

# LUIS A. MARTÍNEZ TOSSAS

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Highly motivated, creative, and bilingual Ph.D. student with a strong background in computational fluid dynamics applied to **wind energy**. I am interested in exploring and applying methods to model flow around wind turbines with different techniques such as large-eddy simulations with an actuator line model. Excellent programming skills with experience in OpenFOAM (C++), Fortran, MPI and Python.

## Education

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### Johns Hopkins University, Baltimore, MD

- *Ph.D. in Mechanical Engineering* September 2012-Present  
*Thesis Topic:* Large Eddy Simulations (LES) of wind turbine flows  
Advisor: Charles Meneveau

### University of Puerto Rico, Mayagüez Campus

- *M.S. in Mechanical Engineering* May 2012  
*Thesis Topic:* Wind Turbine Modeling for Computational Fluid Dynamics  
Advisors: Stefano Leonardi and Matthew J. Churchfield (NREL)
- *B.S. in Mechanical Engineering* August 2010

## Scholar Visits

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### WINDINSPIRE NSF Student Exchange

June – August 2015

École Polytechnique Fédérale de Lausanne (EPFL) Switzerland  
Denmark Technical University (DTU), Lyngby, Denmark  
Katholieke Universiteit Leuven, Belgium

### Research Visit

October 2014

National Renewable Energy Laboratory (NREL), Boulder, Colorado

### WINDINSPIRE NSF Student Exchange

June – August 2013

Denmark Technical University (DTU), Lyngby, Denmark

## Experience

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### National Renewable Energy Laboratory, Golden, CO

June – August 2011

*Researcher*

- Performed grid resolution study on wind turbine CFD models.
- Performed validation on OpenFOAM using DNS of channel flow.
- Studied numerical instabilities of wind turbine models.

### National Renewable Energy Laboratory, Golden, CO

June – August 2010

*SULI Intern*

- Implemented numerical model to simulate wind turbines into CFD solver.
- Validated numerical model against empirical data.
- Performed visualizations of numerical data.

### GE Energy Wind Turbines, Greenville, SC

June – August 2009

*EID Intern*

- Member of the Wind Configuration Management Team.
- Documented function descriptions for all the components in a 2.5 MW wind turbine.
- Developed health metrics for changes in the Bills of Materials of wind turbines.

### GE Energy Gas Turbines, Greenville, SC

June – August 2008

*EID Intern*

- Organized and conducted different tests on a rotor with an RCA team to obtain temperature gradients used to predict stresses that caused the material to yield.
- Wrote a final report on a series of tests being held to better understand the temperature distributions on the turbine rotor of a 7H gas turbine.

## Teaching and Mentoring

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**Center for Educational Outreach**  
**Johns Hopkins University, Baltimore, MD**  
**Engineering Innovation (EN.500.110.01)**

July 2016

*Lecturer*

- Instructor for a group of 20 exceptional high school students with interest in pursuing an engineering career.
- Lectured about engineering topics such as dimensional analysis, digital logic, and materials.

**Johns Hopkins University, Baltimore, MD**  
**Introduction to Fluid Mechanics (EN.530.327)**

August – December 2015

*Teaching Assistant under Prof. Dennice Gayme*

- Prepared weekly homework assignments and graded midterms and homeworks.
- Held office hours for questions on course material.

**Johns Hopkins University, Baltimore, MD**  
**Heat Transfer (EN.530.334)**

January – May 2015

*Teaching Assistant under Prof. Cila Herman*

- Prepared weekly homework assignments and graded midterms and homeworks.
- Held office hours for questions on course material.

**University of Puerto Rico, Río Piedras Campus**  
**NASA Summer STEM Academy**

June 2012

*Group Leader*

- Group leader of ninth grade (high school) students who learned about engineering through the use of micro-controllers and computer programming.
- Supervised students while going through STEM activities.

**University of Puerto Rico, Mayagüez Campus**  
**Creative Design II (INME 3810)**

January – May 2012

*Teaching Assistant under Prof. Jayanta Banerjee*

- Lectured mechanical engineering first year students on basics of engineering.
- Assigned and graded homework and projects.
- Held office hours for questions on course material.

**University of Puerto Rico, Mayagüez Campus**  
**Thermal Sciences Laboratory (INME 4032)**

August – December 2010

*Instructor*

- Lectured heat transfer and thermodynamic concepts to senior mechanical engineering students.
- Organized and supervised laboratory experiments.

## Awards

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**First Place *Engineering & Computational Science***

2010 Science & Energy Research Challenge November 14-15, 2010, Argonne, IL

## Skills

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**Software:** Linux (Ubuntu, Debian, Fedora & Arch), Windows, Microsoft Office Word, Excel and PowerPoint, Matlab, Octave, Fortran, C++, Python, L<sup>A</sup>T<sub>E</sub>X, OpenFOAM, Paraview, Vapor

**Languages:** Fluent in English and Spanish, Basic French (9 credits)

# Publications

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## Refereed Journals

- Martínez-Tossas L.A., Churchfield M.J., Meneveau C. (*Under Review*) Optimal smoothing length scale for actuator line models of wind turbine blades.
- Stevens, R.J.A.M., Martínez-Tossas L.A., Meneveau C. (*To be submitted*) Comparison of large eddy simulations using actuator disk and actuator line models with wind tunnel experiments.
- Howland M.F., Bossuyt J., Martínez-Tossas L.A., Meyers J., Meneveau C. (2016) Wake structure in actuator disk models of wind turbines in yaw under uniform inflow conditions *Journal of Renewable and Sustainable Energy* **8** (4), 043301
- Sarlak H., Nishino T., Martínez-Tossas L.A., Meneveau C., Sørensen J.N. (2016) Assessment of blockage effects on the wake characteristics and power of wind turbines *Renewable Energy* **93**, 340-352
- Martínez-Tossas L.A., Leonardi S., Churchfield M.J. (2015) Large Eddy Simulations of the Flow Past Wind Turbines: Actuator Line and Disk Modeling. *Wind Energy* **18** (6), 1047-1060

## Refereed Conference Proceedings

- Martínez-Tossas L.A., Churchfield M.J., Meneveau C. (2016) A Highly Resolved Large-Eddy Simulation of a Wind Turbine using an Actuator Line Model with Optimal Body Force Projection. 2016 Torque Conference, Munich, Germany (*Accepted*)
- Martínez-Tossas L.A., Stevens, R.J.A.M., Meneveau, C. (2016) Wind Turbine Large-Eddy Simulations on Very Coarse Grid Resolutions using an Actuator Line Model pp. [http://dx. doi. org/10.2514/6.20161261](http://dx.doi.org/10.2514/6.20161261)
- Martínez-Tossas L.A., Churchfield M.J., Meneveau C. (2015) Large Eddy Simulation of wind turbine wakes: detailed comparisons of two codes focusing on effects of numerics and subgrid modeling. 2015 Wake Conference, Gotland, Sweden
- Martínez-Tossas L.A., Leonardi S., Churchfield M. J., Moriarty P. (2012) Comparison of Actuator Disc and Actuator Line Wind Turbine Models and Best Practices for Their Use. 50th AIAA Aerospace Sciences Meeting, January 2012
- Churchfield M.J., Lee S., Moriarty P., Martínez-Tossas L.A., Leonardi S., Vijayakumar G., Brasseur J.G. (2012) A Large-Eddy Simulation of Wind-Plant Aerodynamics. 50th AIAA Aerospace Sciences Meeting, January 2012

## Technical Reports

- Martínez-Tossas L.A., Leonardi S., Churchfield M.J. (2013) Wind Turbine Modeling for Computational Fluid Dynamics: December 2010-December 2012 National Renewable Energy Laboratory (NREL), Golden, CO.

## Conference Presentations

- Martínez-Tossas L.A., Churchfield M.J., Meneveau C. (2016) Determining the Optimal Smoothing Length Scale in Actuator Line Models Wind farms 2016 May 23-25 The University of Texas at Dallas, TX
- Martínez-Tossas L.A., Meneveau C. (2015) Determining the optimal smoothing length scale for actuator line models of wind turbine blades APS 2015 Abstract ID: 2015APS..DFDE28004M
- Martínez-Tossas L.A., Yilmaz A.E., Churchfield M.J., Meyers, J., Meneveau C. (2015) LES of wind turbine wakes: detailed comparisons of codes focusing on effects of numerics and subgrid modeling Wind farms 2015 8-10 July Belgium, Leuven
- Martínez-Tossas L.A., Churchfield M.J., Meneveau C. (2014) A study of two subgrid-scale models and their effects on wake breakdown behind a wind turbine in uniform inflow. APS 2014 Abstract ID: BAPS.2014.DFD.D30.8
- Leonardi S., Martínez-Tossas L.A., García E. (2011) Direct Numerical Simulation of a Turbulent Channel Flow with 3D Wedges Randomly Placed on a Wall. 64th Annual Meeting of the APS Division of Fluid Dynamics, November 20-22, 2011

## Scientific Visualizations

- Martínez-Tossas L.A., Howard M.F., Meneveau C. (2015) V0012: Large Eddy Simulation of Wind Turbine Wakes with Yaw Effects Gallery of Fluid Motion  
<http://dx.doi.org/10.1103/APS.DFD.2015.GFM.V0012>