

CONTACT INFORMATION	Jacob O. Wenegrat Assistant Professor Department of Atmospheric and Oceanic Science University of Maryland, College Park, MD	wenegrat@umd.edu http://wenegrat.github.io
RESEARCH INTERESTS	Geophysical fluid dynamics, atmosphere and ocean dynamics, submesoscale processes, boundary-layer processes	
EDUCATION	Ph.D. , Oceanography School of Oceanography University of Washington, Seattle, WA.	2015
	M.S. , Applied Mathematics Department of Applied Mathematics University of Washington, Seattle, WA.	2014
	M.S. , Oceanography Department of Oceanography University of Washington, Seattle, WA.	2013
	B.S. , Symbolic Systems Stanford University, Stanford, CA.	2006
APPOINTMENTS	Assistant Professor , University of Maryland, College Park Department of Atmospheric and Oceanic Science Burgers Program for Fluid Dynamics (affiliate) Applied Mathematics & Statistics, and Scientific Computation (affiliate)	2020 - present
	Postdoctoral Fellow , Stanford University Department of Earth System Science • Supervisor: Leif Thomas	2016 - 2019
	Visiting Scholar , Kavli Institute for Theoretical Physics, UCSB Program on Planetary Boundary Layers in Atmospheres, Oceans, and Ice on Earth and Moons.	May 2018
	Graduate Research Assistant , University of Washington School of Oceanography • Advisor: Michael J. McPhaden	2010 - 2015
	Consultant , Accenture Technology Labs R&D consultant focused on data center energy forecasting.	2007 - 2009
REFEREED PUBLICATIONS <small>(GROUP MEMBERS IN BOLD)</small>	[15] Chor, T., J.O. Wenegrat , and J.R. Taylor, 2022: Insights into the mixing efficiency of sub-mesoscale centrifugal-symmetric instabilities <i>J. Phys. Oceanogr.</i> , 52, 10, 2273-2287. doi: 10.1175/JPO-D-21-0259.1	

- [14] **Wenegrat, J.O., E. Bonanno**, U. Rack, and G. Gebbie, 2022: A century of observed temperature change in the Indian Ocean. *Geophys. Res. Lett.* 49, e2022GL098217. doi:10.1029/2022GL098217
- [13] Ruan, X., **J.O. Wenegrat**, and J. Gula, 2021: Slippery bottom boundary layers: The loss of energy from the general circulation by bottom drag. *Geophys. Res. Lett.*, 48, 19. doi:10.1029/2021GL094434
- [12] Farrar, J.T., E.A. D’Asaro, E. Rodriguez, A. Shcherbina, E. Czech, P. Matthias, S. Nicholas, F. Bingham, A. Mahadevan, M. Omand, L. Rainville, C. Lee, D. Chelton, R. Samelson, L. O’Neill, D. Menemenlis, D. Perkovich-Martin, P. Mouroulis, M. Gierach, D. Thompson, A. Wineteer, A. Thompson, J. McWilliams, J. Molemaker, R. Barkan, **J.O. Wenegrat**, C. Rocha, G. Jacobs, J. D’Addezio, S. de Halleux, R. Jenkins, 2020: S-MODE: the Sub-Mesoscale Ocean Dynamics Experiment. *IEEE International Geoscience and Remote Sensing Symposium Conference Proceedings*, 3533-3536. doi:10.1109/IGARSS39084.2020.9323112
- [11] **Wenegrat, J.O.**, L.N. Thomas, M.A. Sundermeyer, J.R. Taylor, E.A. D’Asaro, J. Klymak, R.K. Shearman, and C.M. Lee, 2020: Enhanced mixing across the gyre boundary at the Gulf Stream front. *Proc. Nat. Acad. Sci. (PNAS)*, 117, 30, 17607-17614. doi:10.1073/pnas.2005558117
- [10] **Wenegrat, J.O.**, and L.N. Thomas, 2020: Centrifugal and symmetric instability during Ekman adjustment of the bottom boundary layer. *J. Phys. Oceanogr.*, 50, 6, 1793-1812. doi:10.1175/JPO-D-020-0027.1
- [9] Johnson, L., C.M. Lee, E.A. D’Asaro, **J.O. Wenegrat**, and L.N. Thomas, 2020: Restratification at a California Current Upwelling Front, Part II: Dynamics. *J. Phys. Oceanogr.* 50, 5, 1473-1487. doi:10.1175/JPO-D-19-0204.1
- [8] **Wenegrat, J.O.**, and R.S. Arthur, 2018c: Response of the atmospheric boundary layer to submesoscale sea surface temperature fronts. *Geophys. Res. Lett.* 45, 24, 13505-13512. doi:10.1029/2018GL081034
- [7] **Wenegrat, J.O.**, J. Callies, and L.N. Thomas, 2018b: Submesoscale baroclinic instability in the bottom boundary layer. *J. Phys. Oceanogr.* 48, 11, 2571-2592. doi:10.1175/JPO-D-17-0264.1
- [6] **Wenegrat, J.O.**, L.N. Thomas, J. Gula, and J.C. McWilliams, 2018a: Effects of the submesoscale on the potential vorticity budget of ocean mode waters. *J. Phys. Oceanogr.* 48, 9, 2141-2165. doi:10.1175/JPO-D-17-0219.1
- [5] **Wenegrat, J.O.**, and L.N. Thomas, 2017: Ekman transport in balanced currents with curvature. *J. Phys. Oceanogr.*, 47, 5, 1189-1203. doi:10.1175/JPO-D-16-0239.1
- [4] **Wenegrat, J.O.**, and M.J. McPhaden, 2016a: A simple analytical model of the diurnal Ekman layer. *J. Phys. Oceanogr.*, 46, 9, 2877-2894. doi:10.1175/JPO-D-16-0031.1
- [3] **Wenegrat, J.O.**, and M.J. McPhaden, 2016b: Wind, waves, and fronts: Frictional effects in a generalized Ekman model. *J. Phys. Oceanogr.*, 46, 2, 371-394. doi:10.1175/JPO-D-15-0162.1
- [2] **Wenegrat, J.O.**, and M.J. McPhaden 2015: Dynamics of the surface layer diurnal cycle in the equatorial Atlantic Ocean (0°, 23°W). *J. Geophys. Res. Oceans*, 120, 563-581. doi:10.1002/2014JC010504
- [1] **Wenegrat, J.O.**, M.J. McPhaden, and R.-C. Lien, 2014: Wind stress and near-surface shear in the equatorial Atlantic Ocean. *Geophys. Res. Lett.*, 141, 1226-1231. doi:10.1002/2013GL059149

MANUSCRIPTS IN
REVIEW

Wenegrat, J.O., 2023: Current feedback on stress modifies the Ekman buoyancy flux. *J. Phys. Oceanogr.*

OTHER
PUBLICATIONS

Elipot, S., and **J.O. Wenegrat**, 2021: Vertical structure of near-surface currents: Importance, state of knowledge, and measurement challenges. *CLIVAR Variations*, 19, 1, 1-9, doi:10.5065/ybca-0s03

Wenegrat, J.O., 2015: Ocean Boundary Layer Dynamics and Air-Sea Interaction. Ph.D. Thesis, University of Washington, Seattle, WA, <http://hdl.handle.net/1773/35286>

Benedek, Z., J.W.J. Liang, and **J.O. Wenegrat**, 2014: System for providing strategies to reduce the carbon output and operating costs of a workplace. U.S. Patent 8812971.

Tung, T.S., and **J.O. Wenegrat**, 2013: System for providing strategies for increasing efficiency of data centers. U.S. Patent 8395621.

EXTERNAL
FUNDING

Submesoscale instabilities and the forward energy cascade in seamount wakes. **Chor, Wenegrat**. NSF, \$314k, 2023-2025.

Collaborative Research: The Internal Wave Spectrum and Boundary Mixing in the Sub-Tropical South Atlantic. Polzin, Bracco, Kuehl, **Wenegrat**, Blain. NOPP/NSF, \$5.4 mil., \$340k to UMD, 2022-2025.

CISESS: AOSC: A Global Census of Coastal Marine Heatwave Evolution and Drivers Using High-Resolution Satellite Data and Computer Vision. **Wenegrat**. NOAA, \$90k, 2022-2023.

Collaborative Research: Tracing the physics of submesoscale entrainment and subduction. **Wenegrat**, Fox-Kemper, Brett. NSF, \$1.1 mil., \$568k to UMD, 2022-2025.

Collaborative Research: EarthCube Capabilities: ICESpark: An Open-Source Big Data Platform for Science Discoveries in the New Arctic and Beyond. Xie, Yu, Farrell, Hurr, **Wenegrat**. NSF, \$1.2 mil., \$956k to UMD, 2021-2024.

Air-sea interaction and coupling at the ocean submesoscale. PI: **Wenegrat**. NASA, \$361k, 2021-2024.

MIXing and ResAtification in the Bottom mixed-layEr: impActs of sUbmesoscale instabilities and internal waves (MIRABEAU). Gula, Vic, **Wenegrat** (collaborator). ANR France, unfunded collaborator, 2020-2023.

Submesoscale instabilities in the ocean bottom boundary layer: A new pathway for energy dissipation. **Wenegrat**. NSF, \$383k, 2020-2023.

Submesoscale instabilities near the sea-floor and their effects on the ocean circulation and mixing. Thomas, **Wenegrat**. NSF, \$325k, 2018-2020.

INVITED TALKS

The Gulf Stream—Barrier, Blender, or...Breadmaker?, *Science on Tap*, College Park, MD, 2022.

Submesoscale instabilities and mixing at the bottom. *Gordon Research Conference on Ocean Mixing*, Mount Holyoke, MA, 2022.

Submesoscale instabilities in the bottom boundary layer: A new frontier for ocean dynamics. *Scripps Institution of Oceanography*, La Jolla, CA, 2022.

The Gulf Stream—Barrier, Blender, or...Breadmaker? Enhanced Mixing at Sharp Ocean Fronts. *Johns Hopkins Center for Environmental & Applied Fluid Mechanics*, Baltimore, MD, 2022.

The Gulf Stream—Barrier, Blender, or...Breadmaker? Enhanced Mixing at Sharp Ocean Fronts. *Horn Point Laboratories*, Cambridge, MD, 2021.

The Gulf Stream—Barrier, Blender, or...Breadmaker? Enhanced Mixing at Sharp Ocean Fronts. *George Mason University AOES Department Seminar*, Fairfax, VA, 2021.

The Deep Ocean, Menagerie of Instabilities? *Burgers Symposium Lecture*, University of Maryland, College Park, MD, 2020.

From the surface to the abyss: Effects of the submesoscale on the large-scale circulation. *SOEST*, University of Hawaii, Honolulu, HI, 2019.

Submesoscale turbulence in the bottom boundary layer: A new frontier for oceanography. *AOSC*, University of Maryland, College Park, MD, 2019.

Air-sea interaction at the ocean submesoscale: Ekman transport and surface winds. *NASA Jet Propulsion Laboratory*, Pasadena, CA, 2019.

Into the deep: Submesoscale turbulence in the ocean bottom boundary layer. *Climate and Global Dynamics Seminar*, NCAR, Boulder, CO, 2018.

Submesoscale processes in the abyss: A new frontier for ocean dynamics. *Research School for Earth Sciences*, Australian National University, Canberra, AUS, 2018.

From the submesoscale to the gyre scale: How small-scale fronts modify the properties of ocean gyres. *Mechanical Engineering Department Seminar*, University of California, Santa Barbara, Santa Barbara, CA, 2018.

From the submesoscale to the gyre scale: How small-scale fronts modify ocean mode waters. *Oceanography Department Seminar*, Dalhousie University, Halifax NS, Canada, 2017.

Mixed layer dynamics and the diurnal cycle in the equatorial Atlantic Ocean. *Equatorial Dynamics of the Atmosphere and Oceans*, AGU Fall Meeting, San Francisco, CA, 2014.

Mixed layer dynamics and the diurnal cycle in the equatorial Atlantic Ocean. *Physics of Oceans and Atmospheres Seminar*, Oregon State University, Corvallis, OR, 2014.

SELECTED
PRESENTATIONS

Cross-scale interactions and prediction *US CLIVAR Process Study and Model Improvement annual panel meeting*, Norfolk, VA, 2022. Talk.

The current feedback on stress modifies the Ekman buoyancy flux at submesoscale fronts *Ocean Sciences Meeting*, virtual, 2022. Talk.

It's fronts all the way down: Response of the atmosphere to a submesoscale front. *CLIVAR Surface Currents Workshop*, San Diego, CA, 2020. Poster.

Forced symmetric and centrifugal instability in the bottom boundary layer *Ocean Sciences Meeting*, San Diego, CA, 2020. Poster.

Enhanced mixing across the gyre boundary at the Gulf Stream front. *Environmental Fluid Mechanics and Hydrology Seminar*, Stanford University, Stanford, CA, 2019. Talk.

Symmetric instability in the ocean bottom boundary layer: A new pathway for energy dissipation? *California Geophysical Fluid Dynamic Symposium*, Pasadena, CA, 2019. Talk.

Submesoscale turbulence in the ocean bottom boundary layer: Baroclinic, symmetric, and centrifugal instabilities. *22nd Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland, ME, 2019. Talk.

Submesoscale instabilities in the bottom boundary layer. *Workshop on BBL turbulence and the Ocean Overturning Circulation*, MIT, Boston, MA, 2018. Talk.

Into the deep: Submesoscale turbulence in the bottom boundary layer. *SLS*, MIT, Boston, MA, 2018. Talk.

Into the deep: Submesoscale turbulence in the bottom boundary layer. *PO Seminar*, WHOI, Woods Hole, MA, 2018. Talk.

Submesoscale baroclinic instability in the bottom boundary layer. *Ocean Mixing Conference*, Gordon Research Conference, Andover, NH, 2018. Poster.

PV dynamics in the turbulent boundary layer. *Program on Planetary Boundary Layers*, Kavli Institute for Theoretical Physics, Santa Barbara, CA, 2018. Talk.

Submesoscale baroclinic instability in the bottom boundary layer. *Frontiers in Oceanic, Atmospheric, and Cryospheric Boundary Layers*, Kavli Institute for Theoretical Physics, Santa Barbara, CA, 2018. Poster.

Submesoscale baroclinic instability in the bottom boundary layer: A mechanism for enhanced vertical buoyancy fluxes. *Ocean Sciences Meeting*, Portland, OR, 2018. Talk.

From the submesoscale to the gyre scale: How small-scale fronts modify ocean mode waters. *Climate, Atmospheric Sciences, and Physical Oceanography Seminar*, Scripps Institution of Oceanography, San Diego, CA, 2018. Talk.

Submesoscale symmetric instability and observed rapid horizontal dispersion across the Gulf Stream. *CLIVAR Ocean Carbon Hotspots Workshop*, Monterey, CA, 2017. Poster.

Ekman transport in balanced currents with curvature. *21st Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland, OR, 2017. Talk.

Effects of the submesoscale on the potential vorticity budget of ocean mode waters. *21st Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland, OR, 2017. Poster.

Submesoscale dynamics in the turbulent boundary layer. *Oceanography Department Seminar*, Dalhousie University, Halifax NS, Canada, 2017. Talk.

Competing frictional and diabatic potential vorticity fluxes at ocean fronts. *AGU Fall Meeting*, San Francisco, CA, 2016. Talk.

Ocean boundary layer dynamics and air-sea interaction. *Physical Oceanography Dissertation Symposium (PODS) IX*, Honolulu, HI, 2016. Talk.

Dynamics of the diurnal cycle in the upper ocean: Theory, observations, and future challenges. *Environmental Fluid Mechanics and Hydrology Seminar*, Stanford University, Stanford, CA, 2016. Talk.

Implications of spatially varying boundary layer turbulence at a frontal system. *48th International Liège Colloquium on Ocean Dynamics*, Liège, Belgium, 2016. Talk.

The time-dependent vertical structure of mixed layer currents. *Ocean Sciences Meeting*, New Orleans, LA, 2016. Poster.

On the influence of winds, waves, and fronts on ocean currents. *School of Oceanography*, University of Washington, Seattle, WA, 2015. Talk.

Wind, waves, and fronts: An analytic solution to the generalized Ekman model. *20th Conference on Atmospheric and Oceanic Fluid Dynamics*, Minneapolis, MN, 2015. Talk.

	Dynamics of the surface layer diurnal cycle in the equatorial Atlantic Ocean. <i>Physical Oceanography Seminar, University of Washington, Seattle, WA, 2014. Talk.</i>	
	A WKB approximation to the generalized Ekman equation, with application to the diurnal cycle. <i>Applied Mathematics MS Symposium, University of Washington, Seattle, WA, 2014. Talk.</i>	
	The diurnal cycle of near-surface stratified shear flow at 0°N, 23°W. <i>Ocean Sciences Meeting, Honolulu, HI, 2014. Poster.</i>	
	Near-surface shear flow on the Equator. <i>Physical Oceanography Seminar, University of Washington, Seattle, WA, 2013. Talk.</i>	
	Near-surface shear, stratification, and the mixed layer momentum budget at 0°N, 23°W. <i>Tropical Atlantic Variability Conference, Kiel, Germany, 2012. Poster.</i>	
	Near-surface eddy viscosity at 0°N, 23°W inferred from ADCP and wind stress data. <i>Ocean Sciences Meeting, Salt Lake City, UT, 2012. Poster.</i>	
ADVISING	<p>Tomás Chor <i>Postdoctoral Researcher, Atmospheric and Oceanic Science</i> 2020 - present</p> <p>Victoria Whitley <i>PhD Candidate, Applied Mathematics & Statistics, and Scientific Computing</i> 2020 - present</p> <p>Igor Uchôa Farias <i>PhD Student, Atmospheric and Oceanic Science</i> 2021 - present</p> <p>Rachel Wegener <i>MS Student, Atmospheric and Oceanic Science</i> 2021 - present</p> <p>Skylar Lama <i>Undergraduate capstone project, Atmospheric and Oceanic Science</i> <i>Bernice and Susan Tannenbaum Prize in Climate Science,</i> <i>for outstanding research achievements</i> 2021-2022</p> <p>George Campe <i>Undergraduate capstone project, Atmospheric and Oceanic Science</i> 2021-2022</p> <p>Daniel Levy <i>Undergraduate Researcher, Mathematics & Physics</i> <i>UMD Goldwater Scholarship nominee</i> 2021</p> <p>Emma Bonnano <i>Undergraduate capstone project, Atmospheric and Oceanic Science</i> <i>Bernice and Susan Tannenbaum Prize in Climate Science,</i> <i>for outstanding research achievements</i> 2020-2021</p>	
PHD COMMITTEES	<p>Craig Schwartz PhD 2021</p> <p>Austin Hope PhD 2020</p> <p>Benjamin Johnson PhD 2020 <i>Committee Co-Chair with Eugenia Kalnay</i></p>	
TEACHING	<p>University of Maryland, College Park, MD</p> <p>Instructor, <i>Oceanography of the Chesapeake and Mid-Atlantic</i> Spring 2022</p>	

Instructor, *Physical Oceanography*

Fall 2020, 2021, 2022

Stanford University, Stanford, CA

Project Mentor, *SURGE Undergraduate Summer Research*

Summer 2018

University of Washington, Seattle, WA

Instructor, *Physics across Oceanography*

Winter 2015

Course Development, *Huckabay Teaching Fellow*

Autumn 2014

SERVICE AND
LEADERSHIP

Science

- NASA Sub-Mesoscale Ocean Dynamics Experiment (S-MODE) Science Team member
- US CLIVAR Process Study and Model Improvement Panel (2021 - present)

Conferences

- Co-Chair: *Turbulent Mixing of the Ocean Surface Boundary Layer: Observation, Simulation, and Parameterization*, Ocean Sciences Meeting 2022
- Moderator: *Turbulent Mixing of the Ocean Surface Boundary Layer: Observation, Simulation, and Parameterization*, Ocean Sciences Meeting 2020
- Chair: *Air-Sea Interaction at the Mesoscale and Submesoscale*, Ocean Sciences Meeting 2018

Reviewing

- Editor, *Journal of Physical Oceanography* (2023 - present)
- Associate Editor, *Journal of Physical Oceanography* (2020-2022)
- 2020 AMS Editor's award, *Journal of Physical Oceanography*
- *Journal of Physical Oceanography*, *Journal of Fluid Mechanics*, *Geophysical Research Letters*, *Journal of Geophysical Research*, *Nature*, *Quarterly Journal of the Royal Meteorological Society*, *BAMS*, *Ocean Dynamics*, *Ocean Sciences*, *TOS*, *Scientific Reports*, *Journal of Atmospheric and Oceanic Technology*, *JAMES*, *Continental Shelf Research*, *Journal of Climate*
- NASA *Physical Oceanography* proposal review panels, NSF proposal reviewer, NERC proposal reviewer, US-Israel Binational Science Foundation reviewer
- Pre-publication chapters of: *Atmospheric and Oceanic Fluid Dynamics II*, G.H. Vallis.
- NOAA Ernest F. Hollings Undergraduate Scholarship program.

Department

- Graduate Admissions Co-Chair (2020 - present)
- Seminar Committee Chair (2020 - present)
- Undergraduate curriculum committee (2021 - present)
- Lead for AOSC-AGU Bridge Program Partnership (2020 - present)
- DMV Oceans Lunch Seminars organizer (2020 - 2022)
- Faculty mentor *Ocean Builders Club* (2022 - present)