Claudia E. Brunner, PhD

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and Self-Organization
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Education

Princeton University

May 2022 — PhD in Mechanical and Aerospace Engineering
Dissertation: Unsteady aerodynamics with applications for wind turbines

Certificate in Science, Technology and Environmental Policy
from the School of Public and International Affairs

Jan 2019 — M.A. Mechanical and Aerospace Engineering

Stanford University

Jun 2017 — B.S. Mechanical Engineering

B.A. International Relations

Jun 2012 — **Gymnasium Johanneum**, Ostbevern, Germany

Bilingual (German-English) Abitur (1,0)

Research experience

Max Planck Institute for Dynamics and Self-Organization

Mar 24 - present — *Independent Max Planck Research Group Leader*
Topic: Turbulence and Wind Energy

Jan 23 - Feb 24 — *Minerva Fast Track Group Leader* in the department of Prof. Eberhard Bodenschatz
Topic: Turbulence and Wind Energy

Aug 22 - Dec 22 — *Postdoctoral researcher* supervised by Prof. Eberhard Bodenschatz
Topic: Lagrangian particle tracking of turbulence in a wind turbine wake using the Variable Density Turbulence Tunnel

Princeton University

Sep 17 - May 22 — *Graduate research assistant* advised by Prof. Marcus Hultmark
Topics: Unsteady airfoil experiments in the High Reynolds number Test Facility to investigate dynamic stall and its impact on vertical axis wind turbines

Nanoscale hot-wire measurements in the atmospheric surface layer

Sep 19 - May 22 — *Environmental policy fellow* advised by Prof. Alex Glaser
Topic: Investigating the role of wind energy in future energy scenarios using the integrated assessment model WITCH

Acquired funding

2023	**Max Planck Research Group** (∼2.7m€) Max Planck Society
2023	**Humboldt Postdoctoral Research Fellowship** (∼90k€, declined) Alexander von Humboldt Foundation
2022	**Minerva Fast Track Position** (∼700k€) Max Planck Society
	Walter Benjamin Position (∼115k€, declined) German Research Foundation
2019	**Science, Technology and Environmental Policy Fellowship** (∼$91k) High Meadows Environmental Institute, Princeton University
2018	**National Defense Science and Engineering Graduate Fellowship** (∼$272k) United States Department of Defense
2017	**Upton First-Year Fellowship in Engineering** (∼$105k) School of Engineering and Applied Science, Princeton University

Seminars and invited talks

2024 (upcoming)	**Symposium for the 20th Anniversary of Stuttgart Wind Energy**, University of Stuttgart New approaches to high-resolution turbulence measurements in the atmosphere
2024	**Max Planck Institute for Dynamics and Self-Organization**, Department of Living Matter Physics Effect of atmospheric conditions on wind turbine wakes
	Heraeus-Seminar on the Physics of Complex Systems and Global Change Wind turbine flows: how atmospheric conditions affect tip vortex decay into turbulence
2023	**University of Twente**, Department of Physics of Fluids High Reynolds number wind turbine experiments in the Variable Density Turbulence Tunnel
2022	**University of British Columbia**, Department of Mechanical Engineering The unsteady aerodynamics of wind power generation
	Max Planck Institute for Dynamics and Self-Organization, Department for Fluid Physics, Pattern Formation and Biocomplexity Unsteady aerodynamics with applications for vertical axis wind turbines
	Princeton University, School of Public and International Affairs (PhD Seminar) The role of onshore and offshore wind energy in the United States in future energy scenarios
	University of Pennsylvania, Dept. of Mechanical Engineering and Applied Mechanics The unsteady aerodynamics of wind power generation
2021	**Princeton University**, School of Public and International Affairs (PhD Seminar) Offshore wind energy in the United States – from burgeoning technology to competitive market force?

Peer-reviewed publications

Published

C E Brunner, J Kiefer and M Hultmark (2022). "Comparison of dynamic stall on an airfoil undergoing sinusoidal and VAWT-shaped pitch motions" *J. Phys.: Conf. Ser.* 2265: 032006 DOI:10.1088/1742-6596/2265/3/032006

J Kiefer, **C E Brunner**, M O L Hansen and M Hultmark (2022). "Dynamic stall at high Reynolds numbers induced by ramp-type pitching motions" *J. Fluid Mech.* 938: A10. DOI:10.1017/jfm.2022.70

C E Brunner, J Kiefer, M O L Hansen and M Hultmark (2021). "Study of Reynolds number effects on the aerodynamics of a moderately thick airfoil using a high-pressure wind tunnel" *Exp. Fluids* 62: 178. DOI:10.1007/s00348-021-03267-8

K Y Huang, **C E Brunner**, M K Fu, K Kokmanian, T Morrison, A O Perelet, M Calaf, E Pardyjak and M Hultmark (2021). "Investigation of the atmospheric surface layer using novel high-resolution sensors" *Exp. Fluids* 62: 76. DOI:10.1007/s00348-021-03173-z

C E Brunner, J Kiefer, M O L Hansen and M Hultmark (2020). "Unsteady effects on a pitching airfoil at conditions relevant for large vertical axis wind turbines" *J. Phys.: Conf. Ser.* 1618: 052065. DOI:10.1088/1742-6596/1618/5/052065

J Kiefer, **C E Brunner**, M Hultmark and M O L Hansen (2020). "Dynamic stall at high Reynolds numbers due to variant types of airfoil motion" *J. Phys.: Conf. Ser.* 1618: 052028. DOI:10.1088/1742-6596/1618/5/052028

Under review

L Buhr, D Lenzi, A J K Pols, **C E Brunner**, A Fischer, A Staal, B P Hofbauer, B Bovenkerk. "The concepts of irreversibility and reversibility in research on anthropogenic environmental changes". Under review at *PNAS Nexus*.

Manuscripts in preparation

M Grunwald, **C E Brunner** "Effect of inflow conditions on wind turbine tip vortex break-down"

C E Brunner "The vortex formation number as a universal time scale for dynamic stall"

C E Brunner, G Marangoni, A Glaser. "Understanding the Roles of Onshore and Offshore Wind Energy in Future Energy Scenarios"

Conference presentations

2024 (upcoming)	**77th Annual Meeting of the APS Division of Fluid Dynamics** Tip vortex breakdown in a high Reynolds number wind turbine wake
	1st European Fluid Dynamics Conference Large-scale 3D Lagrangian particle tracking using soap bubbles
2024	**Direct In-person Colloquium on Vortex Dominated Flows** The time scales of dynamic stall at high Reynolds numbers
2023	**76th Annual Meeting of the APS Division of Fluid Dynamics** Effects of inflow conditions on wind turbine wakes at high Reynolds numbers
2022	**75th Annual Meeting of the APS Division of Fluid Dynamics** High Reynolds number wind turbine experiments in the Variable Density Turbulence Tunnel
	The Science of Making Torque from Wind (TORQUE) Comparison of dynamic stall on an airfoil undergoing sinusoidal and VAWT-shaped pitch motions
	Direct In-person Colloquium on Vortex Dominated Flows Dynamic stall at high Reynolds numbers
2021	**74th Annual Meeting of the APS Division of Fluid Dynamics** On the timescales of dynamic stall
	2nd Annual NDSEG Fellowship Conference Reduced frequency effects on dynamic stall at high Reynolds numbers
2020	**73rd Annual Meeting of the APS Division of Fluid Dynamics** Dynamic stall on an airfoil pitching at very high amplitudes and Reynolds numbers
	The Science of Making Torque from Wind (TORQUE) Unsteady effects on a pitching airfoil at conditions relevant for large vertical axis wind turbines
2019	**72nd Annual Meeting of the APS Division of Fluid Dynamics** Dynamic stall experiments on a sinusoidally pitching airfoil at high Reynolds numbers
	Thousand Islands Fluid Dynamics Meeting Unsteady airfoils at high Reynolds numbers
2018	**American Geophysical Union Fall Meeting** High-frequency simultaneous temperature and velocity measurements in the atmospheric surface layer
	71st Annual Meeting of the APS Division of Fluid Dynamics Dynamic effects on airfoil performance under unsteady inflow conditions at high Reynolds numbers

Advising & Supervising

	Postdoctoral scientists
Jan 24 - present	Dr. Yuna Hattori
from Sep 24	Dr. Hyunseok Kim
from Nov 24	Akhileshwar Borra
	PhD students
Sep 23 - present	Lorenn Le Turnier, IMPRS Physics of Biological and Complex Systems
	Master students
Sep 23 - present	Mano Grunwald, Faculty of Physics, Georg-August-University Göttingen
from Sep 24	Hoai Son Bien, Faculty of Physics, Georg-August-University Göttingen
	Bachelor students
Apr 24 - present	Fabian Krippenstapel, Faculty of Physics, Georg-August-University Göttingen
Apr 23 - Aug 23	Mano Grunwald, Faculty of Physics, Georg-August-University Göttingen
	Visiting students
Jun 24 - Jul 24	Sofia Arora (bachelor student at Princeton University)
Jun 24 - Jul 24	Liyen Teoh (bachelor student at Princeton University)
Jun 24 - Jul 24	Alex Rui Wu (bachelor student at Princeton University)
Jun 23 - Jul 23	Lasha Shamugia (bachelor student at Princeton University)
Mar / May 23	Julian Jüchter (PhD student at the University of Oldenburg)

Teaching experience

	Institute for the Dynamics of Complex Systems, Georg-August-University Göttingen
Apr 24 - Jul 24	**Introduction to turbulence** *Co-lecturer*
Apr 23 - Jul 23	**The fluid dynamics of wind energy** *Co-lecturer*
	Department of Mechanical and Aerospace Engineering, Princeton University
Feb 20 - May 20	**Integrated Engineering Science Laboratory - Fluid Mechanics** *Graduate teaching assistant*
Sep 19 - Jan 20	**Integrated Engineering Science Laboratory - Thermodynamics** *Graduate teaching assistant*
Feb 19 - May 19	**Mechanics of Fluids** *Graduate teaching assistant*

Honors & awards

2023	**Elisabeth Schiemann Kolleg** Max Planck Society
2019	**Princeton Energy and Climate Scholars** High Meadows Environmental Institute, Princeton University
2016	**Public Service Honor Society** Haas Center for Public Service, Stanford University
	Forum for Undergraduate Environmental Leadership Woods Institute for the Environment, Stanford University

Service

	Reviewer Physical Review Fluids; Experiments in Fluids; Wind Energy Science
Mar 23 - present	**Colloquium Speaker Committee** Max Planck Institute for Dynamics and Self-Organization
Jan 22 - Apr 24	**Executive Committee** Topical Group on the Physics of Climate, American Physical Society
Aug 20 - Jul 21	**Student chair** Princeton Energy and Climate Scholars, Princeton University
Sep 19 - May 20	**Graduate Student Council** Department of Mechanical and Aerospace Engineering, Princeton University

Outreach

2025 (upcoming)	*Scientific contributor* to "Everything Flows" exhibition Forum Wissen Museum
2024	*Exhibitor* Girls' Day / Boys' Day Max Planck Institute for Dynamics and Self-Organization
2023	*Exhibitor* Public celebration of the 75th Anniversary of the Max Planck Society Göttingen City Center
	Exhibitor Girls' Day / Boys' Day Max Planck Institute for Dynamics and Self-Organization
2021	*Guest lecturer*, "International Climate Policy" *Facilitator*, "World Climate Simulation" Princeton Day School
	Panelist, High School Engineering Colloquium Society of Women Engineers, Princeton Chapter
2020	*Guest lecturer*, "Environmental Justice and the Dakota Access Pipeline" Princeton Day School
2019	*Guest lecturer*, "Introduction to Climate Science" Princeton Day School

Professional development

Mar 24	**Supervising Junior Researchers** Planck Academy Workshop
Jan 24 - Dec 24	**Sign Up! Leadership Program** Series of professional development workshops hosted by the Max Planck Society
Jan 23 - Dec 23	**Sign Up! Career Building Program** Series of professional development workshops hosted by the Max Planck Society
Oct 21	**Rising Stars in Mechanical Engineering** Career workshop at Massachusetts Institute of Technology
Sep 20 - Dec 20	**Inclusive Leadership Learning Cohort** Semester-long course at GradFutures, Princeton University
Jan 16 - Mar 16	**Public Service Leadership Program** Ten-week course at Haas Center for Public Service, Stanford University

Professional memberships

American Physical Society (APS)

References

Eberhard Bodenschatz
Director of the Laboratory for Fluid Physics, Pattern Formation and Biocomplexity
Max Planck Institute for Dynamics and Self-Organisation
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Alex Glaser
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