

## MARCO GIOVANNI GIOMETTO

Civil Engineering and Engineering Mechanics Department, Columbia University  
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### HIGHER EDUCATION

*PhD Mechanical Engineering*, 2016  
École Polytechnique Fédérale de Lausanne, Switzerland

*PhD Civil Engineering*, 2014  
Florence and Braunschweig Universities, Italy and Germany

*MS Civil Engineering*, 2010  
Padova University, Italy

*BS Civil Engineering*, 2007  
Padova University, Italy

### EMPLOYMENT RECORD

*Assistant Professor*, 2018 – present  
Columbia University, Dept. of Civil Engineering & Engineering Mechanics

*Amazon Visiting Academic*, 2021 – present  
Amazon.com Inc., Amazon Prime Air Program

*Senior Research Scientist*, 2018 – 2021  
Amazon.com Inc., Amazon Prime Air Program

*Postdoctoral Fellow*, 2017 – 2018  
Stanford University, Center for Turbulence Research

*Postdoctoral Fellow*, 2016 – 2017  
University of British Columbia, Dept. of Civil and Environmental Engineering

### HONORS AND AWARDS

- Postdoctoral Fellowship, Center for Turbulence Research, Stanford University, 2017
- EDME Award for the Best Ph.D. Thesis in Mechanics at École Polytechnique Fédérale de Lausanne, Switzerland, 2016
- Best Oral Presentation Award, 9th International Conference on Urban Climate, 12th Symposium on the Urban Environment, France, 2016
- Third prize in the Application-Centered Computational Engineering Science Visualization Contest, École Polytechnique Fédérale de Lausanne, Switzerland, 2015
- Outstanding Student Paper Award, American Geophysical Union General Assembly Conference, San Francisco, 2014
- Ph.D. Scholarship, Università di Firenze and Braunschweig TU University (joint Ph.D. program), Italy, 2011

- Scholarship from Banca San Giorgio Quinto e Valle Agno, Progetto Erasmus, Italy (2010)
- Erasmus scholarship for the development of MS thesis at the International Center for Numerical Methods in Engineering, Spain, 2010

## HONORS AND AWARDS RECEIVED BY STUDENTS

- *Frontera Computational Science Fellowships* (Gurpreet Singh Hora), Texas Advanced Computing Center, 2021
- *Bonomi Summer Scholar Award* (Christine Ye Shu Blackshaw), Columbia University, 2020
- *Boris A. Bakhmeteff Research Fellowship in Fluid Mechanics* (Beatrice Giacomini), Columbia University, 2019
- *Outstanding Student Paper Award* (Beatrice Giacomini), American Geophysical Union General Assembly Conference, San Francisco, 2019
- *Earl R. Peterson memorial Scholarship in Civil Engineering* (Manuel F. Schmid), University of British Columbia, 2018
- *Doc. Mobility Fellowship* (Manuel F. Schmid), Swiss National Science Foundation, 2018
- *Teaching Assistant Excellence Award* (Beatrice Giacomini), Columbia University, 2018

## JOURNAL PUBLICATIONS <sup>\*</sup>Students <sup>†</sup>Postdocs and Research Staff

1. Momen, M.<sup>†</sup>, Parlange, M.B., and **Giometto, M.G.** (2021) Scrambling and reorientation of classical atmospheric boundary layer turbulence in hurricane winds. In *Geophys. Res. Letters.*, 48, e2020GL091695.
2. Giacomini, B.<sup>\*</sup> and **Giometto, M.G.** (2021) On the suitability of second-order accurate finite-volume solvers for the simulation of atmospheric boundary layer flow. In *Geophys. Mod. Dev.*, 14, 1409–1426.
3. Krayenhoff, S.E., Jiang, T., Christen, A., Martilli, A., Bailey, B.N., Nazarian, N., Voogt, J.A., **Giometto, M.G.**, Stastny, A., and Crawford, B.R. (2020) A multi-layer urban canopy meteorological model with trees (BEP-Tree): Street tree impacts on pedestrian-level climate. In *Urban Climate*, 32, 100590.
4. Lozano-Durán, A., **Giometto, M.G.**, Park, G.I., and Moin, P. (2020) Non-equilibrium three-dimensional boundary layers at moderate Reynolds numbers. In *J. Fluid Mech.*, 883, A20.
5. Comola, F., **Giometto, M.G.**, Parlange, M.B., and Lehning, M. (2019) Scale analysis of snowfall deposition over Gaussian hills using large eddy simulation and Lagrangian stochastic particle-tracking. In *J. Geophys. Res.*, 124, 7951–7974.
6. Schmid, M.F.<sup>\*</sup>, Lawrence, G., and Parlange, M.B., and **Giometto, M.G.** (2019) Volume averaging for urban canopies. In *Boundary-Layer Meteorol.*, 173, 349–372.
7. Lenz, S., Schonher, M., Geier, M., Krafczyk, M., Pasquali, A., Christen, A., and **Giometto, M.G.** (2019) Towards real-time Simulation of Turbulent Wind Flows in Urban Areas with the Cumulant Lattice Boltzmann Method on a GPGPU. In *J. Wind Eng. Ind. Aerod.*, 189, 151–162.
8. Momen, M.<sup>†</sup>, Bou-Zeid, E., Parlange, M.B., and **Giometto, M.G.** (2018) Modulation of Mean Wind and Turbulence in the Atmospheric Boundary Layer by Baroclinicity. In *J. Atmos. Sci.*, 75, 3797–3821.

9. Margairaz, F., **Giometto, M.G.**, Parlange, M.B., and Calaf, M. (2018) Comparison of dealiasing schemes in large-eddy simulation of neutrally-stratified atmospheric boundary-layer type flows. In *Geosci. Model Dev. Discuss.*, 11, 4069–4084.
10. **Giometto, M.G.**, Lozano-Durán, A., Park, G.I., and Moin, P. (2017) Three-dimensional transient channel flow at moderate Reynolds numbers: analysis and wall modeling. In *Ann. Res. Brief, Center for Turbulence Research*, 193–205.
11. **Giometto, M.G.**, Katul, G.G., Fang, J., and Parlange, M.B. (2017) Direct numerical simulation of slope flows up to Grashof number  $Gr = 2^{11}$ . In *J. Fluid Mech.*, 829, 589–620.
12. **Giometto, M.G.**, Christen, A., Egli, P.E., Schmid, M.F.\*, Tooke, R., Coops, N.C., and Parlange, M.B. (2017) Effects of urban trees on mean wind, turbulence and momentum exchange within and above a realistic urban canopy. In *Adv. Water Resour.*, 106, 154–168.
13. **Giometto, M.G.**, Grandi, R., Fang, J., Monkewitz, P.A., and Parlange, M.B. (2016) Katabatic flow: A closed-form solution with spatially-varying eddy diffusivities. In *Boundary-Layer Meteorol.*, 162, 307–317.
14. **Giometto, M.G.**, Christen, A., Meneveau, C., Fang, J., Krafczyk, M., and Parlange, M.B. (2016) Spatial characteristics of roughness sublayer mean flow and turbulence over a realistic urban surface. In *Boundary-Layer Meteorol.*, 160, 425–452.

## MANUSCRIPTS UNDER REVIEW <sup>\*</sup>Students <sup>†</sup>Postdocs

1. Li, W.\*, **Giometto, M.G.** Quality and reliability of second order, finite-volume-based solvers for wall-modeled large eddy simulation. Under review in *J. Comput. Phys.*
2. Cheng, Y., **Giometto, M.G.**, Kauffmann, P., Lin, L., Cao, C., Zupnick, C., Li, H., Li, Q., Abernathy, R., Gentine, P. Deep learning for subgrid-scale turbulence modeling in large-eddy simulations of the atmospheric boundary layer. Under review in *J. Geophys. Res.*
3. Calaf, M., Vercauteren, N., Katul, G.G., **Giometto, M.G.**, Morrison, T.J., Margairaz, F., Boyko, V., Pardyjak, E.R. Contemporary Limitations in Numerical Weather Prediction Models. Under review in *Boundary-layer Meteorol.*

## INVITED TALKS

1. Giometto, M.G. (2021) Insight into the structure of hurricane boundary layer mean flow and turbulence. Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY
2. Giometto, M.G. (2021) Drag and drag partition in vegetated urban canopies. Department of Meteorology and Atmospheric Science, Penn State University, State College, PA
3. Giometto, M.G. (2020) Quantifying the impact of trees on turbulent transport in the urban boundary layer: insight from large-eddy simulation and theoretical models. Department of Mechanical Engineering, The City College New York, New York, NY.
4. Giometto, M.G. (2019) Large-eddy simulation in urban areas: the impact of urban trees. Department of Environmental Engineering, Freiburg University, Freiburg, Germany.
5. Giometto, M.G. (2018) Characterizing atmospheric turbulence over and within urban environments: challenges and opportunities, Amazon Prime Air, Seattle, WA.
6. Giometto, M.G. (2017) Boundary-layer flows over urban canopies and drainage flows: numerical analysis and analytical modeling. Institute for Atmospheric and Earth System Research, Helsinki University, Helsinki, Finland.

7. Giometto, M.G. (2017) Characterization of buoyancy-driven turbulent flows over inclines. CTR Tea Seminar Series, Stanford University, Stanford, CA.
8. Giometto, M.G. (2017) Turbulent transport in complex boundary-layer flows. Department of Civil Engineering and Engineering Mechanics, Columbia University, New York, NY.
9. Giometto, M.G. (2014) Oldroyd H., and Parlange, M.B. Numerical simulations of katabatic flows. Complex Fluids Laboratory, University of British Columbia, Vancouver, BC.
10. Giometto, M.G. (2013) Fang, J., Putti M., and Parlange, M.B. An immersed meshless method for simulation of fluid-structure interaction. Department of Geophysical Sciences, University of Lausanne, Lausanne, Switzerland.

## RECENT PRESENTATIONS

1. Giacomini, B.\*, **Giometto, M.G.** (2020) On the sensitivity of flow statistics to parameter uncertainty in flow over plant canopy. In AGU Fall Meeting, Virtual.
2. Giacomini, B.\*, **Giometto, M.G.** (2020) Uncertainty quantification in canopy turbulence. In AGU Fall Meeting, Virtual.
3. Schmid, M.F.\*, **Giometto, M.G.**, Parlange, M.B. (2020) Towards optimal numerics for the simulation of boundary-layer flows. In 73rd Annual Meeting of the APS Division of Fluid Dynamics, Virtual.
4. **Giometto, M.G.**, Schmid, M.F.\*, Christen, A., Salesky, S.T., Parlange, M.B. (2019) Aerodynamic roughness parameters of vegetated urban canopies. In AGU Fall Meeting, San Francisco, CA.
5. Momen, M.†, **Giometto, M.G.**, Parlange, M.B. (2019) Large-eddy simulations of hurricane boundary layers and scrambling of coherent turbulence structures. In AGU Fall Meeting, San Francisco, CA.
6. **Giometto, M.G.**, Schmid, M.F.\*, Parlange, M.B. (2019) Drag and drag partition over vegetated urban canopies. In AGU Fall Meeting, San Francisco, CA.
7. Parlange, M.B., Schmid, M.F.\*, Lawrence, G.A., Giometto, M.G. (2019) Horizontal averaging of urban canopy flows. In AGU Fall Meeting, San Francisco, CA.
8. Giacomini, B.\*, **Giometto, M.G.** (2019) Quality and reliability of general-purpose finite-volume solvers for the simulation of atmospheric boundary layer flow. In AGU Fall Meeting, San Francisco, CA.
9. Schmid, M.F.\*, **Giometto, M.G.**, Parlange, M.B. (2019) Turbulent flow simulations with the Julia programming language. In 72nd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA.
10. Giacomini, B.\*, **Giometto, M.G.** (2019) Quality and reliability of general-purpose finite-volume solvers for the simulation of atmospheric boundary layer flow. In 72nd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA.
11. Li, W.\*, Katul, G.G., Chamecki, M., Parlange, M.B., Giometto, M.G. (2019) Quality and reliability of general purpose finite-volume solvers for wall-modeled large-eddy simulation of channel flow at a moderate Reynolds number. In 72nd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA.
12. Schmid, M.F.\*, **Giometto, M.G.**, Parlange, M.B. (2018) Atmospheric boundary-layer simulations with the Julia programming language. In American Geophysical Union Fall Meeting, Washington, DC.

13. Li, W.\*, Chamecki, M., Parlange, M.B., **Giometto, M.G.** (2018) A new algebraic subgrid-scale model for flow within vegetation canopies. In American Geophysical Union Fall Meeting, Washington, DC.
14. **Giometto, M.G.**, Schmid, M.F.\*, Parlange, M.B. (2018) Aerodynamic roughness parameters of vegetated urban canopies. In American Geophysical Union Fall Meeting, Washington, DC.
15. Schmid, M.F.\*, **Giometto, M.G.**, Lawrence, G.A., Parlange, M.B. (2018) Volume averaging for urban canopies. In 71st Annual Meeting of the American Physical Society Division of Fluid Dynamics, Atlanta, GA.
16. **Giometto, M.G.**, Schmid, M.F.\*, Christen, A., Salesky, S.T., Parlange, M.B. (2018) Aerodynamic roughness parameters of vegetated urban canopies. In 10th International Conference on Urban Climate, New York, NY.
17. Schmid, M.F.\*, **Giometto, M.G.**, Parlange, M.B. (2018) Relating the horizontally averaged wind profile to the geometry of idealized urban surfaces. In 13th World Congress in Computational Mechanics, New York, NY.
18. **Giometto, M.G.**, Lozano-Duran, A., Park, G.I., Moin, P. (2018) Analysis of three-dimensional transient channel flow at moderate Reynolds numbers. In 13th World Congress in Computational Mechanics, New York, NY.
19. Momen, M.†, Bou-Zeid, E., **Giometto, M.G.**, Parlange, M.B. (2018) Exploring the Impact of Baroclinicity and Stability on the Atmospheric Boundary Layer. In 23rd Symposium on Boundary Layers and Turbulence, American Meteorological Society, Oklahoma City, OK.
20. Li, W.\*, Katul, G.G., Chamecki, M., Parlange, M.B., Giometto, M.G. (2017) Large-eddy simulation of slope flow over and within a vegetation canopy. In American Geophysical Union Fall Meeting, New Orleans, LA.
21. Schmid, M.F.\*, **Giometto, M.G.**, Christen, A., Krayenhoff, E.S., Salesky, S., Parlange, M.B. (2017) Closure models for Reynolds-averaged Navier-Stokes simulations of flow within and above urban canopies. In American Geophysical Union Fall Meeting, New Orleans, LA.
22. **Giometto, M.G.**, Christen, A., Egli, P.E., Schmid, M.F.\*, Coops N.C., Parlange, M.B. (2017) Effects of trees on momentum exchange within and above a real urban environment. In American Geophysical Union Fall Meeting, New Orleans, LA.
23. **Giometto, M.G.**, Fang, J., Parlange, M.B. (2016) Large- and very-large-scale motions in katabatic flows over steep slopes. In American Geophysical Union Fall Meeting, San Francisco, CA.
24. **Giometto, M.G.**, Trujillo, E., Leonard, K.C., Maksym, T.L., Comola, F., Salesky, S., Meneveau, C., Lehning, M., Parlange, M.B. (2016) LES modeling of wind over Antarctic snow-ice formations using a dynamic surface roughness approach. In American Geophysical Union Fall Meeting, San Francisco, CA.
25. **Giometto, M.G.**, Grandi, R., Fang, J., Monkewitz, P.A., Parlange, M.B. (2016) A closed-form solution with spatially-varying eddy diffusivities. In 69th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Portland, OR.

## FUNDED PROJECTS

1. Title: Heat And The City: Supporting Urban Planning in Marginalized Neighborhoods Via Coordinated Experiments and Simulations.  
Funding Agency: Columbia University

Duration: 07/01/2021-06/31/2023

Amount: \$25,000

PI: **Giometto, M.G.**

2. Title: Multiscale Modeling of Hurricane Boundary Layer Flows.  
Funding Agency: Computing Research Association  
Duration: 01/01/2021-12/31/2022  
Amount: \$259,605  
PI: **Giometto, M.G.**
3. Title: Characterizing the Impact of Air Currents on Droplets and Aerosols Dispersion.  
Funding Agency: COVID-19 High Performance Computing Consortium  
Duration: 11/11/2020-05/11/2021  
Amount: 600,000 service units, equivalent to \$155,759  
PI: **Giometto, M.G.**; Co-PI: Hora G. S.
4. Title: Turbulence Structure of Extreme Winds in Hurricanes and Its Impacts on Urban and Coastal Environments.  
Funding Agency: XSEDE High-Performance-Computing Allocation  
Duration: 03/01/2020-03/01/2021  
Amount: 81,387 service units, equivalent to \$21,128  
PI: **Giometto, M.G.**
5. Title: Tracking Air Pollutants and Reconstructing 3-D Scalar Fields from 2-D Satellite Images via Machine Learning.  
Funding Agency: Data Science Institute at Columbia University  
Duration: 09/01/2019–09/01/2021  
Amount: \$190,000  
PI: **Giometto, M.G.**; Co-PI: Gentine P., Vondrick C., Momen M.
6. Title: Turbulence Structure of Extreme Winds in Hurricanes and its Impacts on Urban Environments.  
Funding Agency: XSEDE High-Performance-Computing Allocation  
Duration: 09/01/2018-03/01/2020  
Amount: 106,454 service units, equivalent to \$27,635  
PI: **Giometto, M.G.**; Co-PI: Momen M.
7. Title: GPU-accelerated Computing for CUIT Habanero Cluster.  
Funding Agency: Columbia University  
Duration: One-time equipment grant  
Amount: \$39,000  
PI: Gentine P.; Co-PI: Blei D., Agrawal D., Sun W. C., **Giometto, M.G.**, Waisman H.

## SERVICE AND MEMBERSHIPS

- Affiliated to the American Physics Society, American Geophysical Union, American Society of Civil Engineering, Engineering Mechanics Institute, American Society of Mechanical Engineering, and American Meteorological Society.
- Member of the Data Science Institute, Computing Systems for Data-Driven Science, Columbia University, 2018 – present
- Reviewer of manuscripts for *Boundary-Layer Meteorology*, *Journal of Fluid Mechanics*, *Journal of Geophysical Research*, *Quarterly Journal of the Royal Meteorological Society*, *Environmental Fluid Mechanics*, *Journal of Wind Engineering & Industrial Aerodynam-*

*ics, Geophysical Model Development, Theoretical and Applied Climatology, Journal of Urban Climate, Building and Environment, Agricultural and Forest Meteorology, Atmospheric Science Letters, Risk and Uncertainty in Engineering Systems Part B: Mechanical Engineering, Urban Forestry and Urban Greening, Journal of Renewable and Sustainable Energy.*

- PhD defense committee member (six in total): Fabien Margairaz, Mechanical Engineering, University of Utah 2018; Braden Czapla, Mechanical Engineering, Columbia University 2018; Kun Wang, Civil Engineering and Engineering Mechanics, Columbia University 2019; Cheng Yu, Earth and Environmental Engineering, Columbia University, 2020; Ioannis Petromichelakis, Civil Engineering and Engineering Mechanics, Columbia University, 2020; Arvind Srinivasan, Mechanical Engineering, Columbia University, 2020.
- Reviewer of proposals for National Science Foundation, 2018 – present.
- Member of the *Communication* committee, Department of Civil Engineering and Engineering Mechanics, Columbia University, 2020 – present.
- Member of the *MS Specialization in Computational and Data Driven Engineering Mechanics* committee, Department of Civil Engineering and Engineering Mechanics, Columbia University, 2020 – present.
- Program committee member, NY Scientific Data Summit, 2019.
- Member of the organizing committee, World Congress in Computational Mechanics, 2018.
- Session chair for
  - T709 session, Advances in numerical modeling and physical understanding of turbulent boundary-layer flows, World Congress in Computational Mechanics, 2018.
  - Numerical modeling of urban processes, 10th International Conference on Urban Climate, 2018.
  - Boundary Layer Processes and Turbulence, AGU Fall Meeting, 2020 – 2021.

## **COURSES TAUGHT**

Undergraduate: Fluid Mechanics, 2018 – present

Graduate: Turbulence Theory 2018 – present

## **ADVISING EXPERIENCE**

*Postdocs and Research Staff:*

- Dr. Kianoosh Yousefi, 2021 – present.
- Dr. Mostafa Momen, 2018 – 2019, now Assistant Professor at the University of Houston.

*PhD Students:*

- Beatrice Giacomini, 2018 – present.
- Weiyi Li, 2018 – present.
- Manuel Schmit (co-advised with Prof. M. B. Parlange), 2018 – present.
- Gurpreet Singh Hora, 2020 – present.
- Atharva Sathe, 2021 – present.

*MS Students:*

- Zejian You, 2021 – present.
- Yicheng Li, 2019 – present.
- Tieliang Huang, 2019 – 2020.

*BS Students:*

- Daniel Kolano, 2020 – present.
- Christine Ye Shu Blackshaw, 2020 – present.
- Andrei Coman, 2021 – present.
- Meera Mavroidis, 2021 – present.
- Onyinyechi Obineche, 2021 – present.
- Shinya Michael Kondo, 2018 – 2020.
- Cheng Bi, MS student, 2018 – 2019.

*Visiting Scholars:*

- Jean Lac, BS student, ENS Paris Saclay, France, 2020.
- Sophie Abramian, BS student, ENS Paris Saclay, France, 2018 – 2019.
- Yuxi Guan, PhD student, Wuhan University, China, 2018 – 2019.
- Simone Boi, Postdoc, Helsinki University, Finland, 2020.