Marcus Lofverstrom (PhD)

Contact information

Department of Geosciences
University of Arizona
1040 E 4th St
Tucson, AZ, USA, 85719

☎ +1 (520) 621 6144
✉ lofverstrom@arizona.edu
sites.google.com/view/lofverstromlab

Research interests

Dynamic meteorology: midlatitude circulation; large-scale atmospheric circulation regimes; atmospheric stationary waves; flow-topography interactions; Rossby-wave breaking; critical layer reflection; jet stream and storm track dynamics; climate–ice-sheet interactions
Climatology: atmospheric and oceanic circulation regimes; sea-level rise from melting polar ice sheets; climate feedbacks
Paleo-climatology: atmospheric and oceanic circulation regimes in warm and cold climates; the LGM climate, the pre-LGM glacial climate; the mutual interaction between continental-scale ice sheets and the time-mean atmospheric circulation; conditions for glacial inception: local climate conditions, connection to atmospheric and oceanic circulation regimes, importance of Arctic gateways; jet streams and storm tracks in past climates
Numerical modeling: model development and optimization; model hierarchies and applications; biases in climate/circulation models (from idealized and simplified to comprehensive general circulation models)

Professional appointments

University of Arizona (UA), Department of Geosciences, Tucson, AZ, USA, Assistant professor, 2018.09–present

Boston University (BU), Department of Earth & Environment, Boston, MA, USA, Adjunct assistant professor, 2017.12–2018.12

National Center for Atmospheric Research (NCAR), Climate and Global Dynamics Division (CGD), Boulder, CO, USA, Post-doctoral researcher, 2015.06–2018.08

Stockholm University, Department of Meteorology (MISU), Stockholm, Sweden, Post-doctoral researcher, 2015.01–2015.06

Stockholm University, Department of Meteorology (MISU), Stockholm, Sweden, Ph. D. candidate, 2009.09–2014.11

Education

Ph. D. in Atmospheric Sciences and Oceanography, Stockholm University, Department of Meteorology (MISU), Stockholm, Sweden, 2014.11
Dissertation title: "On the interaction between ice sheets and the large-scale atmospheric circulation over the last glacial cycle"
Advisors: Prof. R. Caballero (MISU) and Prof. J. Nilsson (MISU); external

examiner: Prof. D. Battisti (UW); grading committee: Dr. M. Kageyama (IPSL), Prof. K. Nisancioglu (UiB), Prof. P. Holmlund (SU)

M.Sc. (Magisterexamen) in Meteorology, Stockholm University, Department of Meteorology (MISU), Stockholm, Sweden, 2009.06
Dissertation title: "Barotropic instability of eastward flow"
Advisors: Prof. J. Nycander (MISU) and Dr. A. Engström (MISU); examiners: Prof. M. Tjernström (MISU), Dr. M. Meier (SMHI)

Grants

Principal investigator:
Project Title: "Collaborative Research: Unravelling the signals in tropical Pacific lake archives: towards improved Holocene hydroclimate reconstructions"
Principal Investigator: **M. Lofverstrom**, U. Arizona
co-PI: D. Thompson, U. Arizona, M. Bush, FIT, D. Rodbell, U. College
Funding period: 2020.06–2023.06
Funding agency: NSF-P2C2
Monetary amount: $829,261 (UA $547,191)

Project Title: "Thermal and topographic control of the extratropical atmospheric circulation"
Principal Investigator: **M. Lofverstrom**, U. Arizona
Team Members: J. Russell, U. Arizona
Funding period: 2019.07–2020.06
Funding agency: Research, Development and Innovation, AZ, USA
Monetary amount: $15,000

Co-Principal Investigator:
Project Title: "High resolution simulations of the last deglaciation for understanding abrupt hydroclimate change in Southwest North America"
Principal Investigator: C. Tabor (U. Conn.)
Co-Principal Investigators: **M. Lofverstrom** (U. Arizona)
Funding period: 2019.10–2021.08
Funding agency: University Corporation for Atmospheric Research (UCAR), Computational & Information Systems Lab (CISL), WY, USA
Computer allocation: 15,800,000 core hours on Cheyenne Supercomputer

Project Title: "Moisture source and storm track variability in western North America during the last deglaciation and Holocene"
Principal Investigator: J. Oster (Vanderbilt)
Co-Principal Investigators: **M. Lofverstrom**, U. Arizona, C. Tabor (U. Conn.), I. Montanez (UC Davis)
Funding period: 2018.05–2021.08
Funding agency: University Corporation for Atmospheric Research (UCAR), Computational & Information Systems Lab (CISL), WY, USA
Computer allocation: 10,000,000 core hours on Cheyenne Supercomputer

Project member:

Project Title: "California megadroughts in context: Integrating high-resolution speleothem records with isotope-enabled climate models, and translating climate data for the K-12 classroom"
Principal Investigator: J. Oster, Vanderbilt University
Team Members: **M. Lofverstrom**, U. Arizona
Funding period: 2016.09–2021.08
Funding agency: National Science Foundation (NSF)

Expired:
"Collaborative Research: Multi-Time-Scale Climate Dynamics in California (CA): An Integrated Multi-Proxy Stalagmite, Monitoring, and Modeling Approach": C. Tabor (PI), **M. Lofverstrom**, (co-PI), 21 M hours Bluewaters Supercomputer, NCSA, 2019.05–2019.12

"Transient evolution of the Greenland Ice Sheet over the Last Interglacial warm period": **M. Lofverstrom** (PI), B. Otto-Bliesner (co-PI), 8.4 M hours Cheyenne Supercomputer, CISL, 2017.05–2019.08

"The basic ingredients for the structure of the planetary-scale circulation in the Northern Hemisphere winter": **M. Lofverstrom** (PI), Bolin Center for Climate Research, Stockholm University, Postdoc salary, 2015.01–2015.07

Publications

Group members in bold. # indicates student paper

In preparation/ in review

#Dow, W., A. Maycock, **M. Lofverstrom**, and C. J. Smith: The effect of anthropogenic aerosols on the Aleutian Low, in review in J. Climate

Kageyama, M., S. P. Harrison, M. Kapsch, **M. Lofverstrom**, J. M. Lora, U. Mikolajewicz, S. Sherriff-Tadano, T. Vadsaria, A. Abe-Ouchi, N. Bouttes, A. N. LeGrande, F. Lhardy, G. Lohmann, P. A. Morozova, R. Ohgaito, A. Quiquet, D. M. Roche, X. Shi, A. Schmittner, J. E. Tierney, and E. Volodin: Status of the PMIP4 LGM experiments: first results, comparison to PMIP3 results and to new climatic reconstructions, in review in Clim. Past

Lofverstrom, M., D. Thompson, E. Brady, and B. Otto-Bliesner: A mechanistic link between glacial inception in North America and Scandinavia, in preparation for *Nature*

Lofverstrom, M., J., Liakka, and A. Lewinschal: Linear University Model of the Atmosphere (LUMA), in preparation for *Geoscientific Model Development*

#Muntjewerf, L., W., Sacks, **M. Lofverstrom**, et al.: Ice-sheet/climate coupling between CESM2.1 and CISM2.1, in preparation for J. Adv. Model. Earth Syst.

Odalen, M., **M. Lofverstrom**: Ocean carbon storage in a CESM2 CMIP6 ensemble, in preparation for Geophysical Research Letters

Sommers, A., B. Otto-Bliesner, B., W.H. Lipscomb, **M. Lofverstrom**, S. Shafer, P. Bartlein, E. Brady, E. Kluzek, G. Leguy, K. Thayer-Calder, R.Tomas, and L. van Kampenhout: Retreat and Regrowth of the Greenland Ice Sheet During the Last Interglacial Simulated by Coupled Climate and Ice Sheet Modeling, in preparation for Paleo Oceanography

Tabor, C., **M. Lofverstrom**, et al.: Evolution of North American precipitation over the last deglaciation as simulated by an isotope enabled Earth-system model. In preparation for Quaternary Science Review

Thompson, D.M., M. McCulloch, J.E. Cole, E.V. Reed, J. D'Olivo, K. Dyez, **M. Lofverstrom**, J. Lough, N. Cantin, A.W. Tudhope, A.H. Cheung, L. Vetter, and R.L. Edwards: Marginal reefs under stress: physiological limits render Galápagos corals susceptible to warming and acidification, in review in Nature Communications

2020:

18. #Muntjewerf, L. Sellevold, R., Vizcaino, M., Ernani da Silva, C., Petrini, M., Thayer-Calder, K., Scherrenberg, M., Bradley, S., Fyke, J., Lipscomb, W., **Lofverstrom, M.**, and Sacks, W. J. (2020): Accelerated Greenland ice sheet mass loss under high greenhouse gas forcing as simulated by the coupled CESM2.1-CISM2.1, Journal of Advances in Modeling Earth Systems, 12, e2019MS002031, doi: 10.1029/2019MS002031 (in press)

17. **Lofverstrom, M.**, J. Fyke, K. Thayer-Calder, L. Muntjewerf, M. Vizcaino, W. J. Sacks, W. H. Lipscomb, B. L. Otto-Bliesner, and S. L. Bradley (2020): An efficient ice-sheet/Earth system model spinup procedure for CESM2-CISM2: description, evaluation and broader applicability, *Journal of Advances in Modeling Earth Systems*, 12, e2019MS001984, doi: 10.1029/2019MS001984

16. Rehfeld, K., R. Hebert, J. Lora, **M. Lofverstrom**, and C. Brierley (2020): Variability of surface climate in simulations of past and future, *Earth Syst. Dynam.*, 11, 447–468, doi: 10.5194/esd-11-447-2020

15. #Muntjewerf, L., M. Petrini, M. Vizcaino, C. Ernani da Silva, R. Sellevold, M. Scherrenberg, K. Thayer-Calder, S. Bradley, J. Lenaerts, W. H. Lipscomb, and **M. Lofverstrom** (2020): Greenland Ice Sheet Contribution to 21st Century Sea Level Rise as Simulated by the Coupled CESM2.1-CISM2.1, *Geophys. Res. Lett.*, 47, e2019GL086836, doi: 10.1029/2019GL086836

14. #Tulenko, J.P., **M. Lofverstrom**, and J.P. Briner (2020): Ice sheet influence on atmospheric circulation explains the patterns of Pleistocene alpine glacier records in North America, *Earth and Planetary Science Letters*, 534, doi: https://doi.org/10.1016/j.epsl.2020.116115

13. **Lofverstrom, M.** (2020): A dynamic link between precipitation extremes in western North America and Europe at the Last Glacial Maximum, *Earth and Planetary Science Letters*, 534, doi: 10.1016/j.epsl.2020.116081

2018:

12. Liakka, J. and **M. Lofverstrom** (2018): Arctic warming induced by the Laurentide ice sheet topography, *Climate of the Past* 14, 887–900, doi: https://doi.org/10.5194/cp-14-887-2018

11. Fyke, J.G., O. Sergienko, **M. Lofverstrom**, J. Lenaerts, and S. Price (2018): An overview of interactions and feedbacks between ice sheets and the Earth system, *Reviews of Geophysics* 56, doi: https://doi.org/10.1029/2018RG000600

10. **Lofverstrom, M.**, and J. Liakka (2018): The influence of atmospheric grid resolution in a climate model-forced ice sheet simulation, *The Cryosphere*, 12, 1499–1510, doi: https://doi.org/10.5194/tc-12-1499-2018 (highlighted)

2017:

9. **Lofverstrom, M.**, and J. M. Lora (2017), Abrupt regime shifts in the North Atlantic atmospheric circulation over the last deglaciation, *Geophys. Res. Lett.*, 44, doi: 10.1002/2017GL074274

2016:

8. Otto-Bliesner, B., A. Jahn, R. Feng, E. Brady, A. Hu, and **M. Lofverstrom** (2016): Changes in Arctic Gateways Amplify North Atlantic Warming in the Late Pliocene, *Geophys. Res. Letters*, 44, doi: 10.1002/2016GL071805 (highlighted)

7. **Lofverstrom, M.**, and J. Liakka (2016): On the limited ice intrusion in Alaska at the Last Glacial Maximum, *Geophys. Res. Letters*, 43, doi: 10.1002/2016GL071012

6. **Lofverstrom, M.**, R. Caballero, J. Nilsson, and G. Messori (2016): Stationary wave reflection as a mechanism for zonalising the Atlantic winter jet at the LGM, *J. Atm. Sci.*, 73, 3329–3342, doi: 10.1175/JAS-D-15-0295.1

5. Liakka, J., **M. Lofverstrom**, and F. Colleoni (2016): The impact of the North American glacial topography on the evolution of the Eurasian ice sheet over the last glacial cycle, *Clim. Past.*, 12, 1225–1241, doi: 10.5194/cp-12-1225-2016

2015:

4. Pausata, F., and **M. Lofverstrom** (2015): On the enigmatic similarity in Greenland δ^{18}O between the Oldest and Younger Dryas, *Geophys. Res. Letters*, 42, doi: 10.1002/2015GL066042

3. **Lofverstrom, M.**, J. Liakka, and J. Kleman (2015): The North American Cordillera – an impediment to growing the continent-wide Laurentide Ice Sheet, *J. Clim.*, 28, 9433–9450, doi: http://dx.doi.org/10.1175/JCLI-D-15-0044.1

2014:

2. **Lofverstrom, M.**, R. Caballero, J. Nilsson, and J. Kleman, (2014): Evolution of the large-scale atmospheric circulation in response to changing ice sheets over the last glacial cycle, *Clim. Past*, 10, 1453–1471, doi: 10.5194/cp-10-1453-2014

2011:

1. Liakka, J., J. Nilsson, and **M. Lofverstrom** (2011): Interactions between stationary waves and ice sheets: linear versus nonlinear atmospheric response, *Clim. Dyn.*, 38, 1249–1262, doi: 10.1007/s00382-011-1004-6

Non peer-reviewed publications

Otto-Bliesner, B., **Lofverstrom, M.**, P. Bakker, and R. Feng (2019): Arctic warming and the Greenland Ice Sheet during the Last Interglacial as simulated by climate models: Responses and feedbacks to orbital forcing, *PAGES Science Highlights: Past Sea-Level Changes*

Fyke, J.G., O. Sergienko, **M. Lofverstrom**, J. Lenaerts, and S. Price (2018): Icy interactions, Eos, 99, https://doi.org/10.1029/2018EO100915

Lofverstrom, M. (2014): On the interaction between ice sheets and the large-scale atmospheric circulation over the last glacial cycle, PhD thesis, ISBN: 978-91-7649-010-5

Computer and programming experience

Operating systems:

- Proficient in UNIX/Linux and Mac OS X
- Knowledgeable in Microsoft OS

Programming languages and software:

- Proficient in Python
- Knowledgeable in Fortran 90, MATLAB, shell scripting (BASH & CSH), NCL, CDO, NCO
- Basic knowledge of (Fortran) MPI and OpenMP parallel programming

Clusters and supercomputing facilities:

- Cheyenne, University Corporation for Atmospheric Research (UCAR), Computational & Information Systems Lab (CISL), WY, USA (https://www2.cisl.ucar.edu)
- Blue Waters, National Center for Supercomputing Applications (NSCA), IL, USA (https://bluewaters.ncsa.illinois.edu)

Model experience

Extensive experience working with the following numerical circulation models:

- Community Earth System Model (NCAR CESM1 & 2)
- Community Climate System Model (NCAR CCSM3 & 4)
- Planet Simulator (Plasim)
- Portable University Model of the Atmosphere (PUMA)
- Linear University Model of the Atmosphere (LUMA; self-written)

Main developer of the three-dimensional linear stationary-wave model *Linear University Model of the Atmosphere* (LUMA); used in: Liakka et al. (2011), *Clim. Dyn.*; Lewinschal et al. (2013), *Clim. Dyn.*; and Wilcox et al. (2019), *Atmos. Chem. Phys.*

Teaching

Lecturer:

- Numerical Modeling Workshop (GEOS 596H-001), Fall, 2020, University of Arizona, Tucson, AZ, USA
- Climate Model—Paleoclimate "Proxy" Synthesis: the good, the bad, and the ugly (GEOS 596H-002), Fall, 2020, University of Arizona, Tucson, AZ, USA
- Department of Geosciences Extended Colloquium Discussion (GEOS 596E-001), Fall, 2020, University of Arizona, Tucson, AZ, USA
- Earth from birth the death (GEOS 170A1), Spring, 2020, University of Arizona, Tucson, AZ, USA
- Introduction to Earth-system modeling (GEOS 437/537), Fall, 2019, University of Arizona, Tucson, AZ, USA
- Atmosphere and ocean circulation through time (GEOS 596H-003), Spring, 2019, University of Arizona, Tucson, AZ, USA
- Computing Fridays, Fall, 2018, University of Arizona, Tucson, AZ, USA

Guest lecturer:

- Introduction to Atmospheric Dynamics (ATOC-5050), Oct, 2017, University of Colorado, Boulder, CO, USA (4 classes)

Summer schools and workshops:

- *Community Earth System Model (CESM) tutorial*, 2015, 2016, 2017, 2018, NCAR, Boulder, CO, USA
- Invited modeling and project work support at the International Arctic Research Center (IARC) summer school, Fairbanks, AK, USA, 2011

Attended teaching and science communication courses:

- *Effectively Communicating Science Annual Workshop*, Expert Witness Training Academy, Mitchell Hamline School of Law, St. Paul, MN, USA, Aug 2017
- *University Pedagogy 1*, Stockholm University, Stockholm, Sweden, May–Jun 2012

Selected conference and public presentations

Invited presentations

- AMQUA, Seattle, WA, USA, June 2020
  The importance of Arctic gateways for Northern Hemisphere glacial inception
- University of Arizona, Tucson, AZ, USA, Nov 2019
  A dynamic link between precipitation extremes in western North America and Europe at the Last Glacial Maximum
- University of Arizona, Tucson, AZ, USA, Sep 2019
  The importance of Arctic gateways for Northern Hemisphere glacial inception

- University of Arizona, Tucson, AZ, USA, May 2018
  Coupled climate–ice-sheet modeling: a new frontier in (paleo)climate science
- IBS Center for Climate Physics, Busan, South Korea, Oct 2017
  On the mutual interaction between atmosphere and ice sheets over the last glacial cycle
- Max Planck Institute for Meteorology, Hamburg, Germany, Oct 2016
  Arctic gateways and Northern Hemisphere glacial inception
- Boston University, Boston, MA, USA, Mar 2016
  On the mutual interaction between atmosphere and ice sheets over the last glacial cycle
- Boston College, Boston, MA, USA, Mar 2016
  On the mutual interaction between atmosphere and ice sheets over the last glacial cycle
- Massachusetts Institute of Technology, Boston, MA, USA, Mar 2016
  On the mutual interaction between atmosphere and ice sheets over the last glacial cycle
- Stockholm University, Stockholm, Sweden, Feb 2016
  On the mutual interaction between the large scale atmospheric circulation and continental scale ice sheets over the last glacial cycle
- American Geophysical Union (AGU), San Francisco, CA, USA, Dec 2015 *The North American Cordillera – an impediment to growing the continent-wide Laurentide Ice Sheet*

Presentations:

- CESM Workshop, Boulder, CO, USA, Feb 2020
  The PMIP4-CMIP6 Last Glacial Maximum experiments: preliminary results and comparison with the PMIP3-CMIP5 simulations
- American Geophysical Union (AGU), San Francisco, CA, USA, Dec 2019
  The importance of Arctic gateways for Northern Hemisphere glacial inception
- CESM Workshop, Boulder, CO, USA, Jan 2019
  On the link between waveguides, quasi-stationary waves, and jet zonalisation at the Last Glacial Maximum
- European Geosciences Union (EGU), Vienna, Austria, Apr 2018
  The Late Pliocene Atlantic Meridional Overturning Circulation and State of the Arctic Gateways
- CESM PaleoWG meeting, Austin, TX, USA, Mar 2018
  A transient fully coupled climate–ice-sheet simulation of the last glacial inception
- CESM LIWG Workshop, Boulder, CO, USA, Jan 2018
  Paleoclimate and sea-level modeling with CESM2

- CESM Workshop, Boulder, CO, USA, Jun 2017
  Running the CESM with an interactive ice-sheet component: Challenges and rewards
- American Geophysical Union (AGU), San Francisco, CA, USA, Dec 2016
  The Greenland ice sheet in the Last Interglacial warm period: Surface mass balance and implications for the large-scale circulation
- Research Report, NCAR, Boulder, CO, USA, Oct 2016
  A fully coupled simulation of the Greenland ice sheet evolution in the last interglacial warm period
- PALSEA2, Mount Hood, OR, USA, Oct 2016
  A fully coupled simulation of the Greenland ice sheet evolution in the last interglacial warm period
- CESM workshop, Breckenridge, CO, USA, Jun 2016
  A paleo perspective on some current issues and challenges in coupled CESM-CISM simulations
- PlioVAR, Leeds, England, Feb 2016
  Building the Greenland Ice Sheet in a coupled climate model
- CESM winter meeting, NCAR, Boulder, CO, USA, Feb 2016
  Response of the North Atlantic atmospheric circulation to increasing LGM ice-sheet elevation
- CESM winter meeting, NCAR, Boulder, CO, USA, Feb 2016
  Pliocene: inception and growth of the Greenland Ice Sheet in CESM
- CESM workshop, Breckenridge, CO, USA, Jun 2015
  The North American Cordillera – an impediment to growing the continent-wide Laurentide Ice Sheet
- Bolin Center for Climate Research, Stockholm, Sweden, Nov 2013
  Evolution of the large-scale atmospheric circulation in response to changing ice sheets over the last glacial cycle
- European Geosciences Union (EGU), Vienna, Austria, Apr 2012
- Model development workshop, Hamburg, Germany, Feb 2011

Posters:

- Past 2 future (P2F), London, UK, May 2019
  On the link between waveguides, quasi-stationary waves, and jet zonalisation at the Last Glacial Maximum
- European Geosciences Union (EGU), Vienna, Austria, Apr 2018
  A transient fully coupled climate–ice-sheet simulation of the last glacial inception
- American Geophysical Union (AGU), New Orleans, LA, USA, Dec 2017
  A transient fully coupled climate–ice-sheet simulation of the last glacial inception

- PMIP4 workshop, Stockholm, Sweden, Sep 2017
  A transient fully coupled climate–ice-sheet simulation of the last glacial inception
- CESM Workshop, Boulder, CO, USA, Jun 2017
  Coupled long-term evolution of climate and the Greenland Ice Sheet during past warm periods: A comparison for the Last Interglacial and the Late Pliocene
- European Geosciences Union (EGU), Vienna, Austria, Apr 2015
- Latsis Symposium, Zürich, Switzerland, May 2014
- WAVACS-COST winter school, Venice, Italy, Feb 2011
- American Geophysical Union (AGU), San Francisco, CA,USA, Dec 2010

Guest visits

- Stockholm University, Stockholm, Sweden, May-June 2019
- IBS Center for Climate Physics, Busan, South Korea, Oct 2017
- University of Western Australia, Perth, Australia, Nov 2016
- Max Planck Institute for Meteorology, Hamburg, Germany, Oct 2016
- Boston University, Boston, MA, USA, Mar–Apr 2016
- Stockholm University, Stockholm, Sweden, Mar & Sep 2016
- University of Hamburg, Hamburg, Germany, Feb 2011
- University of Utah, Salt Lake City, UT, USA, Jan 2011

Reviewer

Journal of Climate, Climate Dynamics, Geophysical Research Letters, Climate of the Past, Earth and Planetary Science Letters, Quaternary Science Reviews, Scientific Reports, Nature Geoscience, The Cryosphere, Geology, Cambridge University Press, European Research Council

Committee member

- Dervla Meegan Kumar, PhD candidate, University of Arizona
- Jonathan King, PhD candidate, University of Arizona

Community activities

- Core member of NCAR Land-ice working group (NCAR LIWG), 2015-present
- Judge of Outstanding Student Presentation, GeoDaze, UA, 2019, 2020
- Judge of Outstanding Student Poster and PICO (OSPP) Award, EGU General Assembly, 2018

Honors and awards

- International Meteorological Institute (IMI) visiting researcher, Department of Meteorology, Stockholm University, 2016 & 2019
- Bolin Center for Climate Research, travel grant, 2011, 2014
- Wallenberg donation stipend, 2012
- Helge Ax:son Johnson donation stipend, 2010

Language skills	Swedish (native); English (read, write, and speak – fluent); German (read, write, and speak – basic competence)
Other	Swedish army: anti-aircraft battalion (Lv 7), Boden, Sweden, 2004–2005