

## CURRICULUM VITAE

### NICHOLAS EDWARD PIZZO

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#### Education

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- 2015      **Ph.D. Oceanography, Scripps Institution of Oceanography, UCSD**  
Title: *Properties of nonlinear and breaking deep-water surface waves*  
Advisor: W. Kendall Melville  
Committee: R. Guza, R. Salmon, S. Sarkar, J. Smith
- 2008      **B.Sc. Physics (Honors) & B.Sc. Mathematics (with Distinction), University of California, Santa Barbara**

#### Research Interests

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- Air-sea interaction
- Surface waves
- Geophysical fluid dynamics at the submesoscale
- Fluid mechanics

#### Research Experience

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- 2024      Graduate School of Oceanography, URI, Assistant Professor
- 2023      *Department of Physics, UC Berkeley*, Visiting Scientist
- 2017-2023      *Scripps Institution of Oceanography*, Project Scientist
- 2016-2017      *Scripps Institution of Oceanography*, Postdoctoral Researcher
- 2009-2015      *Scripps Institution of Oceanography*, Graduate Student Researcher
- 2008      *Universidade Federal de Brasil, Ceara*, Undergraduate researcher  
Participated in International Research Experience for Students (IRES), working on problems in differential geometry and general relativity.

#### Teaching/Mentoring Experience

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- 2018-2020      *Scripps Institution of Oceanography*  
James Sinnis, UCSD undergraduate/gap-year student (now a PhD student in physics at the University of Washington). Project: The effects of bandwidth on mass transport and energy dissipation by wave breaking.
- 2020-2023      *Scripps Institution of Oceanography*  
Teodor Vrecica, postdoctoral researcher. Project: Wave-front interactions.

- 2020-Present *Scripps Institution of Oceanography*  
Aidan Blaser, Graduate student. Project: Lagrangian drift of surface waves.
- 2020-Present *Scripps Institution of Oceanography*  
Luke Colosi, Graduate student. Project: Measurement in a quasi-Lagrangian reference frame.
- 2020-Present *Scripps Institution of Oceanography*  
Adriana Formby-Fernandez, Graduate student. Project: Fog occurrence off the Grand Banks
- 2020-2021 *Scripps Institution of Oceanography*  
David Llewellyn-Smith, high school student. Project: Particle kinematics near wave breaking: theory and numerics.
- 2017-2023 *Scripps Institution of Oceanography, MPL Summer Internship*  
Mentored Sidarth Raghunathan (2017). Project: Particle trajectories in deep-water solitons: theory and experiment.  
Co-mentored David Vishny (2018). Project: Characterizing the submesoscale front at Kaena Point, Oahu, HI.  
Co-mentored Aidan Blaser (2019). Project: Wave breaking statistics.  
Mentored Raphael Benamran (2023). Project: Lagrangian drift of water waves.
- 2010-2017 *Scripps Institution of Oceanography*  
SIO 202A, 211B Linear and Nonlinear Wave Physics (graduate level). Prepared and led laboratory experiments, numerical demonstrations, and classroom lectures.

## Field Experience

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- Oct-Nov 2021 NASA S-MODE Pilot program. Piloted fleet of wave gliders off the coast of California. Participated in daily planning and science meetings.
- June 2021 R/V Beyster, Southern California. NASA S-MODE Wave Glider Pilot. Establishing the fidelity of wave glider velocity measurements versus a bottom mounted ADCP off the coast of San Diego, CA. Assisted in deploying, recovering, and piloting a fleet of wave gliders.
- May 2021 & Nov. 2020 R/V Beyster, Southern California Bight. ONR Task Force Oceanography. Simultaneous measurements of ocean acoustics and physical oceanography. Assisted in deploying, recovering, and piloting a fleet of wave gliders.

- March 2017 *R/P FLIP*, Southern California Bight.  
ONR Langmuir Circulation DRI: Investigation of Langmuir circulations and upper ocean dynamics, main experiment.
- July 2016 *R/P FLIP*, Southern California Bight.  
ONR Langmuir Circulation DRI: Investigation of Langmuir circulations and upper ocean dynamics, pilot experiment.

## Honors and Awards

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- 2014 Scripps student research award, which funded participation in the *Theory of Water Waves* program, *Isaac Newton Institute for Mathematical Sciences, Cambridge University, UK*.
- 2008 Raymond L Wilder Award for outstanding achievement in mathematics, *University of California, Santa Barbara*.

## Publications (Italics represent a paper with a student/postdoc I mentored)

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Hodges, B. A., Grare, L., Greenwood, B., Matsuyoshi, K., **Pizzo, N.**, Statom, N. M., ... & Lenain, L. (2023). Evaluation of ocean currents observed from autonomous surface vehicles. *Journal of Atmospheric and Oceanic Technology*.

*Colosi, L., Pizzo, N., Grare, L., Statom, N., & Lenain, L. (2023). Observations of Surface Gravity Wave Spectra from Moving Platforms. Journal of Atmospheric and Oceanic Technology*.

Salmon, R., & **Pizzo, N.** (2023). Two-dimensional flow on the sphere. *Atmosphere*, 14(4), 747.

*Ho, A., Merrifield, S., & Pizzo, N. (2023). Wave–Tide Interaction for a Strongly Modulated Wave Field. Journal of Physical Oceanography*, 53(3), 915-927.

Lenain, L., Smeltzer, B. K., **Pizzo, N.**, Freilich, M., Colosi, L., Ellingsen, S. Å., ... & Statom, N. (2023). Airborne Remote Sensing of Upper-Ocean and Surface Properties, Currents and Their Gradients From Meso to Submesoscales. *Geophysical Research Letters*, 50(8), e2022GL102468.

**Pizzo, N.E.**, Lenain, L., Rømcke, O., Ellingsen, S. Å., & Smeltzer, B. K. (2023). The role of Lagrangian drift in the geometry, kinematics and dynamics of surface waves. *Journal of Fluid Mechanics*, 954, R4.

*Vrecica, T., Pizzo, N.E.* and L. Lenain (2022). Observations of strongly modulated surface wave and wave breaking statistics at a submesoscale front. *Journal of Physical Oceanography* 52.2: 289-304.

**Pizzo, N.E.**, Murray, E., Llewellyn Smith, D. and L. Lenain, (2021). The role of bandwidth in setting the breaking slope threshold of deep-water focusing wave packets. *Physics of Fluids*, 33, (11) 111706.

Villas Boas, A.B. and **N.E. Pizzo**. (2021). The geometry, kinematics, and dynamics of the two-way coupling between wind, waves, and currents. *US CLIVAR Variations*, doi:10.5065/ybca-0s03.

**Pizzo, N.E.**, Deike, L. and A. Ayet, (2021). How does the wind generate waves? *Physics Today*. 74, 11, 38.

*Sinnis, J.*, Grare, L., Lenain, L. and **N.E. Pizzo**, (2021) Laboratory studies of the role of bandwidth in surface transport and energy dissipation of deep-water breaking waves. *Journal of Fluid Mechanics*, 927, A5.

**Pizzo, N.E.** and R. Salmon, (2021). A particle description of the interaction of compact wave packets and point vortices. *Journal of Fluid Mechanics*, 925, A32.

Grare, L., Statom, N., **Pizzo, N.E.**, and Lenain, L. (2021). Instrumented Wave Gliders for Air-Sea Interaction and Upper Ocean Research. *Frontiers in Marine Science*, 8, 888.

Lenain, L., and **N.E. Pizzo**, (2021). Modulation of surface gravity waves by internal waves. *Journal of Physical Oceanography*, 51(9), 2735-2748.

Lenain, L. and **N.E. Pizzo**, (2020). On the contribution of high frequency wind-generated surface waves to the Stokes drift. *Journal of Physical Oceanography*, 1-39.

**Pizzo, N.E.** (2020). Theory of deep-water surface gravity waves derived from a Lagrangian. *Journal of Fluid Mechanics*. 896, A7-1-17.

Lenain, L., **Pizzo, N.E.**, and W.K. Melville, (2019). Laboratory Studies of Lagrangian Transport by Breaking Surface Waves. *Journal of Fluid Mechanics*. 876, R1.

**Pizzo, N.E.** and W.K. Melville, (2019). Focusing deep-water surface gravity wave packets: wave breaking criterion in a simplified model. *Journal of Fluid Mechanics*. 873, 238-259.

**Pizzo, N.E.**, W.K. Melville and Luc Deike, (2019). Lagrangian Transport by Nonbreaking and Breaking Deep-Water Waves at the Ocean Surface. *Journal of Physical Oceanography*. 49(4), 983-992.

**Pizzo, N.E.**, (2017). Surfing surface gravity waves. *Journal of Fluid Mechanics*. 823, 316-328.

Deike, L., **N.E. Pizzo**, and W.K. Melville, (2017). Lagrangian transport by breaking waves. *Journal of Fluid Mechanics*. 829, 364-391.

**Pizzo, N.E.** and W.K. Melville, (2016). Wave modulation: the geometry, kinematics, and dynamics of surface-wave focusing. *Journal of Fluid Mechanics*. 803, 292-312.

**Pizzo, N.E.**, L. Deike, and W.K. Melville, (2016). Current generation by deep-water breaking waves. *Journal of Fluid Mechanics*. 803, 275-291.

**Pizzo, N.E.** and W.K. Melville, (2013). Vortex generation by deep-water wave breaking. *Journal of Fluid Mechanics*. 734, 198-218.

## Selected Talks

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Pizzo, N.E. 2022, Upper Ocean currents. **Invited Talk** at URI GSO.

Pizzo, N.E. 2022, Upper Ocean currents. **Invited Talk** at Woods Hole Oceanographic Institution.

Pizzo, N.E. 2022, A general theory for the interaction of wave packets and currents. **Invited Talk** at Ibaraki University (Japan). <https://youtu.be/8QAGoYC3dn4>

Pizzo, N.E. 2021, Observational, numerical, and theoretical studies of air-sea boundary layer processes. **Invited Talk** at Texas A&M University.

Pizzo, N.E. 2021, Mass transport by non-breaking and breaking deep-water surface gravity waves. **Invited Talk** at Oxford University.

Pizzo, N.E. 2020 Observational, numerical, and theoretical studies of current generation at the air-sea interface **Invited Talk** at the Scripps Institution of Oceanography at UCSD. *Cancelled due to COVID-19.*

Pizzo, N.E., L. Deike, L. Lenain, W.K. Melville, 2019. Lagrangian transport by deep-water breaking waves. *26<sup>th</sup> Waves in Shallow Water Environment Meeting*, Sapporo, Japan.

Pizzo, N.E. 2019, Nonlinear and breaking deep-water surface gravity waves. **Invited Talk** at BP Institute for Multiphase Flow, University of Cambridge, England.

Pizzo, N.E. 2018, A Lagrangian for water waves with application to the stability of Stokes waves. SIAM Conference on Nonlinear Waves and Coherent Structures, Anaheim, California.

Pizzo, N.E. 2018, Breaking Waves & Mass Transport. *Kavli Institute of Theoretical Physics*

*Program: Planetary Boundary Layers in Atmospheres, Oceans, and Ice on Earth and Moons*, Santa Barbara, USA. <https://online.kitp.ucsb.edu/online/blayers18/pizzo/>

Pizzo, N.E. 2017, Properties of nonlinear and breaking deep-water surface gravity waves. **Invited Talk** at Department of Marine Science, University of Otago, New Zealand.

Pizzo, N.E. 2017, Surfing surface gravity waves and Lagrangian transport by breaking. *IUTAM Wind Waves Conference*, University College London, England.

Pizzo, N.E. 2017, Properties of nonlinear and breaking deep-water surface gravity waves. **Invited Talk** at Department of Mechanical Engineering, Massachusetts Institute of Technology.

Pizzo, N.E. and W.K. Melville, 2016, Wave modulation: the geometry, kinematics, and dynamics of focusing deep-water wave packets. *International Congress of Theoretical and Applied Mechanics*, Montreal, Canada

Pizzo, N.E. and W.K. Melville, 2015, Scaling laws for deep-water breaking waves. *7<sup>th</sup> International symposium on gas transfer at water surfaces*, Seattle, USA

Pizzo, N.E. and W.K. Melville, 2013. Vortex generation by deep-water breaking waves. *American Mathematical Society Joint Mathematics Meeting*. San Diego, USA

## **Synergistic Activities**

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Founding member/organizer of the Scripps Student Symposium, a one-day conference for SIO graduate students to present their research.

Organizer of the Ken Melville 70<sup>th</sup> Birthday Symposium (2016), a two-day international conference focusing on work related to the career of W.K. Melville.

Organizer of special collection in honor of Ken Melville in the *Journal of Physical Oceanography* (2020)

Referee: *Journal of Fluid Mechanics*, *Proceedings of the Royal Society A*, *Journal of Physical Oceanography*, National Science Foundation

Conference session convener: AGU Fall Meeting (2019), AGU Ocean Sciences Meeting (2020)

Numerous outreach activities, including creating a Ted-Ed and associated learning material: <https://youtu.be/5nCcE-jABSo>

Organizer of surface waves reading group at SIO (2019-Present:  
<https://airsea.ucsd.edu/publications/surface-waves-group/>)