William Gregory

- Postdoctoral research associate at Princeton University (NOAA GFDL)
- Research interests include sea ice prediction and modeling
- Research methods include machine learning, data assimilation
- PhD in Arctic sea ice predictability and machine learning

william-gregory.github.io Tel: +1 (609) 627 - 9659 wg4031@princeton.edu

Education

09/2017 — 11/2021 PhD Climate Science, University College London *Pass*

- Thesis: "Machine learning tools for pattern recognition in polar climate science". Supervisors: Dr M. Tsamados & Prof J. Stroeve
- 4-year funded position through the London NERC Doctoral Training Partnership

09/2013 — 09/2014 MSc Petroleum Geophysics, Imperial College London *Distinction*

09/2010 — 09/2013 BSc Geology with Geophysics, University of Leicester *1st class*

Employment History

01/2022 — Present Postdoctoral Research Associate, Princeton University (NOAA GFDL)

- Member of consortium: Multi-scale Machine Learning in Coupled Earth System Modeling (M^2LInES)
- Developing neural networks which can correct state-dependent sea ice model errors
- Implementing neural networks into ice-ocean and fully coupled climate models
- Past responsibilities include organizing biweekly group meetings within M^2LInES, and leading monthly sub-group meetings on data assimilation

11/2014 — 07/2017 Depth Imaging Geophysicist, Petroleum Geo-Services Ltd

- Created 3D sub-surface velocity models for seismic data processing, using tomographic inversion methods
- Heavily involved with day-to-day project management, including leading progress meetings with clients, compiling status reports and updating Gantt charts
- Trained new staff in depth-imaging theory and implementation
- Created staff user-guides related to in-house processing algorithms

Peer-reviewed Publications

- **Gregory, W.**, Bushuk, M., Zhang, Y., Adcroft, A., Zanna, L. 2024. Machine learning for online sea ice bias correction within global ice-ocean simulations, *Geophysical Research Letters*, 51, e2023GL106776. https://doi.org/10.1029/2023GL106776

- Bushuk, M., ..., **Gregory, W.**, et al. 2024. Predicting September Arctic sea ice: a multi-model seasonal skill comparison, *Bulletin of the American Meteorological Society* https://doi.org/10.1175/BAMS-D-23-0163.1.
- Zhang, Y., ..., **Gregory, W.**, et al. 2023. Improvements in September Arctic sea ice predictions via assimilation of summer CryoSat-2 sea ice thickness observations, *Geophysical Research Letters*, 50, e2023GL105672. https://doi.org/10.1029/2023GL105672
- **Gregory, W.**, Bushuk, M., Adcroft, A., Zhang, Y., Zanna, L. 2023. Deep learning of systematic sea ice model errors from data assimilation increments, *Journal of Advances in Modeling Earth Systems*, 15, e2023MS003757. https://doi.org/10.1029/2023MS003757.
- Nab, C., Mallett, R., **Gregory, W.**, et al. 2023. Synoptic variability in satellite altimeter-derived radar freeboard of Arctic sea ice, *Geophysical Research Letters*, 50, e2022GL100696. https://doi.org/10.1029/2022GL100696
- **Gregory, W.**, Stroeve J., Tsamados, M. 2022. Network connectivity between the winter Arctic Oscillation and summer sea ice in CMIP6 models and observations, *The Cryosphere*, 16, 1653–1673. https://doi.org/10.5194/tc-16-1653-2022
- **Gregory, W.**, Lawrence, I.R., Tsamados, M. 2021. A Bayesian approach towards daily pan-Arctic sea ice freeboard estimates from combined CryoSat-2 and Sentinel-3 satellite observations, *The Cryosphere*, 15, 2857-2871. https://doi.org/10.5194/tc-15-2857-2021
- **Gregory, W.**, Tsamados, M., Stroeve, J. and Sollich, P. 2020. Regional September sea ice forecasting with complex networks and Gaussian processes. *Weather and Forecasting*, 35(3), pp.793-806. https://doi.org/10.1175/WAF-D-19-0107.1

Publications in review

- **Gregory, W.**, MacEachern, R., Takao, S., Lawrence, I.R., Nab, C., Deisenroth, M.P., Tsamados, M. 2024. Scalable interpolation of satellite altimetry data with probabilistic machine learning, *Nature Communications* https://doi.org/10.21203/rs.3.rs-4209064/v1.
- Balwada, D., ..., **Gregory, W.**, et al. 2024. Learning machine learning with Lorenz-96, *Journal of Open Source Education*. https://doi.org/10.22541/essoar.170365239.95851488/v1

Outreach

- Project development co-chair for Climatematch Academy, 2024.
- Content developer and reviewer for Climatematch Academy, 2023.
- Presented history of Equality, Diversity and Inclusion (EDI) progress at GFDL during internal division workshop
- Delivered science outreach presentations to secondary-school and A-level students at King Solomon Academy school, London

Funding Awarded

YEAR	AWARD	PROJECT	AMOUNT
2017 — 2021	London NERC DTP Research Training Support Grant	PhD in polar climate science	£7000

Prizes and Awards

YEAR	AWARDING BODY	AWARD	RESULT
2019	University College London	Departmental travel support grant	Awarded £100
2013	Imperial College London	Best group-based field development project presentation	Winner
2013	British Petroleum	MSc Scholarship	Awarded £25,000
2013	University of Leicester	Shell Geophysics Prize	Winner £250
2012	University of Leicester	Award for Academic Excellence	Awarded £50

Teaching Experience

DATE	ROLE	INSTITUTION: COURSE	STUDENTS
Jan–Sept 2022	Co-supervised MSc student project	UCL: Dept of Computer Science, Centre for AI	MSc student
Jan–Apr 2020	Assisted practical sessions and grading	UCL: Geodynamics	3rd year undergraduates
Jan–Apr 2020	Assisted practical sessions	UCL: Ocean Physics	3rd year undergraduates
Oct–Dec 2018/19	Delivered and graded practical sessions	UCL: Foundations of Physical Geoscience	1st year undergraduates
Oct–Dec 2018/19/20	Delivered practical sessions and pre-recorded material for online learning	UCL: Introduction to Matlab	1st year undergraduates

Selected Conference Presentations

DATE	EVENT	PRESENTATION TITLE
Apr 2024	EGU General Assembly	Towards improving numerical sea ice predictions with data assimilation and machine learning
Feb 2024	AGU Ocean Sciences	Machine learning for online sea ice bias correction within global ice-ocean simulations
Apr 2023	EGU General Assembly	Fast interpolation of satellite altimetry data with probabilistic machine learning
Apr 2023	EGU General Assembly	Deep Learning of systematic sea ice model errors from data assimilation increments
Dec 2022	AGU Fall Meeting	Deep Learning of systematic sea ice biases from data assimilation increments
May 2022	M^2LInES annual conference	Learning systematic model error from data assimilation increments
Apr 2021	EGU General Assembly	A Bayesian approach towards daily pan-Arctic radar freeboards
Apr 2020	EGU General Assembly	Random walks through climate networks: Sea ice prediction with Bayesian inference

Invited Presentations

DATE	EVENT	LOCATION	PRESENTATION TITLE
May 2024	US Climate Modeling Summit	Princeton, USA	Informing earth system models with coupled data assimilation
Apr 2024	CMCC Seminar	Bologna, Italy	Improving sea ice prediction capabilities with data assimilation and machine learning
Nov 2022	NYU Courant Seminar	New York, USA	Deep learning of systematic model biases from data assimilation increments
Apr 2022	EGU General Assembly	Virtual	Machine Learning tools for pattern recognition in polar climate science.
Nov 2021	UCL Centre for AI	London, UK	Improving Arctic sea ice predictability with Gaussian processes
Mar 2020	Government Digital Service	London, UK	Machine Learning in climate science

Selected Training

DATE	COURSE	PROVIDER	LOCATION
Jan 2019	Arena One: Gateway Workshop. Teacher Training	University College London	London
Jan 2018	Statistics in Environmental Science	NERC DTP	London

Technical or Other Skills

- Competent computer programmer in Python, familiar with Matlab, bash, and Fortran-90
- Competent with object-oriented programming (OOP), primarily in Python
- Competent user of HPC systems, including SLURM. Proficient with parallel processing
- Competent user of Mac and Linux OS