

H. Jane Bae, Ph.D.

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EDUCATION

Stanford University, Stanford, CA <i>Ph.D. in Computational and Mathematical Engineering</i>	Sept. 2012 – Sept. 2018
California Institute of Technology, Pasadena, CA <i>B.S with honors in Mathematics</i>	Sept. 2008 – Dec. 2011

PROFESSIONAL APPOINTMENTS

Assistant Professor in Aerospace <i>Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, CA</i>	Sept. 2021 – Present
Postdoctoral Fellow in Applied Mathematics <i>School of Engineering and Applied Sciences, Harvard University, Cambridge, MA</i>	Sept. 2020 – Aug. 2021
Postdoctoral Scholar in Aerospace <i>Graduate Aerospace Laboratories, California Institute of Technology, Pasadena, CA</i>	Oct. 2018 – Aug. 2020

JOURNAL PUBLICATIONS

- W. Rozema, **H. J. Bae** & R. W. C. P. Verstappen “A local dynamic model for large-eddy simulation”, in preparation, 2021.
- H. J. Bae** & P. Koumoutsakos “Wall-modeled large-eddy-simulation via multi-agent reinforcement learning”, *Nat. Comm.*, under review, 2021.
- M. A. Ahmed, **H. J. Bae**, A. F. Thompson & B. J. McKeon, “Resolvent analysis of stratification effects on wall-bounded shear flows”, *Phys. Rev. Fluids* **6**, 084804, 2021.
- H. J. Bae** & M. Lee “Life cycle of streaks in the buffer layer of wall-bounded turbulence”, *Phys. Rev. Fluids*, **6**, 064603, 2021.
- H. J. Bae** & A. Lozano-Durán “Effect of wall boundary conditions on wall-modeled large-eddy simulation in a finite-difference framework”, *Fluids* (invited paper) **6**, 112, 2021.
- H. J. Bae**, A. Lozano-Durán & B. J. McKeon, “Nonlinear mechanism in the self-sustaining process of wall-bounded flows”, *J. Fluid Mech.* **914**, A3, 2021.
- H. J. Bae**, S. T. M. Dawson & B. J. McKeon “Resolvent-based study of compressibility effects on supersonic turbulent boundary layers”, *J. Fluid Mech.* **883**, A29, 2020.
- A. Lozano-Durán, **H. J. Bae** & M. P. Encinar “Causality of energy-containing eddies in wall turbulence”, *J. Fluid Mech.* **882**, A2, 2020.
- A. Lozano-Durán & **H. J. Bae** “Error scaling of large-eddy simulation in the outer region of wall-bounded turbulence”, *J. Comp. Phys.* **392**, 532–555, 2019.
- A. Lozano-Durán & **H. J. Bae** “Characteristic scales of momentum-carrying eddies in wall turbulence”, *J. Fluid Mech.* **868**, 698–725, 2019.
- H. J. Bae**, A. Lozano-Durán, S. T. Bose & P. Moin, “Dynamic slip wall model for large-eddy simulation”, *J. Fluid Mech.* **856**, 400–432, 2019.
- M. Bassenne, **H. J. Bae** & A. Lozano-Durán “Mandala-inspired representation of the turbulent energy cascade”, *Phys. Rev. Fluids* **3**, 100505, 2018.
- H. J. Bae**, A. Lozano-Durán, S. T. Bose & P. Moin, “Turbulent intensities in large-eddy simulation of wall-bounded flows”, *Phys. Rev. Fluids* **3**, 014610, 2018.

M. Abkar, **H. J. Bae** & P. Moin, “Minimum-dissipation scalar transport model for large-eddy simulation of turbulent flows”, *Phys. Rev. Fluids* **1**, 041701(R), 2016.

W. Rozema, **H. J. Bae**, P. Moin & R. W. C. P. Verstappen, “Minimum-dissipation models for large-eddy simulation”, *Phys. Fluids* **27**, 085107, 2015.

PROCEEDINGS AND BRIEFS

A. Lozano-Durán & **H. J. Bae** “Self-critical machine-learning wall-modeled LES for external aerodynamics”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2020.

H. J. Bae & B. J. McKeon, “Characterization of vortex regeneration mechanism in the self-sustaining process of wall-bounded flows using resolvent analysis”, *J. Phys. Conf. Ser.*, 2020.

H. J. Bae, S. T. M. Dawson & B. J. McKeon “Studying the effect of wall cooling in supersonic boundary layer flow using resolvent analysis”, *AIAA Paper*, 2020-0575

H. J. Bae & A. Lozano-Durán “A minimal flow unit of the logarithmic layer in the absence of near-wall eddies and large scales”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2019.

H. J. Bae & A. Lozano-Durán “DNS-aided explicitly filtered LES of channel flow”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2018.

A. Lozano-Durán & **H. J. Bae** “Characteristic scales of Townsend’s wall-attached eddies”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2018.

H. J. Bae, J. D. Gibbon, R. M. Kerr & A. Lozano-Durán “Regularity diagnostics applied to a turbulent boundary-layer”, *Proceedings of the Summer Program*, Center for Turbulence Research, Stanford University, 2018.

H. J. Bae, M. P. Encinar & A. Lozano-Durán, “Causal analysis of self-sustaining processes in the log-layer of wall-bounded turbulence”, *J. Phys. Conf. Ser.* **1001(1)**, 012013, 2018.

H. J. Bae & A. Lozano-Durán, “Towards exact subgrid-scale models for explicitly filtered large-eddy simulation of wall-bounded flows”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2017.

A. Lozano-Durán & **H. J. Bae**, “Convergence of large-eddy simulation in the outer region of wall-bounded turbulence”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2017.

A. Lozano-Durán, **H. J. Bae**, S. T. Bose & P. Moin, “Dynamic wall models for the slip boundary condition”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2017.

H. J. Bae, A. Lozano-Durán & P. Moin, “Investigation of slip wall boundary condition in wall-modeled LES”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2016.

A. Lozano-Durán & **H. J. Bae**, “Turbulent channel with slip boundaries as a benchmark for subgrid-scale models in LES”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2016.

M. H. Silvis, F. X. Trias, M. Abkar, **H. J. Bae**, A. Lozano-Durán & R. W. C. P. Verstappen, “Exploring nonlinear subgrid-scale models and new characteristic length scales for large-eddy simulation”, *Proceedings of the Summer Program*, Center for Turbulence Research, Stanford University, 2016.

H. J. Bae & P. Moin, “Multirate time-stepping least squares shadowing method”, *Annual Research Briefs*, Center for Turbulence Research, Stanford University, 2014.

F. Capuano, G. Coppola, G. Balarac, **H. J. Bae** & L. de Luca, “A low-cost time-advancing strategy for energy-preserving turbulent simulations”, *Proceedings of the Summer Program*, Center for Turbulence Research, Stanford University, 2014.

R. W. C. P. Verstappen, W. Rozema & **H. J. Bae**, “Numerical scale separation in large-eddy simulation”, *Proceedings of the Summer Program*, Center for Turbulence Research, Stanford University, 2014.

INVITED TALKS

- “Tracking streaks in the buffer layer of wall-bounded turbulence”, Fluid Mechanics Seminar, Stanford University, September, 2021.
- “Tracking streaks in the buffer layer of wall-bounded turbulence”, Australasian Fluid Mechanics Society Seminar Series, September, 2021.
- “Nonlinear interaction of the self-sustaining process in the near-wall region of wall-bounded turbulence”, GKB 100 Fluid Mechanics Webinar Series, Cambridge University Press, June, 2021.
- “Resolvent analysis of stably-stratified turbulent boundary layers”, Advanced Modeling & Simulations Seminar, University of Texas at El Paso, March, 2021.
- “Dynamic wall-models for large-eddy simulation: towards parameter-free high-fidelity simulation of real-world engineering applications”, Department of Aerospace Engineering, University Michigan, Ann Arbor, March, 2020.
- “Real-time identification of extreme events in turbulent flows: computational modeling and prediction”, Computational Science and Engineering, Georgia Institute of Technology, February, 2020.
- “Real-time identification of extreme events in turbulent flows: computational modeling and prediction”, Department of Mechanical Engineering, Northeastern University, February, 2020.
- “Compressibility effects on turbulent boundary layers: a resolvent approach”, Fluid Mechanics Research Conference, California Institute of Technology, January, 2020.
- “Compressibility effects on turbulent boundary layers: a resolvent approach”, Center for Turbulence Tea Seminar, Stanford University, October 2019.
- “Modeling the wall in large-eddy simulation: dynamic slip wall model”, Department of Mechanical and Aerospace Engineering, UC Irvine, March, 2019.
- “DNS-aided explicitly-filtered large-eddy simulation of turbulent channel flow”, Fluid Mechanics Research Conference, California Institute of Technology, February, 2019.
- “Dynamic slip wall model for large-eddy simulation”, GALCIT Colloquium, California Institute of Technology, January, 2019.
- “Investigation of dynamic subgrid-scale and wall models for turbulent boundary layers”, Fluid Mechanics Seminar, Stanford University, May, 2018.

CONFERENCE PARTICIPATION

- H. J. Bae** & P. Koumoutsakos, “Multi-agent reinforcement learning of wall-modeled large-eddy-simulation”, Euromech colloquium on Machine learning methods for prediction and control of turbulent flows, Paris, France (virtual), 2021.
- H. J. Bae** & A. Lozano-Durán, “A minimal flow unit of the logarithmic layer in the absence of near-wall eddies and large scales”, 73rd Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Chicago, IL (virtual), 2020.
- H. J. Bae**, S. T. M. Dawson & B. J. McKeon, “Studying the effect of wall cooling in supersonic boundary layer flow using resolvent analysis”, AIAA Scitech, Orlando, FL, 2020.
- H. J. Bae** & B. J. McKeon, “Identification of nonlinear interaction of the self-sustaining process in wall-bounded turbulence using resolvent analysis”, 72nd Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Seattle, WA, 2019.
- H. J. Bae** & A. Lozano-Durán, “DNS-aided explicitly filtered LES of turbulent channel flow”, ERCOFTAC Workshop Direct and Large Eddy Simulation 12, Madrid, Spain, 2019.
- H. J. Bae**, S. T. M. Dawson & B. J. McKeon, “Resolvent analysis for supersonic turbulent boundary layers”, 13th Southern California Flow Physics Symposium, Santa Barbara, CA, 2019.

H. J. Bae, A. Lozano-Durán, S. T. Bose & P. Moin, “Dynamic slip wall model for large-eddy simulation”, 71st Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Atlanta, GA, 2018.

H. J. Bae, A. Lozano-Durán, S. T. Bose & P. Moin, “Turbulent intensities in large-eddy simulation of wall-bounded flows”, 70th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Denver, CO, 2017.

H. J. Bae, A. Lozano-Durán, S. T. Bose & P. Moin, “An investigation of slip wall boundary condition for wall-modeled large-eddy simulation”, 69th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, OR, 2016.

H. J. Bae, W. Rozema, P. Moin & R. W. C. P. Verstappen, “Minimum-dissipation models for large-eddy simulation”, 68th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, MA, 2015.

H. J. Bae & P. Moin, “Multirate time-stepping least squares shadowing method for unsteady turbulent flow”, 67th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, San Francisco, CA, 2014.

TEACHING AND MENTORING

Teaching Experience | *California Institute of Technology, Pasadena, CA*

- AE 232a: Computational Fluid Dynamics, Fall 2021

Dissertations/Theses Supervised | *California Institute of Technology, Pasadena, CA*

- Rahul Arun: “Real-time reconstruction of velocity fluctuations in turbulent flow”, Junior Thesis, 2019–2020

Undergraduate Projects Supervised | *California Institute of Technology, Pasadena, CA*

- Sydney Richardson: SURF, Summer 2020

HONORS AND AWARDS

Rising Stars in Computational and Data Sciences	2020
Center for Autonomous Systems and Technology (CAST) Grant PI	2019 – 2020
APS/DFD Milton van Dyke Award	2017
Argonne Training Program on Extreme-Scale Computing Scholar	2014
Stanford Graduate Fellowship	2012 – 2015

PROFESSIONAL SERVICE

Journal referee for

- *Journal of Fluid Mechanics*
- *Journal of Computational Physics*
- *Physical Review Fluids*
- *Computers and Fluids*
- *Physics of Fluids*
- *Theoretical and Computational Fluid Dynamics*

Faculty advisor for Caltech Women in GALCIT	2021-
Member of Caltech Women in GALCIT	2019,2020
Host of Center for Turbulence Research Summer Program	2014, 2016, 2018
Member of the Caltech Postdoctoral Association Career Committee	2019, 2020

OUTREACH

Genius Girls' Gathering <i>Panelist</i>	February, 2020
<ul style="list-style-type: none">• Served on a panel and presented a hands-on workshop for middle school students.	
Caltech Science for March <i>Volunteer</i>	March, 2019
<ul style="list-style-type: none">• Presented hands-on fluid mechanics experiments for K-12 students.	