CURRICULUM VITAE

PERSONAL DETAILS

Dematteis, Giovanni

Researcher unique identifiers: ORCID: 0000-0003-2918-8951, Scopus ID: 57210935154

URL for web site: https://giovannidematteis.github.io/

- **Education and key qualifications**

28/06/2019 PhD in Applied Mathematics
Department of Mathematical Sciences, Polytechnic of Turin, Italy
PhD Supervisors: Prof. Lamberto Rondoni (Polytechnic of Turin) and Prof. Eric Vanden-Eijnden (New York University), 18 months (from Feb 2016 to Dec 2017) spent as Visiting PhD Student at Courant Institute of Mathematical Sciences, New York University

2015 Master's: Physics of Complex Systems (nonlinear and statistical physics, geophysics, machine learning)
Physics Department, University of Turin, Italy

2013 Undergraduate Degree in Physics
Physics Department, University of Turin, Italy

- **Current positions**

12/2023 - present Postdoctoral Researcher (Assegno di Ricerca)
Physics Department, University of Turin, Italy

12/2023 - present Guest Investigator
Physical Oceanography Department, Woods Hole Oceanographic Institution, USA

- **Previous positions**

05/2023 - 12/2023 Postdoctoral Investigator
Physical Oceanography Department, Woods Hole Oceanographic Institution, USA

03/2020 - 05/2023 Postdoctoral Researcher
Department of Mathematical Sciences, Rensselaer Polytechnic Institute, USA

11/2018 - 10/2019 Research Fellow
Physics Department, University of Turin, Italy

SCIENTIFIC ACTIVITY

Research outputs

18 peer-reviewed published papers (and 4 under revision), of which 8 first-authored in Nature Communications (IF 14.7), PNAS (IF 9.4), JPO (IF 2.8), PRX (IF 11.6), PRL (IF 8.1), JFM (2 publications, IF 3.6)
Google Scholar metrics: 532 citations, 12 h-index

1. Bellerjeau, C., Alford, M.H., Le Boyer, A., Dematteis, G., Naveira Garabato, A., Voet, G., Couto, N. and Wynne-Cattanach, B.L., 2025. Pathways to turbulent dissipation in a submarine canyon. *Geophysical Research Letters*, *52*(7), p.e2024GL113526.
2. Maestrini, D., Dematteis, G., Benetazzo, A., and Onorato, M., 2025. Revealing wave-wave resonant interactions in ocean wind waves. *arXiv preprint arXiv:2507.12274.*
3. Polzin, K.L. and Dematteis, G., 2025. Mesoscale Eddy--Internal Wave Coupling. III. The End of the Enstrophy Cascade and Maintenance of Gyre Scale Potential Vorticity Gradients. *arXiv preprint arXiv:2504.00486*.
4. Salvatore, N.R., Dematteis, G. and Lvov, Y.V., 2025. Spectral Transfers of Sign-Definite Invariants in Wave Turbulence. *arXiv preprint arXiv:2503.15533*.

5. Villois, A., Dematteis, G., Lvov, Y.V., Onorato, M. and Shatah, J., 2025. Anomalous correlators, negative frequencies and non-phase-invariant Hamiltonians in random waves. *arXiv preprint arXiv:2502.20574*.
6. Maestrini, D., Noto, D., Dematteis, G. and Onorato, M., 2025. On the wave kinetic equation in the presence of forcing and dissipation. *Journal of Fluid Mechanics*, *1008*, p.A44.
7. Dematteis, G., Le Boyer, A., Pollmann, F., Polzin, K.L., Alford, M.H., Whalen, C.B. and Lvov, Y.V., 2024. Interacting internal waves explain global patterns of interior ocean mixing. *Nature Communications*, 15(1), p.7468.
8. Dematteis, G., 2024. Codes for 'Interacting internal waves explain global patterns of interior ocean mixing'. *Zenodo* https://doi.org/10.5281/zenodo.12529645.
9. Burchard, H., Alford, M., Chouksey, M., Dematteis, G., Eden, C., Giddy, I., Klingbeil, K., Le Boyer, A., Olbers, D., Pietrzak, J. and Pollmann, F., 2024. Linking ocean mixing and overturning circulation. *Bulletin of the American Meteorological Society*, 105(7), pp. E1265-E1274.
10. Onorato, M., Lvov, Y.V., Dematteis, G. and Chibbaro, S., 2023. Wave Turbulence and thermalization in one-dimensional chains. *Physics Reports*, *1040*, pp.1-36.
11. Dematteis, G. and Lvov, Y.V., 2023. The structure of energy fluxes in wave turbulence. *Journal of Fluid Mechanics*, 954, p.A30.
12. Dematteis, G., Polzin, K. & Lvov, Y.V., 2022. On the Origins of the Oceanic Ultraviolet Catastrophe. *Journal of Physical Oceanography*, 52(4), pp.597-616.
13. De Vita, F., Dematteis, G., Mazzilli, R., Proment, D., Lvov, Y.V. and Onorato, M., 2022. Anomalous conduction in one-dimensional particle lattices: Wave-turbulence approach. *Physical Review E*, *106*(3), p.034110.
14. Onorato, M., Dematteis, G., Proment, D., Pezzi, A., Ballarin, M. and Rondoni, L., 2022. Equilibrium and nonequilibrium description of negative temperature states in a one-dimensional lattice using a wave kinetic approach. *Physical Review E*, *105*(1), p.014206.
15. Dematteis, G. & Lvov, Y.V., 2021. Downscale energy fluxes in scale-invariant oceanic internal wave turbulence. *Journal of Fluid Mechanics*, 915.
16. Onorato, M. & Dematteis, G., 2020. A straightforward derivation of the four-wave kinetic equation in action-angle variables. *Journal of Physics Communications*, 4(9), p.095016.
17. Dematteis, G., Rondoni, L., Proment, D., De Vita, F. and Onorato, M., 2020. Coexistence of ballistic and Fourier regimes in the β Fermi-Pasta-Ulam-Tsingou lattice. *Physical Review Letters*, *125*(2), p.024101.
18. Dematteis, G., Grafke, T., Onorato, M. & Vanden-Eijnden, E., 2019. Experimental evidence of hydrodynamic instantons: the universal route to rogue waves. *Physical Review X*, 9(4), p.041057.
19. Dematteis, G., Grafke, T. & Vanden-Eijnden, E., 2019. Extreme event quantification in dynamical systems with random components. *SIAM/ASA Journal on Uncertainty Quantification*, 7(3), pp.1029-1059.
20. Dematteis, G., Grafke, T. & Vanden-Eijnden, E., 2018. Rogue waves and large deviations in deep sea. *Proceedings of the National Academy of Sciences*, 115(5), pp.855-860.
21. Chibbaro, S., Dematteis, G. and Rondoni, L., 2018. 4-wave dynamics in kinetic wave turbulence. *Physica D: Nonlinear Phenomena*, *362*, pp.24-59.
22. Chibbaro, S., Dematteis, G., Josserand, C. and Rondoni, L., 2017. Wave-turbulence theory of four-wave nonlinear interactions. *Physical Review E*, *96*(2), p.021101.
23. Lamberto, R. and Giovanni, D., 2016. Physical ergodicity and exact response relations for low-dimensional maps. *CMST*, *22*(2), pp.71-85.

Outstanding invited visits and participation to conferences

- December 2023 and December 2024. Attended upon invitation the Wave Turbulence Simons Collaboration annual meeting at the Simons Foundation in NYC (full financial support).
- September 2024: Invited visit to the group of Prof. Katy Sheen in Exeter University, UK (PI of an ERC Consolidator Grant on observational submesoscale dynamics), with seminar to the oceanography group on internal wave-driven mixing.
- June 2024: Invited speaker at the Gordon Research Seminar on Ocean Mixing in My. Holyoke, MA.
- June 2024: Invited participation to 1-week scientific cruise in the Gulf of Mexico targeting IWs and mixing, funded by NOPP-GIW PIs.
- September 2023: Selected speaker at the 11th Warnemuende Turbulence Days, held in Rostock, Germany, with invitation to writing conference proceeding.

- August 28-31, 2023. Invited lecturer at the Workshop/Summer School on Wave Dynamics: Integrable vs Non-Integrable Effects, held at ICTP (Trieste, Italy).
- 2022: Recognized peer-reviewer of the highly cited paper *Pickering, E. et al. "Discovering and forecasting extreme events via active learning in neural operators."* *Nature Computational Science* 2.12 (2022): 823-833.
- December 1-2, 2022. Keynote Speaker at the Wave Turbulence Simons Collaboration annual meeting at the Simons Foundation in NYC: The role of internal wave turbulence in the oceanic energy pathways (invitation with full financial support, including the PI's pre-meeting workshop, Nov 28-30).
- October 17-19, 2022. Invited visit with full financial support to Scripps Institution of Oceanography of UC San Diego. 1h talk at the weekly CASPO seminar series. Participation in the 'student lunch with the speaker', an open conversation with the PhD students of Scripps.
- July 18-21, 2022. Invited lecturer at the Summer School 'Wave Turbulence and Beyond' organized by the Simons Collaboration on Wave Turbulence, held in Torino. Lecture title: 'The role of internal wave turbulence in the oceanic energy pathways'.
- June 6-10, 2022. Keynote speaker at Ocean Mixing Gordon Research Conference at Mt Holyoke (MA), session Mixing in the Interior: Internal Waves and the Next Generation of Parameterizations.
- April 2022. Invited talk at the MIT EAPS Department Seminar, invited by Prof. R. Ferrari: 'Internal wave turbulence and finescale parameterization of ocean mixing'.
- December 2021 and December 2020. Attended the Wave Turbulence Simons Collaboration annual meeting at the Simons Foundation in NYC (under invitation and full financial support).

Other important conferences/workshops attended as speaker include: Ocean Sciences Meeting in New Orleans (February 2024); EGU, European Geosciences Union, Vienna (May 2022); IMACS conference on Nonlinear Evolution Equations and Wave Phenomena in Athens, GA (March 2022); Waves-Cote d'Azur Conference in Nice (2019); ICIAM 19 in Valencia, symposium 'Uncertainty quantification in geophysics' (2019); StatPhys Conference in Buenos Aires (2019); SIAM Conference Analysis and PDE in Baltimore (2017).

Proposal writing

- 2024. Unfunded Collaborator in NSF Postdoctoral Fellow proposal submitted by PI Zachary Taebel (proposed host: Scripps Institution of Oceanography), with title: "A Parameterization of Tidal and Equatorial Internal Wave Turbulence", with the role of providing mentorship regarding the theoretical parts of the project.
- 2024. Lead PI of proposal to the ERC Starting Grant call of October 2024 with title "Oceanic Physics-based Parameterizations of Internal Wave-driven Mixing", asking for €1.5mln over 5 years to start my group. Admitted to the interview phase.
- 2024. Unfunded Collaborator in NSF OCE proposal (under revision) "Wave Kinetic Theory for Estimating Turbulent Dissipation: From Theory to Realistic and Evolving Spectra": PIs Cynthia Wu and Yulin Pan (University of Michigan). I collaborated substantially to the writing but not a PI as based in a foreign institution.
- 2024. Unfunded Collaborator in NSF OCE proposal (under revision) "Collaborative Research: Internal Tide-Driven Turbulence: Energy Pathways and Mixing Efficiency": PIs H. Drake (University of California Irvine) and A. Kaminski (University of California Berkeley).

Prizes and honors

- July 28, 2019. PhD in Pure and Applied Mathematics (Politecnico di Torino and Universita degli Studi di Torino) awarded 'cum Laude'
- Winner of the 'PhD Quality Prize' 2018 awarded by Politecnico di Torino
- Winner of the 'PhD Quality Prize' 2017 awarded by Politecnico di Torino

Training activities

- August 2023. Participation in the 4-week long Les Houches summer school: 200 years of the Navier Stokes equations.
- July 2023. Participation in the 1-week summer school on Wave Turbulence held at MIT.
- 2020-2022. Several visits to Dr. Kurt Polzin at WHOI.
- July 6-9, 2020. Online Les Houches summer school on Wave Turbulence.

- November 2019. 2 weeks at the University of East Anglia, Norwich UK (Applied Math) visiting Prof. Davide Proment.
- February 2019. One week visit in Princeton to Prof. Lamberto Rondoni, in sabbatical with Prof. Amilcare Porporato's group at the Department of Civil and Environmental Engineering, followed by a 3 day visit at the Courant Institute (Prof. Eric Vanden-Eijnden).
- June 18-22, 2018. Summer School: Wave Turbulence and Extreme Events (Udine, Italy).
- June 2018. One week visit at Courant Institute, New York (Prof. Eric Vanden-Eijnden).
- April 12-14, 2018. Participant at the conference of the Italian statistical physics community: Il problema di Fermi-Pasta-Ulam: stato dell'arte e prospettive (Padova)
- 18 months (from Feb 2016 to Dec 2017) spent as Visiting PhD Student at the Courant Institute of Mathematical Sciences of the New York University (with professor Eric Vanden-Eijnden) working on applications of Large Deviations theory.
- July 16-29, 2017. Summer School: Fundamental Problems in Statistical Physics XIV (Brunico, Italy).
- July 2015. One week visit at Pierre et Marie Curie University, Paris (Prof. Sergio Chibbaro).

Other contributions to the scientific community

Service as a peer reviewer (over 40 completed rounds of review)
Reviewer for Nature Computational Science, Geophysical Research Letters, Journal of Physical Oceanography, Journal of Fluid Mechanics, Physical Review Letters, Physical Review E, Physical Review Fluids, Journal of Statistical Physics, Ocean Modelling, Journal of Nonlinear Science, J. of Atmosph. and Oc. Technology, European Physical Journal Plus.

Mentoring

- Co-supervision of PhD student Nick Salvatore in Applied Mathematics at Rensselaer Polytechnic Institute (official supervisor: Prof. Yuri Lvov): 'A formalism for spectral flux in wave turbulence'. Dr. Salvatore successfully earned his PhD in July 2024.
- Fall 2024. Co-supervisor of Undergraduate Thesis: 'Internal waves and solitons on the continental shelf'. Supervisor: Prof. Miguel Onorato.
- Collaboration with C. Bellerjeau during her PhD in Physical Oceanography at Scripps, resulted in research publication (research output #1 above).
- Spring 2021. Reviewer of MSc thesis in Physics at University of Turin.
- 2019. Co-supervisor of Master's Thesis: 'Waves on the sea surface and large deviation theory', supervisor: Prof. Miguel Onorato.
- Collaboration with M. Alqahtani during her PhD in Applied Math at Warwick University, UK (visit in person in Warwick and online meetings), acknowledged in publication: *M. Alqahtani & T. Grafke 2021 J. Phys. A: Math. Theor. 54 175001.*
- 2019. Co-supervisor of Undergraduate Thesis: 'Extreme events and large deviation theory in the Schroedinger equation', supervisor: prof. Miguel Onorato.

Teaching

- Fall 2024. Teaching Assistant in Physics II for Undergraduate in Physics, University of Turin.
- Spring 2024. Teaching 4 hours (2 classes) on internal waves and ocean mixing in Geophysical Fluid Dynamics class for Master's degree in Physics, University of Turin (class by Prof. A. Provenzale).
- Spring 2023. Teaching 8 hours (4 classes) of Ordinary Differential Equations in the Undergraduate degree at Rensselaer Polytechnic Institute (class by Prof. Yuri Lvov, RPI).
- Spring 2020. Teaching 4 hours (2 classes) on surface gravity waves, in the course on Physical Oceanography by Prof. Yuri Lvov (RPI).
- Fall 2018 and fall 2019. Teaching a 3 hour class (each year) on Extreme events and large deviations, part of Prof. Miguel Onorato's course Nonlinear waves and turbulence.
- Fall 2018. Teaching Assistant of the course of Calculus I (Prof. Paolo Cortese, PoliTo), 60 hours.
- 2013-2014. For 2 years tutor in Scientific Computing classes (C++) for Physics students in the second year of the Bachelor (20 hours each year, Physics UniTo)
- 2013. Tutor in the Physics I course for Math freshmen students (20 hours, Math UniTo).

Other

- September 3-6, 2019. Staff-volunteer at conference ETC17, European Turbulence Conf., in Torino.
- April 2019. Speaker in the Mathematics PhD Seminar at Università di Torino, a science communication seminar series for research outreach with undergraduate students.