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| CONTACT<br>INFORMATION   | Jacob O. Wenegrat<br>Assistant Professor<br>Department of Atmospheric and Oceanic Science<br>University of Maryland, College Park, MD   | <a href="mailto:wenegrat@umd.edu">wenegrat@umd.edu</a><br><a href="http://wenegrat.github.io">http://wenegrat.github.io</a> |
| RESEARCH<br>INTERESTS    | <b>Geophysical fluid dynamics, atmosphere and ocean dynamics, submesoscale processes, boundary-layer processes</b>  |   |
| EDUCATION                | <b>Ph.D., Oceanography</b> 2015<br>School of Oceanography<br>University of Washington, Seattle, WA.<br><br><b>M.S., Applied Mathematics</b> 2014<br>Department of Applied Mathematics<br>University of Washington, Seattle, WA.<br><br><b>M.S., Oceanography</b> 2013<br>Department of Oceanography<br>University of Washington, Seattle, WA.<br><br><b>B.S., Symbolic Systems</b> 2006<br>Stanford University, Stanford, CA.   |   |
| APPOINTMENTS             | <b>Assistant Professor</b> , University of Maryland, College Park since 2020<br>Department of Atmospheric and Oceanic Science<br>Burgers Program for Fluid Dynamics (affiliate)<br>Applied Mathematics & Statistics, and Scientific Computation (affiliate)<br><br><b>Postdoctoral Fellow</b> , Stanford University 2016 - 2019<br>Department of Earth System Science<br>• Supervisor: <a href="#">Leif Thomas</a><br><br><b>Visiting Scholar</b> , Kavli Institute for Theoretical Physics, UCSB May 2018<br>Program on Planetary Boundary Layers in Atmospheres, Oceans, and Ice on Earth and Moons.<br><br><b>Graduate Research Assistant</b> , University of Washington 2010 - 2015<br>School of Oceanography<br>• Advisor: <a href="#">Michael J. McPhaden</a><br><br><b>Consultant</b> , Accenture Technology Labs 2007 - 2009<br>R&D consultant focused on data center energy forecasting. |   |
| REFEREED<br>PUBLICATIONS | [1] Bachman, S.D., I. Grooms, and <b>J.O. Wenegrat</b> , <i>in review</i> : The vertical transport of energy by $\beta$ in the quasigeostrophic layered model. <i>Fluids</i><br><br>[2] <b>Wenegrat, J.O.</b> , 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](https://doi.org/10.1073/pnas.2005558117)

- [3] **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](https://doi.org/10.1175/JPO-D-020-0027.1)
- [4] 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](https://doi.org/10.1175/JPO-D-19-0204.1)
- [5] **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](https://doi.org/10.1029/2018GL081034)
- [6] **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](https://doi.org/10.1175/JPO-D-17-0264.1)
- [7] **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](https://doi.org/10.1175/JPO-D-17-0219.1)
- [8] **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](https://doi.org/10.1175/JPO-D-16-0239.1)
- [9] **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](https://doi.org/10.1175/JPO-D-16-0031.1)
- [10] **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](https://doi.org/10.1175/JPO-D-15-0162.1)
- [11] **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](https://doi.org/10.1002/2014JC010504)
- [12] **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](https://doi.org/10.1002/2013GL059149)

#### OTHER PUBLICATIONS

**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 in the ocean bottom boundary layer: A new pathway for energy dissipation. PI: **Wenegrat**. NSF, \$383k, 2020-2022.

Submesoscale instabilities near the sea-floor and their effects on the ocean circulation and mixing. PI: **Wenegrat**. NSF, \$325k (UMD portion \$74k), 2018-2020.

## INVITED TALKS

- 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

- 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. *22<sup>nd</sup> 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. *21<sup>st</sup> Conference on Atmospheric and Oceanic Fluid Dynamics*, Portland, OR, 2017. Talk.

Effects of the submesoscale on the potential vorticity budget of ocean mode waters. *21<sup>st</sup> 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. *48<sup>th</sup> 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. *20<sup>th</sup> Conference on Atmospheric and Oceanic Fluid Dynamics*, Minneapolis, MN, 2015. Talk.

Dynamics of the surface layer diurnal cycle in the equatorial Atlantic Ocean. *Physical Oceanography Seminar, University of Washington*, Seattle, WA, 2014. Talk.

A WKB approximation to the generalized Ekman equation, with application to the diurnal cycle. *Applied Mathematics MS Symposium, University of Washington*, Seattle, WA, 2014. Talk.

The diurnal cycle of near-surface stratified shear flow at 0°N, 23°W. *Ocean Sciences Meeting*, Honolulu, HI, 2014. Poster.

Near-surface shear flow on the Equator. *Physical Oceanography Seminar, University of Washington*, Seattle, WA, 2013. Talk.

Near-surface shear, stratification, and the mixed layer momentum budget at 0°N, 23°W. *Tropical Atlantic Variability Conference*, Kiel, Germany, 2012. Poster.

Near-surface eddy viscosity at 0°N, 23°W inferred from ADCP and wind stress data.  
*Ocean Sciences Meeting*, Salt Lake City, UT, 2012. Poster.

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| ADVISING               | Victoria Whitley,<br><i>PhD Student, Applied Mathematics &amp; Statistics, and Scientific Computing</i>  | since 2020  |
|                        | Benjamin Johnson PhD,<br><i>Committee Co-Chair with Eugenia Kalnay</i>   | 2020        |
| TEACHING               | <b>University of Maryland, College Park, Stanford, CA</b>  |             |
|                        | Instructor, <i>Physical Oceanography</i>   | Fall 2020   |
|                        | <b>Stanford University, Stanford, CA</b>   |             |
|                        | Project Mentor, <i>SURGE Undergraduate Summer Research</i>   | Summer 2018 |
|                        | <b>University of Washington, Seattle, WA</b>   |             |
|                        | Instructor, <i>Physics across Oceanography</i>   | Winter 2015 |
|                        | Course Development, <i>Huckabay Teaching Fellow</i>  | Autumn 2014 |
| SERVICE AND LEADERSHIP | <b>Conferences</b>   |             |
|                        | <ul style="list-style-type: none"> <li>• Moderator: <i>Turbulent Mixing of the Ocean Surface Boundary Layer: Observation, Simulation, and Parameterization</i>, Ocean Sciences Meeting 2020</li> <li>• Chair: <i>Air-Sea Interaction at the Mesoscale and Submesoscale</i>, Ocean Sciences Meeting 2018</li> </ul>   |             |
|                        | <b>Reviewing</b>   |             |
|                        | <ul style="list-style-type: none"> <li>• Associate Editor, <i>Journal of Physical Oceanography</i></li> <li>• 2020 AMS Editor's award, <i>Journal of Physical Oceanography</i></li> <li>• <i>Journal of Physical Oceanography</i>, <i>Journal of Fluid Mechanics</i>, <i>Geophysical Research Letters</i>, <i>Journal of Geophysical Research</i>, <i>Nature</i>, <i>Quarterly Journal of the Royal Meteorological Society</i>, <i>BAMS</i>, <i>Ocean Dynamics</i>, <i>Ocean Sciences</i>, <i>TOS</i>, <i>Scientific Reports</i>, <i>Journal of Atmospheric and Oceanic Technology</i>, <i>JAMES</i>, <i>Continental Shelf Research</i>, <i>Journal of Climate</i></li> <li>• <i>NASA Physical Oceanography</i> proposal review panels, <i>NSF</i> proposal reviewer, <i>NERC</i> proposal reviewer</li> <li>• Pre-publication chapters of: <i>Atmospheric and Oceanic Fluid Dynamics II</i>, G.H. Vallis.</li> <li>• <i>NOAA Ernest F. Hollings Undergraduate Scholarship program</i>.</li> </ul> |             |