

Olga Sergienko

Geophysical Fluid Dynamics Laboratory
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Education

The University of Chicago	Chicago, IL, USA
PhD Geophysical Sciences, Advisor: Douglas R. MacAyeal	2001–2005
Dissertation: <i>Surface melting on ice shelves and icebergs</i>	
Moscow Engineering Physics Institute (State University)	Moscow, Russia
Candidate of Sciences (PhD equivalent), Physics and Mathematics, Advisor: Oleg V. Nagornov	1996–1999
Dissertation: <i>Numerical modeling of heat and mass transfer under an ice shelf and on its base</i>	
Moscow Engineering Physics Institute (State University)	Moscow, Russia
M.S. Physics (awarded with distinction), Advisor: Boris M. Tulinov	1989–1995
Dissertation: <i>Numerical simulations of radioactive waste burial in permafrost</i>	

Employment and professional activity

Princeton University	Princeton, NJ, USA
The Program in Atmospheric and Oceanic Sciences	2014–present
Research Glaciologist (12 months salary)	

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 a dynamically coupled ice-sheet component of the GFDL climate model. Facilitating development of a framework to represent icebergs in global ocean circulation models and its implementation in the GFDL ocean model MOM6. Conducting research on dynamics and stability of marine ice sheets, ice/ocean interactions, flexural dynamics of ice shelves, application of inverse methods techniques to glaciological problems. Supervising postdoctoral fellows.

Princeton University	Princeton, NJ, USA
The Program in Atmospheric and Oceanic Sciences	2009–2014
Associate Research Scholar (12 months salary)	

Facilitated model developments to allow for sub-ice-shelf circulation in the GFDL ocean model. Conducted research on the ice/ocean interactions, flexure of ice shelves, developed inverse method techniques and applied to glaciological applications. Supervised postdoctoral fellows and graduate and undergraduate students.

Portland State University	Portland, OR, USA
Geology Department	2008–2009
Research Assistant Professor	

Investigated mutual interactions between the basal traction, subglacial lakes and ice-stream flow.

NASA Goddard Space Flight Center

Hydrospheric and Biospheric Sciences Laboratory

NASA Postdoctoral Fellow, mentor: Robert A. Bindschadler

Greenbelt, MD, USA

2006–2008

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)

High energy-density physics Department

Docent

Moscow, Russia

2000–2001

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)

The High energy-density physics Department

Lecturer

Moscow, Russia

1999–2000

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

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

Undergraduate

Kasturi Shah, Senior Thesis, Princeton University 2014–2017

Graduate

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

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

Postdoctoral Fellows

Alexander Huth 2020–present

Elisa Mantelli	2019–2021
Currently University of Tasmania, Lecturer	
Anders Damsgaard	2017–2018
Currently Aarhus University, Marie-Sklodowska Curie fellow	
Michael Wolowick	2016–2018
Currently Beijing Normal University, postdoctoral fellow	
Alon Stern	2015 –2018
Currently Slide Financial Ltd, founder	
Marianne Haseloff	2015–2017
Currently Northumbria University, VC Senior Fellow	
Yonggang Liu	2012–2014
Currently Peking University, Associate Professor	
Daniel N. Goldberg	2009–2011
Currently the University of Edinburgh, Reader	

Field experience

Icebergs of the Ross Sea, the Ross Ice Shelf and McMurdo Ice Shelf	Antretica 2004-2006
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Research grants

• NOAA NA13OAR4310097 Lead PI	01/09/2013–31/08/2017
“Collaborative Research: 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
“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

Recent invited talks

• Marine ice-sheet instability is the exception not the rule	23/06/2021
International Glaciological Society Global Seminar Series	virtual
• Marine ice sheets: stability and dynamics of their grounding lines	23/06/2020
Sea Level Rise Seminar, NASA Goddard Institute for Space Studies	virtual
• Grounding line conditions of marine ice sheets	15/01/2020
Mathematical Modelling in Glaciology workshop	Banff, Alberta, Canada
• Interactions between ice sheets and the rest of the Earth system	28/11/2018
California Institute of Technology	Pasadena, CA, USA
• GRenland Ice Sheet-Ocean interactions (GRISO)	10/08/2017
US CLIVAR Summit	Baltimore, MD, USA

Awards

NASA Postdoctoral Fellowship

NSF Medal for Service in Antarctica

Kavli Frontiers of Science Fellow

Synergistic activities

Editor of *Journal Geophysical Research: Earth Surface*

Selecting Committee Member of the Climate & Global Change Postdoctoral Fellowship Program

Co-chair of the U.S. CLIVAR Greenland Ice Sheet/Ocean Interactions Working Group

Grant proposals reviewer and panelist: NSF, NASA, NOAA, DOE, Schmidt Futures, European Science Foundation, UK Natural Environment Research Council, Dutch Research Council, Royal Society of New Zealand, Australian Research Council

Publications

1. 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).
2. 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).
3. **Sergienko O. V.** & Wingham, D. J. Bed topography and marine ice sheet stability. *Journal of Glaciology*. doi:10.1017/jog.2021.79 (2021).
4. **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).
5. 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).
6. 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).
7. 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).
8. 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).
9. 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).
10. 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).
11. **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).
12. 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).
13. 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).
14. 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).
15. 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).
16. **Sergienko, O. V.** Order in Antarctic ice streams. *Nature Geoscience* **8**, 822–822. doi:10.1038/ngeo2536 (2015).
17. 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).

18. **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).
19. **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).
20. 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).
21. MacAyeal, D. R. & **O. V. Sergienko**. The flexural dynamics of melting ice shelves. *Annals of Glaciology* **54**, 1–10. doi:10.3189/2013AoG63A256 (2013).
22. **Sergienko O. V.** Basal channels on ice shelves. *Journal of Geophysical Research* **118**, 1342–1355. doi:10.1002/jgrf.20105 (2013).
23. **Sergienko O. V.** Glaciological twins: basally controlled subglacial and supraglacial lakes. *Journal of Glaciology* **59**. doi:10.3189/2013JoG12J040 (2013).
24. **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).
25. **Sergienko O. V.**, Goldberg, D. N. & Little, C. M. Alternative ice-shelf equilibria determined by ocean environment. *Journal of Geophysical Research* **118**, 970–981. doi:10.1002/jgrf.20054 (2013).
26. **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).
27. 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).
28. 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).
29. 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).
30. **Sergienko O. V.** The effects of transverse bed topography variations in ice-flow models. *Journal of Geophysical Research* **117**. doi:10.1029/2011JF002203 (2012).
31. 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).
32. MacAyeal, D. R., Abbot, D. S. & **Sergienko, O. V.** Iceberg-capsize tsunamigenesis. *Annals of Glaciology* **52**, 51–56. doi:10.3189/172756411797252103 (2011).
33. **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).
34. Bromirski, P., **O. V. Sergienko** & MacAyeal, D. R. Transoceanic infragravity waves impacting Antarctic ice-shelves. *Geophysical Research Letters*. doi:10.1029/2009GL041488 (2010).
35. **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).
36. **Sergienko O.**, MacAyeal, D. & Bindshadler, R. Stick—slip behavior of ice streams: modeling investigations. *Annals of Glaciology* **50**, 87–94. doi:10.3189/172756409789624274 (2009).

37. **Sergienko O. V.**, Bindshadler, 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 Bindshadler Ice Stream. *Journal of Geophysical Research* **113**. doi:10.1029/2008JF001004 (2008).
38. **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).
39. **Sergienko O. V.**, MacAyeal, D. R. & Bindshadler, R. A. Causes of sudden, short-term changes in ice-stream surface elevation. *Geophysical Research Letters* **34**. doi:10.1029/2007GL031775 (2007).
40. 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).
41. 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).
42. 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).
43. **Sergienko O.** & MacAyeal, D. R. Surface melting on Larsen Ice Shelf, Antarctica. *Annals of Glaciology* **40**, 215–218. doi:10.3189/172756405781813474 (2005).
44. 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).
45. 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 Oceanic Physics* **37**, 671–676 (2001).
46. 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).
47. 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).
48. 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).
49. 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.