Olga Sergienko

Geophysical Fluid Dynamics Laboratory
201 Forrestal Rd.
Princeton, NJ, 08540, USA
Email: osergien@princeton.edu

Education

The University of Chicago — Chicago, IL, USA
PhD Geophysical Sciences, Advisor: Douglas R. MacAyeal — 2001–2005
Dissertation: *Surface melting on ice shelves and icebergs*

Moscow Engineering Physics Institute (State University) — Moscow, Russia
Candidate of Sciences (PhD equivalent), Physics and Mathematics, Advisor: Oleg V. Nagornov — 1996–1999
Dissertation: *Numerical modeling of heat and mass transfer under an ice shelf and on its base*

Moscow Engineering Physics Institute (State University) — Moscow, Russia
M.S. Physics (awarded with distinction), Advisor: Boris M. Tulinov — 1989–1995
Dissertation: *Numerical simulations of radioactive waste burial in permafrost*

Employment and professional activity

Princeton University — Princeton, NJ, USA
The Program in Atmospheric and Oceanic Sciences — 2014–present
Research Glaciologist (36.25 hrs/week)

Conducting research in the field of glaciology. Developing theories and numerical models to understand dynamics and stability of marine ice sheets, ice-sheet/ice-shelf/icebergs interactions with the oceans and atmosphere. Applying advanced mathematical methods, including inverse techniques to glaciological problems. Supervising and mentoring postdoctoral fellows and students. In collaboration with researchers from the Cooperative Institute for Modeling the Earth System (Princeton University) and scientists from the Geophysical Fluid Dynamics Laboratory (GFDL) developing the next-generation of the GFDL global ocean-cryosphere model OM5 that includes dynamcially coupled ice-sheet model, MOM6-IS. Facilitating development of a framework to represent icebergs in global ocean circulation models and its implementation in the GFDL ocean model MOM6.

Princeton University — Princeton, NJ, USA
The Program in Atmospheric and Oceanic Sciences — 2009–2014
Associate Research Scholar (36.25 hrs/week)

Developed novel inverse method techniques and remote sensing data analysis applied to glaciological applications. Supervised postdoctoral fellows and graduate and undergraduate students.Facilitated model developments to allow for sub-ice-shelf circulation in the GFDL ocean model MOM6. Conducted research on the ice/ocean interactions. Developied novel theories for understanding the impacts of supraglacial lakes on collapse of the ice shelves.

Portland State University — Portland, OR, USA
Geology Department — 2008–2009
Research Assistant Professor (37.25 hrs/week)

Developed theoretical and numerical models to understand mutual interactions between the basal traction, subglacial lakes and ice-stream flow.

NASA Goddard Space Flight Center Greenbelt, MD, USA
Hydrospheric and Biospheric Sciences Laboratory 2006–2008
NASA Postdoctoral Fellow, mentor: Robert A. Bindschadler (37.5 hrs/week)

Applied inverse methods to infer basal conditions under Bindschadler Ice Stream from surface observations. Developed numerical models to investigate the effects of dynamic subglacial lakes on the ice-stream flow.

Moscow Engineering Physics Institute (State University) Moscow, Russia
High energy-density physics Department 2000–2001
Docent

Developed and taught courses *Mechanics of fluids and gases* (introduction and advanced), *Introduction to solid state physics*. Supervised a master student Nadezhda Boiko, MS, 2001 (thesis: *Thermal regimes in the vicinity of buried radioactive waste containers*).

Moscow Engineering Physics Institute (State University) Moscow, Russia
The High energy-density physics Department 1999–2000
Lecturer

Developed and taught a course *Introduction to solid state physics*. Supervised a master student.

Research grants

- NASA NNH22ZDA001N-ESI, co-PI 03/01/2023–03/01/2026
  "Greenland-scape: Uncovering topography and geology beneath the Greenland Ice Sheet $52,420
- NOAA NA13OAR4310097 Lead PI 01/09/2013–31/08/2017
  "Climate Process Team: Representing Calving and Iceberg Dynamics in Global Climate Models" $1,295,000
- NSF PLR-1246151, co-PI 01/06/2014–01/06/2017
  "Collaborative Research: Dynamic Response of the Ross Ice Shelf to Wave-Induced Vibrations" $42,000
- NSF ANT-0838811, Lead PI 15/07/2009–30/06/2013
  "Collaborative Research: Model investigation of ice stream/subglacial lake system" $375,543
- NSF CMG-09344534, co-PI 15/09/2009–31/08/2013
  "Enabling ice sheet sensitivity & stability analysis with a large-scale higher-order ice sheet model's adjoint to support sea level change assessment" $68,968

Teaching

- **Guest Lecturer** at Princeton University 2013–2015, 2018
  Courses: Introduction to Ocean Physics for Climate, Introduction to Physical Oceanography
  Special topics: the role of the cryosphere; ice-sheet dynamics; ice/ocean interactions
- **Summer school lecturer/instructor** 8-19/06/2010
  Advanced Climate Dynamics Courses Lyngen, Norway
  Lectures: *Ice-shelf dynamics; Special Processes at the Ice Front; Inverse Modeling*
- **Summer school lecturer/instructor** 6-15/08/2009
  Ice Sheet Modeling Summer School Portland, OR, USA
  Lectures: *Ice-stream dynamics; Ice-shelf processes; Inverse Modeling*
- **Teaching assistant** at the University of Chicago 2001–2005
  Courses: Earth's ice age, Global Climate Change, Introduction to climate dynamics

- **Docent, Lecturer** at Moscow Engineering Physics Institute (State University) 1999–2001
  Courses: Mechanics of fluids and gases (introduction and advanced), Introduction to solid state physics

Advisees

Postdoctoral Fellows

Alexander Huth 2020–2022
Currently GFDL, Physical scientist

Elisa Mantelli 2019–2021
Currently Ludwig-Maximilians-Universität Munich, Assistant Professor

Anders Damsgaard 2017–2018
Currently Aarhus University, Assistant Professor

Michael Wolovick 2016–2018
Currently Alfred Wegener Institute, postdoctoral fellow

Alon Stern 2015 –2018
Currently Slide Financial Ltd, founder

Marianne Haseloff 2015–2017
Currently University of Wisconsin-Madison, Assistant Professor

Yonggang Liu 2012–2014
Currently Peking University, Associate Professor

Daniel N. Goldberg 2009–2011
Currently the University of Edinburgh, Reader

Graduate students

Nail Coffey, PhD Thesis, Stanford University, 2022–present

Kaylie Cohanim, MS Thesis, Princeton University, 2020–2022

Justin Hiester, MS Thesis, Portland State University, 2010–2013

Nadezhda Boiko, MS Thesis, Moscow Engineering Physics Institute (State University), 1999–2001

Undergraduate students

Kasturi Shah, Senior Thesis, Princeton University 2014–2017

Summer Interns

Haemah Akhtar, Cooperative Institute for Modeling the Earth System 2023

Jules de la Cruz, Cooperative Institute for Modeling the Earth System 2022

Siobhan Light, NOAA Hollings Scholar 2022

Nuzhat Khan, Cooperative Institute for Modeling the Earth System 2021

External Thesis Examiner

Martin Forbes, Doctor of Philosophy, Otago University March 2023
Thesis “Numerical simulation of rifts in the Ross Ice Shelf, Antarctica”

Field experience

McMurdo Ice Shelf	Antrctica October-November, 2004
Icebergs of the Ross Sea	Antrctica October-December 2005
Ross Ice Shelf	Antrctica October-December 2006

Awards

Fellow of Kavli Frontiers of Science	2015
NSF Medal for Service in Antarctica	2008
NASA Postdoctoral Fellowship	2006–2008

Professional activities

Editor of *Journal Geophysical Research: Earth Surface*	2019–present
Selecting Committee Member of the Climate & Global Change Postdoctoral Fellowship Program	2016–2020
Co-chair of the U.S. CLIVAR Greenland Ice Sheet/Ocean Interactions Working Group	2015–2018
Grant proposals reviewer and panelist: NSF, NASA, NOAA, DOE, Schimdt Futures, European Science Foundation, UK Natural Environment Research Council, Dutch Research Council, Royal Society of New Zealand, Australian Research Council	
Reviewer of core activities: the World Climate Research Programme	2024

Publications

1. MacGregor, J. A., Colgan, W. T., Paxman, G. J. G., Tinto, K. J., Csathó, B., Darbyshire, F. A., Fahnestock, M. A., Kokfelt, T. F., MacKie, E. J., Morlighem, M. & **Sergienko, O. V.** Geologic Provinces Beneath the Greenland Ice Sheet Constrained by Geophysical Data Synthesis. *Geophysical Research Letters* **51.** doi:10.1029/2023GL107357 (2024).
2. **Sergienko O.** & Wingham, D. Diverse behaviors of marine ice sheets in response to temporal variability of the atmospheric and basal conditions. *Journal of Glaciology,* 1–30. doi:10.1017/jog.2024.43 (2024).
3. Huth†, A., Duddu, R., Smith, B. & **Sergienko O.** Simulating the processes controlling ice-shelf rift paths using damage mechanics. *Journal of Glaciology,* 1–14. doi:10.1017/jog.2023.71 (2023).
4. **Sergienko, O.** & Haseloff, M. 'Stable' and 'unstable' are not useful descriptions of marine ice sheets in the Earth's climate system. *Journal of Glaciology* **69,** 1483–1499. doi:10.1017/jog.2023.40 (2023).
5. Coffey†, N. B., MacAyeal, D. R., Copland, L., Mueller, D. R., **Sergienko, O. V.**, Banwell, A. F. & Lai, C.-Y. Enigmatic surface rolls of the Ellesmere Ice Shelf. *Journal of Glaciology,* 1–12. doi:10.1017/jog.2022.3 (2022).
6. Harrison, M., Adcroft, A., Hallberg, R. & **Sergienko O.** Improved Surface Mass Balance Closure in Ocean Hindcast Simulations. *Journal of Advances in Modeling Earth Systems* **14,** e2021MS002888. doi:10.1029/2021MS002888 (2022).
7. Haseloff, M. & **Sergienko, O. V.** Effects of calving and submarine melting on steady states and stability of buttressed marine ice sheets. *Journal of Glaciology,* 1–18. doi:10.1017/jog.2022.29 (2022).
8. Huth†, A., Adcroft, A. & **Sergienko, O.** Parameterizing Tabular-Iceberg Decay in an Ocean Model. *Journal of Advances in Modeling Earth Systems* **14,** e2021MS002869. doi:10.1029/2021MS002869 (2022).
9. Huth†, A., Adcroft, A., **Sergienko O.** & Khan†, N. Ocean currents break up a tabular iceberg. *Science Advances* **8,** 1–5. doi:10.1126/sciadv.abq6974 (2022).
10. **Sergienko, O. V.** Marine outlet glacier dynamics, steady states and steady-state stability. *Journal of Glaciology* **68,** 946–960. doi:10.1017/jog.2022.13 (2022).
11. **Sergienko, O. V.** No general stability conditions for marine ice-sheet grounding lines in the presence of feedbacks. *Nature Communications* **13,** 2265. doi:10.1038/s41467-022-29892-3 (2022).
12. **Sergienko, O. V.** & Wingham, D. J. Bed topography and marine ice-sheet stability. *Journal of Glaciology* **68,** 124–138. doi:10.1017/jog.2021.79 (2022).
13. Damsgaard†, A., **Sergienko, O.** & Adcroft, A. The Effects of Ice Floe-Floe Interactions on Pressure Ridging in Sea Ice. *Journal of Advances in Modeling Earth Systems* **13,** e2020MS002336. doi:10.1029/2020MS002336 (2021).
14. MacAyeal, D. R., **Sergienko, O. V.**, Banwell, A. F., Macdonald, G. J., Willis, I. C. & Stevens, L. A. Treatment of ice-shelf evolution combining flow and flexure. *Journal of Glaciology,* 1–18. doi:10.1017/jog.2021.39 (2021).
15. **Sergienko O. V.** & Wingham, D. J. Grounding line stability in a regime of low driving and basal stresses. *Journal of Glaciology* **65,** 833–849. doi:10.1017/jog.2019.53 (2019).
16. Stern†, A. A., Adcroft, A. & **Sergienko, O.** Modeling Ice Shelf Cavities and Tabular Icebergs Using Lagrangian Elements. *Journal of Geophysical Research: Oceans* **124,** 3378–3392. doi:10.1029/2018JC014876 (2019).
17. Bronselaer, B., Winton, M., Griffies, S. M., Hurlin, W. J., Rodgers, K. B., **Sergienko, O. V.**, Stouffer, R. J. & Russell, J. L. Change in future climate due to Antarctic meltwater. *Nature* **564,** 53–58. doi:10.1038/s41586-018-0712-z (2018).

18. Damsgaard†, A., Adcroft, A. & **Sergienko, O.** Application of Discrete Element Methods to Approximate Sea Ice Dynamics. *Journal of Advances in Modeling Earth Systems* **10,** 2228–2244. doi:10.1029/2018MS001299 (2018).

19. Fyke, J., **Sergienko O.**, Löfveström, M., Price, S. & Lenaerts, J. T. M. An Overview of Interactions and Feedbacks Between Ice Sheets and the Earth System. *Reviews of Geophysics* **56,** 361–408. doi:10.1029/2018RG000600 (2018).

20. Haseloff†, M. & **O. V. Sergienko**. The effect of buttressing on grounding line dynamics. *Journal of Glaciology* **64,** 417–431. doi:10.1017/jog.2018.30 (2018).

21. Liu†, Y., Hallberg, R., **Sergienko, O.**, Samuels, B. L., Harrison, M. & Oppenheimer, M. Climate response to the meltwater runoff from Greenland ice sheet: evolving sensitivity to discharging locations. *Climate Dynamics* **51,** 1733–1751. doi:10.1007/s00382-017-3980-7 (2018).

22. **Sergienko, O. V.** Behavior of flexural gravity waves on ice shelves: Application to the Ross Ice Shelf. *Journal of Geophysical Research: Oceans* **122,** 6147–6164. doi:10.1002/2017JC012947 (2017).

23. Stern†, A. A., Adcroft, A., **Sergienko, O.** & Marques, G. Modeling tabular icebergs submerged in the ocean. *Journal of Advances in Modeling Earth Systems* **9,** 1948–1972. doi:10.1002/2017MS001002 (2017).

24. Hiester†, J., **Sergienko, O. V.** & Hulbe, C. L. Topographically mediated ice stream subglacial drainage networks. *Journal of Geophysical Research: Earth Surface* **121.** 2015JF003660, 497–510. doi:10.1002/2015JF003660 (2016).

25. Stern†, A. A., Adcroft, A. & **Sergienko, O.** The effects of Antarctic iceberg calving-size distribution in a global climate model. *Journal of Geophysical Research: Oceans* **121,** 5773–5788. doi:10.1002/2016JC011835 (2016).

26. MacAyeal, D. R., **Sergienko, O. V.** & Banwell, A. F. A model of viscoelastic ice-shelf flexure. *Journal of Glaciology* **61,** 635–645. doi:10.3189/2015JoG14J169 (2015).

27. **Sergienko, O. V.** Order in Antarctic ice streams. *Nature Geoscience* **8,** 822–822. doi:10.1038/ngeo2536 (2015).

28. Goldberg†, D. N., Schoof, C. & **Sergienko, O. V.** Stick-slip motion of an Antarctic Ice Stream: The effects of viscoelasticity. *Journal of Geophysical Research: Earth Surface* **119,** 1564–1580. doi:10.1002/2014JF003132 (2014).

29. **Sergienko O. V.** A vertically integrated treatment of ice stream and ice shelf thermodynamics. *Journal of Geophysical Research* **119,** 745–757. doi:10.1002/2013JF002908 (2014).

30. **Sergienko O. V.**, Creyts, T. T. & Hindmarsh, R. C. A. Similarity of organized patterns in driving and basal stresses of Antarctic and Greenland ice sheets beneath extensive areas of basal sliding. *Geophysical Research Letters* **41,** 3925–3932. doi:10.1002/2014GL059976 (2014).

31. Banwell, A. F., MacAyeal, D. R. & **Sergienko, O. V.** Breakup of the Larsen B Ice Shelf triggered by chain reaction drainage of supraglacial lakes. *Geophysical Research Letters* **40.** 2013GL057694, 5872–5876. doi:10.1002/2013GL057694 (2013).

32. MacAyeal, D. R. & **O. V. Sergienko**. The flexural dynamics of melting ice shelves. *Annals of Glaciology* **54,** 1–10. doi:10.3189/2013AoG63A256 (2013).

33. **Sergienko O. V.** Basal channels on ice shelves. *Journal of Geophysical Research* **118,** 1342–1355. doi:10.1002/jgrf.20105 (2013).

34. **Sergienko O. V.** Glaciological twins: basally controlled subglacial and supraglacial lakes. *Journal of Glaciology* **59.** doi:10.3189/2013JoG12J040 (2013).

35. **Sergienko O. V.** Normal modes of a coupled ice-shelf/sub-ice-shelf cavity system. *Journal of Glaciology* **59,** 76–80. doi:10.3189/2013JoG12J096 (2013).

36. **Sergienko O. V.**, Goldberg†, D. N. & Little†, C. M. Alternative ice-shelf equilibriums determined by ocean environment. *Journal of Geophysical Research* **118,** 970–981. doi:10.1002/jgrf.20054 (2013).

37. **Sergienko O. V.** & Hindmarsh, R. C. A. Regular Patterns in Frictional Resistance of Ice-Stream Beds Seen by Surface Data Inversion. *Science* **342,** 1086–1089. doi:10.1126/science.1243903 (2013).

38. Straneo, F., Heimbach, P., **Sergienko, O.**, Hamilton, G., Catania, G., Griffies, S., Hallberg, R., Jenkins, A., Joughin, I., Motyka, R., Pfeffer, W. T., Price, S., Rignot, E., Scambos, T., Truffer, M. & Vieli, A. Challenges to Understanding the Dynamic Response of Greenland's Marine Terminating Glaciers to Oceanic and Atmospheric Forcing. *Bulletin of the American Meteorological Society* **94,** 5773–5788. doi:10.1175/BAMS-D-12-00100.1 (2013).

39. Goldberg†, D. N., Little†, C. M., **O. V. Sergienko**, Gnanadesikan, A., Hallberg, R. & Oppenheimer, M. Investigation of land ice-ocean interaction with a fully coupled ice-ocean model, Part 1: Model description and behavior. *Journal of Geophysical Research* **117.** doi:10.1029/2011JF002246 (2012).

40. Goldberg†, D. N., Little†, C. M., **O. V. Sergienko**, Gnanadesikan, A., Hallberg, R. & Oppenheimer, M. Investigation of land ice-ocean interaction with a fully coupled ice-ocean model, Part 2: Sensitivity to external forcings. *Journal of Geophysical Research* **117.** doi:10.1029/2011JF002247 (2012).

41. **Sergienko O. V.** The effects of transverse bed topography variations in ice-flow models. *Journal of Geophysical Research* **117.** doi:10.1029/2011JF002203 (2012).

42. Goldberg†, D. N. & **O. V. Sergienko**. Data assimilation using a hybrid ice flow model. *The Cryosphere* **5,** 315–327. doi:10.5194/tc-5-315-2011 (2011).

43. MacAyeal, D. R., Abbot, D. S. & **Sergienko, O. V.** Iceberg-capsize tsunamigenesis. *Annals of Glaciology* **52,** 51–56. doi:10.3189/172756411797252103 (2011).

44. **Sergienko O. V.** & Hulbe, C. L. "Sticky spots" and subglacial lakes under ice streams of the Siple Coast, Antarctica. *Annals of Glaciology* **52,** 18–22. doi:10.3189/172756411797252176 (2011).

45. Bromirski, P., **O. V. Sergienko** & MacAyeal, D. R. Transoceanic infragravity waves impacting Antarctic ice-shelves. *Geophysical Research Letters.* doi:10.1029/2009GL041488 (2010).

46. **Sergienko O. V.** Elastic response of floating glacier ice to impact of long-period ocean waves. *Journal of Geophysical Research* **115.** doi:10.1029/2010JF001721 (2010).

47. **Sergienko O.**, MacAyeal, D. & Bindschadler., R. Stick—slip behavior of ice streams: modeling investigations. *Annals of Glaciology* **50,** 87–94. doi:10.3189/172756409789624274 (2009).

48. **Sergienko O. V.**, Bindschadler, R. A., Vornberger, P. L. & MacAyeal, D. R. Ice stream basal conditions from block-wise surface data inversion and simple regression models of ice stream flow: Application to Bindschadler Ice Stream. *Journal of Geophysical Research* **113.** doi:10.1029/2008JF001004 (2008).

49. **Sergienko, O. V**., MacAyeal, D. R. & Thom, J. E. Reconstruction of snow/firn thermal diffusivities from observed temperature variation: application to iceberg C16, Ross Sea, Antarctica, 2004–07. *Annals of Glaciology* **49,** 91–95. doi:10.3189/172756408787814906 (2008).

50. **Sergienko O. V.**, MacAyeal, D. R. & Bindschadler, R. A. Causes of sudden, short-term changes in ice-stream surface elevation. *Geophysical Research Letters* **34.** doi:10.1029/2007GL031775 (2007).

51. Brunt, K. M., **O. Sergienko** & MacAyeal, D. R. Observations of unusual fast-ice conditions in the southwest Ross Sea, Antarctica: preliminary analysis of iceberg and storminess effects. *Annals of Glaciology* **44,** 183–187. doi:10.3189/172756406781811754 (2006).

52. MacAyeal, D. R., Okal, E. A., Aster, R. C., Bassis, J. N., Brunt, K. M., Cathles, L. M., Drucker, R., Fricker, H. A., Kim, Y. J., Martin, S., Okal, M. H., **O. V. Sergienko**, Spoinser, M. P. & Thom., J. E. Transoceanic wave propagation links iceberg calving margins of Antarctica with storms in tropics and Northern Hemisphere. *Geophysical Research Letters* **33.** doi:10.1029/2006GL027235 (2006).

53. Scambos, T., **Sergienko, O.**, Sargent, A., MacAyeal, D. & Fastook, J. ICESat profiles of tabular iceberg margins and iceberg breakup at low latitudes. *Geophysical Research Letters* **32.** doi:10.1029/2005GL023802 (2005).

54. **Sergienko O.** & MacAyeal, D. R. Surface melting on Larsen Ice Shelf, Antarctica. *Annals of Glaciology* **40,** 215–218. doi:10.3189/172756405781813474 (2005).

55. Nagornov, O. V. & **Sergienko, O. V.** The response of the ice-shelf base to the ocean temperature change. *Mathematical Modeling* **14.** (in Russian), 43–50 (2002).

56. Nagornov, O. V. & **Sergienko, O. V.** The effect of ocean temperature variations on the position of the lower boundary of an ice shelf. *Izvestiya Atmospheric and Oceaninc Physics* **37,** 671–676 (2001).

57. Nagornov, O. V. & **Sergienko, O. V.** The influence of the ocean temperature change on response of an ice shelf base. *News of Russian Academy of Sciences. Atmospheric and Oceanic Physics* **37,** 723–729 (2001).

58. Nagornov, O. V. & **Sergienko, O. V.** Special features of the processes of heat and mass transfer under a shelf glacier. *Journal of Engineering Physics and Thermophysics* **72,** 524–533. doi:10.1007/BF02699220 (1999).

59. Nagornov, O. V. & **Sergienko, O. V.** Temperature field of an ice shelf in the vicinity of a hot water-drilled well. *Journal of Engineering Physics and Thermophysics* **71,** 154–160. doi:10.1007/BF02682510 (1998).

60. Nagornov, O. & **O. V. Sergienko**. in *Development and Application of Computer Techniques to Environmental Studies* (eds Pepper, D., Brebbia, C. & Zannetti, P.) 281–295 (Wessex Inst Tech, Univ Nevada, 1998). ISBN: 1-85312-606-3.

†Advisees