeting, 26–28 April  
                   *Technical chair, session organizer*
- 2012            APS Division of Fluid Dynamics Annual Meeting  
                   *Session chair: G28, Swimming Efficiency*
- 2012            American Physical Society Division of Fluid Dynamics Annual Meeting  
                   *Session chair: E13, Biofluids: Cardiovascular: FSI and CFD*

## Academic contributions

- 2016 Invited guest speaker, Syracuse University chapter of ASEE “Engineering PhD Academic Career Pathways”
- 2016 Organized Pointwise/Caelus CFD and Meshing Workshop for Syracuse University Mechanical and Aerospace Engineering juniors and seniors. Attendance ~ 20 students.
- 2015 Organized Syracuse CoE Research Science and Technology Forum, “Optimizing Dynamic Thrust: What Would Nature Do?”
- 2014 – pres. Syracuse Museum of Science and Technology Summer Women’s Science Camp, Organizer of “Research Day” on Syracuse University campus
- 2014 – pres. Project ENGAGE, Participating faculty
- 2013 – pres. Member, AIAA Fluid Dynamics Technical Committee, Fundamentals of flow phenomena Sub-committee, Chair of Low Reynold Number Discussion Group, website manager
- 2012 – pres. Member, American Society of Mechanical Engineers (ASME)
- 2011 – pres. Member, American Institute of Aeronautics and Astronautics (AIAA)
- 2011 – pres. Peer reviewer: Journal of Fluid Mechanics; Chaos, Physics of Fluids; Experiments in Fluids; Physical Review E; AIAA Journal; Experimental Thermal and Fluid Science; Journal of Hydro-environment; Physica D; Journal of Fluids and Structures; Progress in Turbulence; ASME International Gas Turbine Institute Turbo Expo
- 2006 – pres. Member, American Physical Society