

# Alejandro Campos

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## RESEARCH INTERESTS

Extreme-scale computational simulations of fluid and plasma turbulence.

## EDUCATION

Stanford University, PhD, Aeronautics & Astronautics June 2011 - Present  
Thesis: Advances in structure-based modeling of turbulent flows  
Advisors: Prof. Iaccarino (Stanford U.), Prof. Duraisamy (U. of Michigan–Ann Arbor)  
Stanford University, MS, Aeronautics & Astronautics June 2011  
University of Rochester, BS, Mechanical Engineering May 2009  
University of Rochester, Minor, Physics May 2009

## RESEARCH EXPERIENCE

*Graduate Research Assistant* July 2011 – present  
Stanford University, Stanford, CA

- Introduced an Eulerian solution method for the interacting particle representation model of homogeneous turbulence that avoids particle noise characteristic of Lagrangian simulations.
- Formulated an alternate variant of the Algebraic Structure-based Model (ASBM) of turbulence.
- Work supported by NASA Cooperative Agreement (July 2011 – July 2014) and a fellowship from the Achievement Rewards for College Scientists Foundation (July 2014 – June 2015).

*Visiting Researcher* July 2013 – August 2013 & June 2012 – August 2012  
NASA Langley Research Center, Hampton, VA

- Implemented the ASBM in the NASA CFD code FUN3D.
- Coupled the ASBM with the shear-stress transport turbulence model.
- Added a FUN3D module that allows for the solution of 3–equation models of turbulence.
- Developed an elliptic relaxation solver used by turbulence models in FUN3D.

*SU2 Developer* June 2011 – May 2013  
Stanford University, Stanford, CA

- Implemented the Shear-stress transport turbulence model in the CFD code SU2.
- Contributed to the code’s non-dimensionalization and documentation.
- Added a revision control system, based on `cruisecontrol.rb`, to detect errors introduced in SU2.

*Master’s Research* June 2010 – September 2010  
Stanford University, Stanford, CA

- Performed simulations of separated flow in the curved channel of Marquillie et al. (2008) using various turbulence models.
- Compared results against the available high-fidelity direct numerical simulation.
- Concluded that models overpredict separation-bubble size and underpredict turbulence anisotropy.

*Research Intern* June 2008 – August 2008  
Princeton Plasma Physics Laboratory, Princeton, NJ

- Designed and tested a gas puff system to clear off particles from the surface of dust detectors inside Tokamaks.
- Achieved optimal design by experimenting with varying nozzle shapes, backing pressures, pulse configurations, etc.

Research Intern

June 2007 – August 2007

California Institute of Technology, Pasadena, CA

- Contributed to the design, construction, and testing of a double-pendulum suspension, which is used to isolate the output mode cleaner of LIGO's gravitational wave detector.
- Analyzed the pendulum's transfer functions, decay curves, feedback loop, and cross coupling between its six degrees of freedom.

## TEACHING EXPERIENCE

Course Assistant for Applied Aerodynamics (AA 200)

January 2011 – March 2011

Stanford University, Stanford, CA

- Guided approximately thirty students on both course assignments and exam preparation.
- Introduced the learning management system Piazza to the course, which increased the interconnection between students, TAs, and the professor by allowing all to post questions, answers, comments or other information in an online forum.

## HONORS & AWARDS

William K. Bowes, Jr. Foundation Scholar, Achievement Rewards for College Scientists (ARCS), 2014

Honorable Mention, National Science Foundation Graduate Research Fellowship Program, 2010

Diversity Fellowship, Stanford University, Department of Aeronautics & Astronautics, 2009

Honorable Mention, Student Poster Session, American Association for the Advancement of Sciences annual meeting, 2009

Highest Distinction in Mechanical Engineering, University of Rochester, graduation ceremony, 2009

Highest Distinction in Physics, University of Rochester, graduation ceremony, 2009

Dean's Honor List, University of Rochester, 2005-2009

## PUBLICATIONS & PRESENTATIONS

### Peer-Reviewed Journal Articles

1. **Campos, A.**, Duraisamy, K., Iaccarino, G., "An Eulerian Formulation of the Interacting Particle Representation Model of Homogeneous Turbulence," (in preparation).
2. **Campos, A.**, Duraisamy, K., Iaccarino, G., "A Segregated Explicit Algebraic Structure-based Model for Wall-bounded Turbulent Flows," International Journal of Heat and Fluid Flow, (under revision).
3. Ryu, S., Emory, M., Iaccarino, G., **Campos, A.**, Duraisamy, K., "Large-Eddy Simulation of a Wing-Body Junction Flow," AIAA Journal, (accepted for publication).
4. **Campos, A.**, Skinner, C. H., "Advances in Dust Detection and Removal for Tokamaks," Journal of Undergraduate Research, U.S. Department of Energy, vol. IX, pp. 30-35, Oct. 2009.

### Conference Papers in Proceedings

1. **Campos, A.**, Duraisamy, K., Iaccarino, G., "Towards a Two-equation Algebraic Structure-based Model with Applications to Turbulent Separated Flows," AIAA Paper 2013-2719, 21st AIAA Computational Fluid Dynamics Conference, San Diego, CA, Jun. 24-27, 2013.
2. Palacios, F., Colonno, M. R., Aranake, A. C., **Campos, A.**, Copeland, S. R., Economou, T. D., Lonkar, A. K., Lukaczyk, T. W., Taylor, T. W. R., Alonso, J. J., "Stanford University Unstructured (SU2): An open-source integrated computational environment for multi-physics simulation and design," AIAA Paper 2013-0287, 51st AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition, Grapevine, Texas, Jan. 7-10, 2013.
3. Skinner, C. H., **Campos, A.**, Kugel, H., Leisure, J., Roquemore, A. L., Wagner, S., "Electrostatic Dust Detection and Removal for ITER," 22<sup>nd</sup> IAEA Fusion Energy Conference, Conf. Proc. IT/P6-26, Geneva, Oct. 2008.

## Presentations & Posters

1. **Campos, A.**, Duraisamy, K., Iaccarino, G., “Simulations of a Probability Density Function Model of Homogeneous Turbulence in an Eulerian Reference Frame,” Thermal & Fluid Sciences Affiliates & Sponsors Conference, Stanford, CA, Feb. 2016, (presentation).
2. **Campos, A.**, Duraisamy, K., Iaccarino, G., “Asymptotic Stability of Spectral-based PDF Modeling for Homogeneous Turbulent Flows,” Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, MA, Nov. 2015, (presentation).
3. **Campos, A.**, “Advances in Structure-based Modeling of Turbulent Flows,” Ph. D. defense, Stanford University, CA, Oct. 9, 2015, (presentation).
4. **Campos, A.**, “Advances in Structure-based Modeling of Turbulent Flows,” Thermal & Fluid Sciences Affiliates & Sponsors Conference, Stanford, CA, Feb. 2015, (poster).
5. Ryu, S., Emory, M., **Campos, A.**, Duraisamy, K., Iaccarino, G., “Large Eddy Simulation of a Wing-body Junction Flow,” Annual Meeting of the American Physical Society, Division of Fluid Dynamics, San Francisco, CA, Nov. 2014, (presentation).
6. **Campos, A.**, Duraisamy, K., Iaccarino, G., Alonso J., “Towards Structure-based Modeling of Turbulent Separated Flows,” Thermal & Fluid Sciences Affiliates & Sponsors Conference, Stanford, CA, Feb. 2013, (presentation).
7. **Campos, A.**, Duraisamy, K., Iaccarino, G., “Algebraic Structure-based Modeling of Turbulent Separated Flows,” Thermal & Fluid Sciences Affiliates & Sponsors Conference, Stanford, CA, Feb. 2012, (poster).
8. **Campos, A.**, “Advances in Dust Detection and Removal for Tokamaks,” Annual Meeting of the American Association for the Advancement of Science, Chicago, IL, Feb. 2009, (poster).
9. **Campos, A.**, “Advances in Dust Detection and Removal for Tokamaks,” 50<sup>th</sup> Annual Meeting of the APS Division of Plasma Physics, Dallas, TX, Nov. 2008, (poster).

## REFERENCES

Iaccarino, G., Professor of Mechanical Engineering, Stanford University, jops@stanford.edu  
Duraisamy, K., Professor of Aerospace Engineering, University of Michigan–Ann Arbor, kdur@umich.edu  
Alonso, J. J., Professor of Aeronautics & Astronautics, Stanford University, jjalonso@stanford.edu