Pavel Perezhogin

pperezhogin@gmail.com, pp2681@nyu.edu
pperezhogin.github.io
scholar.google.com/citations?user=HRXHqugAAAAJ

Education and Employment

Oct 2025 – Now — **Research Associate** in Mathematics Department. Courant Institute of Mathematical Sciences, New York University. **Lead Scientist** in M^{2}LInES project.

Dec 2021 – Oct 2025 — **Postdoctoral Associate** in Mathematics Department. Courant Institute of Mathematical Sciences, New York University. Advisor: Dr. Laure Zanna

2017 – 2021 — **PhD** in Mathematical Modeling, Numerical Methods and Software.
Marchuk Institute of Numerical Mathematics of the Russian Academy of Sciences. Thesis Title: Stochastic and deterministic subgrid parameterizations for two-dimensional turbulence and their application in ocean circulation models (in Russian). Advisor: Dr. Andrey Glazunov

2011 – 2017 — **BSc&MSc** in Applied Mathematics and Physics. Department of Control and Applied Mathematics. Moscow Institute of Physics and Technology (MIPT).

Awards

2019 — **PhD Research Fellowship**, Russian Foundation for Basic Research, Grant No. 19-35-90023. Advisor: A. V. Glazunov.

2018 — **Medal of the Russian Academy of Sciences** for students for the best scientific work in oceanology, atmospheric physics and geography.

Additional Experience

Leadership — Member of the **CESM-MLe Integration Team**, dedicated to incorporating Machine Learning-based parameterizations and techniques into the Community Earth System Model (CESM).

Short-term visit — Conducted a research project during the **Summer Program 2024** at the Center for Turbulence Research (CTR), Stanford University.

Teaching — **Invited** guest lectures "Machine Learning in Geophysics", Russia, Moscow, INM RAS (2023).

Mentoring — Grad. student Ivan Kobzar (co-advised with Andrey Glazunov, 2021) and Undergrad. Matias Ortiz (co-advised with Laure Zanna, 2023).

Reviewing — Journal of Advances in Modeling Earth Systems (JAMES) | Ocean Modeling | Geoscientific Model Development (GMD)

Selected Talks

2025 American Geophysical Union (AGU) annual meeting, Climate Process Team (CPT) annual meeting, NCAR-DLR meeting (Boulder, Colorado), CESM Ocean Model Working Group

2024 Ocean Sciences | CESM Ocean Model Working Group

2023 Courant Atmosphere Ocean Science Colloquium (**invited**) | AGU Fall Meeting | APS Division of Fluid Dynamics | CESM Workshop | CPT Annual Meeting | NEMO Machine Learning WG (**invited**) | CESM Ocean Model WG meeting

2022 AGU Fall Meeting | CPT Annual Meeting | NEMO Eddy Closure WG (**invited**)

2017-2021 TRR 181 Seminar (**2021, invited**) | EGU General Assembly (**2020, 2021, online**) | AGU Fall Meeting (**2020, online**) | ECMWF Annual seminar (**2020, online**) | Winter School in Les Houches (**2019**, **poster**) | 32nd-IUGG (**2018**) | CITES-**2017**

Publications

Peer-reviewed Journal papers

1. **Perezhogin**, **P.**, Adcroft, A., & Zanna, L. (2025). Generalizable neural-network parameterization of mesoscale eddies in idealized and global ocean models. *Geophysical Research Letters*, *52*(19), e2025GL117046. doi:https://doi.org/10.1029/2025GL117046
2. Zhang, C., **Perezhogin**, **P.**, Adcroft, A., & Zanna, L. (2025). Addressing out-of-sample issues in multi-layer convolutional neural-network parameterization of mesoscale eddies applied near coastlines. *Journal of Advances in Modeling Earth Systems (JAMES)*, *17*(5), e2024MS004819. doi:https://doi.org/10.1029/2024MS004819
3. Falasca, F., **Perezhogin**, **P.**, & Zanna, L. (2024). Data-driven dimensionality reduction and causal inference for spatiotemporal climate fields. *Phys. Rev. E*, *109*, 044202. doi:https://doi.org/10.1103/PhysRevE.109.044202
4. **Perezhogin**, **P.**, Zhang, C., Adcroft, A., Fernandez-Granda, C., & Zanna, L. (2024). A stable implementation of a data-driven scale-aware mesoscale parameterization. *JAMES*, *16*(10), e2023MS004104. doi:https://doi.org/10.1029/2023MS004104
5. **Perezhogin**, **P.**, & Glazunov, A. (2023). Subgrid Parameterizations of Ocean Mesoscale Eddies Based on Germano Decomposition. *JAMES*, *15*(10). doi:https://doi.org/10.1029/2023ms003771
6. **Perezhogin**, **P.**, Zanna, L., & Fernandez-Granda, C. (2023). Generative Data-Driven Approaches for Stochastic Subgrid Parameterizations in an Idealized Ocean Model. *JAMES*, *15*(10), e2023MS003681. doi:https://doi.org/10.1029/2023MS003681
7. Ross, A., Li, Z., **Perezhogin**, **P.**, Fernandez-Granda, C., & Zanna, L. (2023). Benchmarking of machine learning ocean subgrid parameterizations in an idealized model. *JAMES*, *15*(1), e2022MS003258. doi:https://doi.org/10.1029/2022MS003258
8. Zasko, G. V., Glazunov, A. V., Mortikov, E. V., Nechepurenko, Y. M., & **Perezhogin**, **P.** (2023). Optimal energy growth in stably stratified turbulent Couette flow. *Boundary-Layer Meteorology*, *187*(1-2), 395–421. doi:https://doi.org/10.1007/s10546-022-00744-3
9. Zhang, C., **Perezhogin**, **P.**, Gultekin, C., Adcroft, A., Fernandez-Granda, C., & Zanna, L. (2023). Implementation and Evaluation of a Machine Learned Mesoscale Eddy Parameterization Into a

Numerical Ocean Circulation Model. *JAMES*, *15*(10), e2023MS003697. doi:https://doi.org/10.1029/2023MS003697

10. **Perezhogin**, **P.**, Chernov, I., & Iakovlev, N. (2021). Advanced parallel implementation of the coupled ocean–ice model FEMAO (version 2.0) with load balancing. *Geoscientific Model Development*, *14*(2), 843–857. doi:https://doi.org/10.5194/gmd-14-843-2021

11. **Perezhogin**, **P.** (2020a). 2D turbulence closures for the barotropic jet instability simulation. *Russian Journal of Numerical Analysis and Mathematical Modelling*, *35*(1), 21–35. doi:https://doi.org/10.1515/rnam-2020-0003

12. **Perezhogin**, **P.** (2020b). Testing of kinetic energy backscatter parameterizations in the NEMO ocean model. *Russian Journal of Numerical Analysis and Mathematical Modelling*, *35*(2), 69–82. doi:https://doi.org/10.1515/rnam-2020-0006

13. **Perezhogin**, **P.**, Glazunov, A. V., & Gritsun, A. S. (2019). Stochastic and deterministic kinetic energy backscatter parameterizations for simulation of the two-dimensional turbulence. *Russian Journal of Numerical Analysis and Mathematical Modelling*, *34*(4), 197–213. doi:https://doi.org/10.1515/rnam-2019-0017

14. Dymnikov, V., & **Perezhogin**, **P.** (2018). Systems of hydrodynamic type that approximate two-dimensional ideal fluid equations. *Izvestiya, Atmospheric and Oceanic Physics*, *54*, 232–241. doi:https://doi.org/10.1134/S0001433818030040

15. **Perezhogin**, **P.**, & Dymnikov, V. (2017). Modeling of quasi-equilibrium states of a two-dimensional ideal fluid. *Doklady Physics*, *62*, 248–252. doi:https://doi.org/10.1134/S1028335817050032

16. **Perezhogin**, **P.**, Glazunov, A. V., Mortikov, E. V., & Dymnikov, V. P. (2017). Comparison of numerical advection schemes in two-dimensional turbulence simulation. *Russian Journal of Numerical Analysis and Mathematical Modelling*, *32*(1), 47–60. doi:https://doi.org/10.1515/rnam-2017-0005

Conference Proceedings

1. **Perezhogin**, **P.**, Balakrishna, A., & Agrawal, R. (2024). Large eddy simulation of ocean mesoscale eddies. In *Center for Turbulence Research, Proceedings of the Summer Program*. Retrieved from https://web.stanford.edu/group/ctr/ctrsp24/vi07_PEREZHOGIN.pdf

Preprints

1. Zanna, L., Gregory, W., **Perezhogin**, **P.**, Sane, A., Zhang, C., Adcroft, A. et al. (2025). *A Framework for Hybrid Physics-AI Coupled Ocean Models*. doi:https://doi.org/10.48550/arXiv.2510.22676

2. Balwada, D., **Perezhogin**, **P.**, Adcroft, A., & Zanna, L. (2025). *Design and implementation of a data-driven parameterization for mesoscale thickness fluxes*. doi:https://doi.org/10.22541/essoar.174835313.30541637/v1

3. Wu, J., **Perezhogin**, **P.**, Gagne, D. J., Reichl, B., Subramanian, A. C., Thompson, E., & Zanna, L. (2025). *Data-driven probabilistic air-sea flux parameterization*. doi:https://doi.org/10.48550/arXiv.2503.03990

Note: *Additional* publications, including peer-reviewed in Russian journals (**2**), preprints (**1**), conference papers (**3**) and open source education/software (**1**) can be found at pperezhogin.github.io/publications

CV was created on October 28, 2025