

Pavel Perezhogin

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Education and Employment

- Oct 2025 – Now 📌 **Research Scientist** in Mathematics Department. Courant Institute of Mathematical Sciences, New York University. **Lead Scientist** in M²LInES project.
- Jun-Jul 2024 📌 **Short-term visit.** Stanford University, Center for Turbulence Research, leading a project in **Summer Program 2024**
- 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).
- Teaching 📌 **Invited** guest lectures "Machine Learning in Geophysics", Russia, Moscow, INM RAS (2023).
- Mentoring 📌 Ivan Kobzar (co-advised with Dr. Andrey Glazunov), and Matias Ortiz, Sid Arora, Yuan Yuan (co-advised with Prof. Laure Zanna).
- Reviewing 📌 Journal of Advances in Modeling Earth Systems (JAMES) | Ocean Modeling | Geoscientific Model Development (GMD) | Physics of Fluids

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**

Selected Publications

Peer-reviewed Journal papers

- 1 Balwada, D., **Perezhogin, P.**, Adcroft, A., & Zanna, L. (2026). Design and implementation of a data-driven parameterization for mesoscale eddy-induced transport: Idealized two-layer configurations. *Journal of Advances in Modeling Earth Systems*, 18(9), e2025MS005245.
- 2 Kamm, D., **Perezhogin, P.**, Deshayes, J., Meunier, E., & Barge, A. (2026). Assessing data-driven eddy-parameterizations in an atlantic sector model. *Journal of Advances in Modeling Earth Systems*, 18(6), e2026MS005816.  doi:<https://doi.org/10.1029/2026MS005816>
- 3 **Perezhogin, P.**, Adcroft, A., & Zanna, L. (2026). Calibration of a neural network ocean closure for improved mean state and variability. *Geophysical Research Letters*, 53(13), e2026GL123513.  doi:<https://doi.org/10.1029/2026GL123513>
- 4 Wu, J., **Perezhogin, P.**, Gagne, D. J., Reichl, B. G., Subramanian, A. C., Thompson, E. J., & Zanna, L. (2026). Data-driven probabilistic air-sea flux parameterization. *Geophysical Research Letters*, 53(6), e2025GL120472.  doi:<https://doi.org/10.1029/2025GL120472>
- 5 **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>
- 6 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>
- 7 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>
- 8 **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>

- 9 **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
- 10 **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
- 11 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
- 12 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
- 13 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
- 14 **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
- 15 **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
- 16 **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
- 17 **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
- 18 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
- 19 **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
- 20 **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