

Pavel Perezhogin

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🌐 pperezhogin.github.io

📄 scholar.google.com/citations?user=HRXHqugAAAAJ

Education and Employment

- 2021 – Now 📖 **Postdoctoral Associate** in Mathematics Department. Courant Institute of Mathematical Sciences, New York University, as part of M²LInES project.
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 (INM RAS)
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. Moscow Institute of Physics and Technology (MIPT), Department of Control and Applied Mathematics.

Awards

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

Additional Experience



- Short-term visits 📖 Summer Program 2024 in Center for Turbulence Research (CTR SP), Stanford.
- 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).
- Reviewer 📖 Journal of Advances in Modeling Earth Systems (JAMES) | Ocean Modeling | Geoscientific Model Development (GMD)

Selected Talks









Note: *extended list* of 34 presentations for 2016-2024 years can be found at 🌐 pperezhogin.github.io/talks

2024 📖 Ocean Sciences | CESM OMWG | CTR SP

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**

Code repositories







-  Generative ML models for ocean parameterization  github.com/mzlines/pyqg_generative
-  Equation-discovered ML parameterization in MOM6 ocean model  github.com/NOAA-GFDL/MOM6/pull/484
-  Parallel exchange library with load balancing for FEMAO ocean-ice model  zenodo.org/records/3873239
-  Kinetic energy backscatter parameterizations for NEMO ocean model  [github](https://github.com)

Publications

Preprints

- 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*.
- 2** Zhang, C., **Perezhogin, P.**, Adcroft, A., & Zanna, L. (2024). Addressing out-of-sample issues in multi-layer convolutional neural-network parameterization of mesoscale eddies applied near coastlines. In *Arxiv preprint arxiv:2411.01138*.  doi:<https://arxiv.org/abs/2411.01138>

Peer-reviewed Journal papers

- 1** 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>
- 2** **Perezhogin, P.**, Zhang, C., Adcroft, A., Fernandez-Granda, C., & Zanna, L. (2024). A stable implementation of a data-driven scale-aware mesoscale parameterization. *Journal of Advances in Modeling Earth Systems*, *16*(10), e2023MS004104.  doi:<https://doi.org/10.1029/2023MS004104>
- 3** **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>
- 4** **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>
- 5** 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>
- 6** 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>

- 7 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](https://doi.org/10.1029/2023MS003697)
- 8 **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](https://doi.org/10.5194/gmd-14-843-2021)
- 9 **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](https://doi.org/10.1515/rnam-2020-0003)
- 10 **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](https://doi.org/10.1515/rnam-2020-0006)
- 11 **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](https://doi.org/10.1515/rnam-2019-0017)
- 12 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](https://doi.org/10.1134/S0001433818030040)
- 13 **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](https://doi.org/10.1134/S1028335817050032)
- 14 **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](https://doi.org/10.1515/rnam-2017-0005)

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