GAEL FORGET

CURRENT POSITION	Research Scientist Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, 2007–present
EDUCATION	Massachusetts Institute of Technology, Cambridge, MA Postdoctoral Researcher, 2005–2007 • Supervisor: Prof. Carl Wunsch University of Brittany (UBO), Brest, France Ph.D., physical oceanography, 2005 • Dissertation Topic: Argo Profiles And 4D Variational Assimilation To Monitor North Atlantic Climate Variability. • Advisors: Dr. Herlé Mercier, Dr. Bruno Ferron M.S., oceanography, meteorology, and environment, 2001 • Final Project Topic: Inverse Modeling Over The Western Equatorial Atlantic. École Centrale Lyon (ECL), Lyon, France M.S., engineering and fluid mechanics, 2000 • Final Project Topic: Objective Analysis of Argo Profile Data.
RESEARCH INTERESTS	Ocean circulation and climate; tracer transport and transformation processes; interaction of ecology, biogeochemistry, and physical processes; marine ecosystems and biogeography; global cycles of energy, water, and carbon; observational statistics; forward and inverse modeling; numerical methods, artificial intelligence, and cloud computing.
ASSOCIATION MEMBERSHIPS	US CLIVAR Panel on Phenomena, Observations, and Synthesis, 2022-2025. CBIOMES (Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems), 2018-present. NSLCT (NASA Sea Level Change Team), 2015–2017. ECCO (Estimating the Circulation and Climate of the Ocean) consortium, 2005–present. MITgcm (MIT general circulation model) development team, 2005–present. AGU (American Geophysical Union), 2005–present. ASLO (Association for the Sciences of Limnology and Oceanography), 2018-present.
MODELLING COMMUNITY INVOLVEMENT	Contributions to model and reanalyses inter-comparison projects (CORE, ORA-IP). Design, development, and maintenance of model code base and setups (MITgcm, ECCO). Design, development, and maintenance of open source toolboxes (Julia, Matlab).
PEER-REVIEWED PUBLICATIONS	64. Sanders, Rachael N.C. ; Jones, Daniel C. ; Josey, Simon A. ; Sinha, Bablu; Forget, G. 2022 Causes of the 2015 North Atlantic cold anomaly in a global state estimate. Ocean Science, 18 (4). 953-978. https://doi.org/10.5194/os-18-953-2022 63. Hyun S, Mishra A, Follett CL, Jonsson B, Kulk G, Forget G, Racault M-F, Jackson T, Dutkiewicz S, Müller CL, Bien J. 2022 Ocean mover's distance: using optimal transport for analysing oceanographic data. *Proc. R. Soc. A* **478**: 20210875. https://doi.org/10.1098/rspa.2021.0875 62. Britten, G. L., Padalino, C., Forget, G., & Follows, M. J. (2022). Seasonal photoacclimation in the North Pacific Transition Zone. Global Biogeochemical Cycles, 36, e2022GB007324. https://doi.org/10.1029/2022GB007324

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61. Wu, Z., & Forget, G. (2022). PlanktonIndividuals.jl: A GPU supported individual-based phytoplankton life cycle model. Journal of Open Source 1 Software, 7(73), 4207. https://doi.org/10.21105/joss.04207

60. Strobach, E., Molod, A., Barahona, D., Trayanov, A., Menemenlis, D., and Forget, G.: Earth system model parameter adjustment using a Green's functions approach, Geosci. Model Dev., 15, 2309–2324, https://doi.org/10.5194/gmd-15-2309-2022, 2022.

59. Peytavin, A., Sainte-Rose, B., Forget, G., and Campin, J.-M. (2021): Ocean Plastic Assimilator v0.2: Assimilation of Plastics Concentration Data Into Lagrangian Dispersion Models, Geosci. Model Dev., https://doi.org/10.5194/gmd-14-4769-2021

58. Kostov, Y., Johnson, H.L., Marshall, D.P. et al. Distinct sources of interannual subtropical and subpolar Atlantic overturning variability. Nat. Geosci. (2021). https://doi.org/10.1038/s41561-021-00759-4

57. Follett, C.L., Dutkiewicz, S., Forget, G., Cael, B.B. and Follows, M.J. (2021), Moving ecological and biogeochemical transitions across the North Pacific. Limnol Oceanogr. https://doi.org/10.1002/lno.11763

56. Rousselet, L., Cessi, P., & Forget, G. (2021). Coupling of the mid-depth and abyssal components of the global overturning circulation according to a state estimate. Science Advances, 7(21), https://doi.org/10.1126/sciadv.abf5478

55. Forget, G., (2021). IndividualDisplacements.jl: a Julia package to simulate and study particle displacements within the climate system. Journal 1 of Open Source Software, 6(60), 2813. https://doi.org/10.21105/joss.02813

54. Boland, E. J. D., Jones, D. C., Meijers, A. J. S., Forget, G., & Josey, S. A. (2021). Local and remote influences on the heat content of Southern Ocean mode water formation regions. Journal of Geophysical Research: Oceans, 126, e2020JC016585. https://doi.org/10.1029/2020JC016585

53. Rousselet, L., Cessi, P., & Forget, G. (2020). Routes of the upper branch of the Atlantic meridional overturning circulation according to an ocean state estimate. Geophysical Research Letters, 47, e2020GL089137. https://doi.org/10.1029/2020GL089137

52. Sonnewald, M., Dutkiewicz, S., Hill, C. and Forget, G., 2020. Elucidating ecological complexity: Unsupervised learning determines global marine eco-provinces. Science Advances, 6(22), p.eaay4740.

51. Strobach, E., Molod, A., Trayanov, A., Forget, G., Campin, J.M., Hill, C. and Menemenlis, D., 2020. Three-to-Six-Day Air-Sea Oscillation in Models and Observations. Geophysical Research Letters, p.e2019GL085837.

50. Lauderdale, J.M., Braakman, R., Forget, G., Dutkiewicz, S. and Follows, M.J., 2020. Microbial feedbacks optimize ocean iron availability. Proceedings of the National Academy of Sciences, 117(9), pp.4842-4849.

49. Jones, D.C., Boland, E., Meijers, A.J., Forget, G., Josey, S., Sallée, J.B. and Shuckburgh, E., 2020. The sensitivity of Southeast Pacific heat distribution to local and remote changes in ocean properties. Journal of Physical Oceanography, 50(3), pp.773-790.

48. Jackson, L.C., Dubois, C., Forget, G., Haines, K., Harrison, M., Iovino, D., Köhl, A., Mignac, D., Masina, S., Peterson, K.A. and Piecuch, C.G., 2019. The mean state and variability of the North Atlantic circulation: a perspective from ocean reanalyses. Journal of Geophysical Research: Oceans, 124(12), pp.9141-9170.

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47. Jones, D.C., Boland, E., Meijers, A.J., Forget, G., Josey, S.A., Sallee, J.B. and Shuckburgh, E., 2019. Heat Distribution in the Southeast Pacific Is Only Weakly Sensitive to High-Latitude Heat Flux and Wind Stress. Journal of Geophysical Research: Oceans, 124(12), pp.8647-8666.

46. Storto, A., Alvera-Azcárate, A., Balmaseda, M.A., Barth, A., Chevallier, M., Counillon, F., Domingues, C.M., Drevillon, M., Drillet, Y., Forget, G. and Garric, G., 2019. Ocean reanalyses: recent advances and unsolved challenges. Frontiers in Marine Science, 6, p.418.

45. Frajka-Williams, et al , 2019. Atlantic meridional overturning circulation: Observed transport and variability. Frontiers in Marine Science, 6, p.260.

44. Forget, G. and Ferreira, D., 2019. Global ocean heat transport dominated by heat export from the tropical Pacific. Nature Geoscience, 12(5), pp.351-354.

43. Heimbach, P., Fukumori, I., Hill, C.N., Ponte, R.M., Stammer, D., Wunsch, C., Campin, J.M., Cornuelle, B., Fenty, I., Forget, G. and Köhl, A., 2019. Putting it all together: Adding value to the global ocean and climate observing systems with complete self-consistent ocean state and parameter estimates. Frontiers in Marine Science, 6, p.55.

42. Wagner, C.C., Amos, H.M., Thackray, C.P., Zhang, Y., Lundgren, E.W., Forget, G., Friedman, C.L., Selin, N.E., Lohmann, R. and Sunderland, E.M., 2019. A global 3-D ocean model for PCBs: Benchmark compounds for understanding the impacts of global change on neutral persistent organic pollutants. Global Biogeochemical Cycles, 33(3), pp.469-481.

41. Roemmich, D., et al. , 2019. On the future of Argo: A global, full-depth, multi-disciplinary array. Frontiers in Marine Science, 6, p.439.

40. Strobach, E., A. Molod, G. Forget, J.-M. Campin, C. Hill, D. Menemenlis, P. Heimbach, 2018: Consequences of different air-sea feedbacks on ocean using MITgcm and MERRA-2 forcing: Implications for coupled data assimilation systems. Ocean Modelling, 132, 91-111, doi: 10.1016/j.ocemod.2018.10.006

39. Amrhein, D.E., C. Wunsch, O. Marchal, and G. Forget, 2018: A Global Glacial Ocean State Estimate Constrained by Upper-Ocean Temperature Proxies. J. Climate, 31,8059–8079, https://doi.org/10.1175/JCLI-D-17-0769.1

38. Jones, D. C., Forget, G., Sinha, B., Josey, S. A., Boland, E. J. D., Meijers, A. J. S., & Shuckburgh, E. (2018). Local and remote influences on the heat content of the Labrador Sea: An adjoint sensitivity study. Journal of Geophysical Research: Oceans, 123, 2646-2667. https://doi.org/10.1002/2018JC013774

37. Liang, X., C.G. Piecuch, R.M. Ponte, G. Forget, C. Wunsch, and P. Heimbach, 2017: Change of the Global Ocean Vertical Heat Transport over 1993–2010. J. Climate, 30, 5319–5327, https://doi.org/10.1175/JCLI-D-16-0569.1

36. Evans, D.G., J. Toole, G. Forget, J.D. Zika, A.C. Naveira Garabato, A.J. Nurser, and L. Yu, 2017: Recent Wind-Driven Variability in Atlantic Water Mass Distribution and Meridional Overturning Circulation. J. Phy. Oceanogr., 47, https://doi.org/10.1175/JPO-D-16-0089.1

35. Ashkezari, M., Hill, C. N., Follett, C., Forget, G., and Follows, M., 2016: Oceanic eddy detection and lifetime forecast using machine learning methods. Geophys. Res. Lett., 43, doi: 10.1002/2016GL071269

34. Song, H., Marshall, J., Follows, M., Dutkiewicz, S., and G. Forget, 2016: Source waters for the highly productive Patagonian shelf in the southwestern Atlantic. doi:10.1016/j.jmarsys.2016.02.009

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33. Chevallier, et al., 2016: Intercomparison of the Arctic sea ice cover in global ocean–sea ice reanalyses from the ORA-IP project. Climate Dynamics, 1-30, DOI: 10.1007/s00382-016-2985-y.

32. Danabasoglu, et al., 2016: North Atlantic simulations in Coordinated Ocean-ice Reference Experiments phase II (CORE-II). Part II: Inter-annual to decadal variability. Ocean Modelling, 97, 65-90, doi:10.1016/j.ocemod.2015.11.007.

31. Chaudhuri, A., R. M. Ponte, and G. Forget, 2016: Impact of uncertainties in atmospheric boundary conditions on ocean model solutions. doi:10.1016/j.ocemod.2016.02.003.

30. Forget, G., D. Ferreira, and X. Liang, 2015: On the observability of turbulent transport rates by argo: supporting evidence from an inversion experiment. Ocean Science, 11, 839–853, doi:10.5194/os-11-839-2015.

29. Forget, G., J.-M. Campin, P. Heimbach, C. N. Hill, R. M. Ponte, and C. Wunsch, 2015: Ecco version 4: an integrated framework for non-linear inverse modeling and global ocean state estimation. Geoscientific Model Development, 8, 3071-3104, doi:10.5194/gmd-8-3071-2015.

28. Forget, G. and R. Ponte, 2015: The partition of regional sea level variability. Progress in Oceanography, 137, 173–195, doi:10.1016/j.pocean.2015.06.002.

27. Piecuch, C., P., Heimbach, R. M., Ponte, and G. Forget, 2015: Sensitivity of contemporary sea level trends in a global ocean state estimate to effects of geothermal fluxes. Ocean Modelling, 96, 214-220.

26. McCaffrey, K., B. Fox-Kemper, and G. Forget, 2015: Estimates of Ocean Macro-turbulence: Structure Function and Spectral Slope from Argo Profiling Floats. Journal of Physical Oceanography, 45, 1773–1793.

25. Liang, X., C. Wunsch, P. Heimbach, and G. Forget, 2015: Vertical redistribution of oceanic heat content. Journal of Climate, 28 (9), 3821–3833.

24. Buckley, M. W., R. M. Ponte, G. Forget, and P. Heimbach, 2015: Determining the origins of advective heat transport convergence variability in the North Atlantic. Journal of Climate, 28 (10), 3943–3956.

23. Fukumori, I., O. Wang, W. Llovel, I. Fenty, and G. Forget, 2015: A near-uniform fluctuation of ocean bottom pressure and sea level across the deep ocean basins of the arctic ocean and the nordic seas. Progress in Oceanography, 134 (0), 152– 172.

22. Toyoda, T., et al., 2015: Interannual-decadal variability of wintertime mixed layer depths in the north pacific detected by an ensemble of ocean syntheses. Climate Dynamics, 1–17.

21. Toyoda, T., et al., 2015: Intercomparison and validation of the mixed layer depth fields of global ocean syntheses. Climate Dynamics, 1–21.

20. Storto, A., et al., 2015: Steric sea level variability (19932010) in an ensemble of ocean reanalyses and objective analyses. Climate Dynamics, 1–21.

19. Balmaseda, M., et al., 2015: The ocean reanalyses intercomparison project (ora-ip). Journal of Operational Oceanography, 8 (sup1), s80–s97.

18. Buckley, M. W., R. M. Ponte, G. Forget, and P. Heimbach, 2014: Low frequency SST and upper-ocean heat content variability in the North Atlantic. Journal of Climate, 27.

17. Danabasoglu, G., et al., 2014: North Atlantic simulations in coordinated ocean-ice reference experiments phase II (core-II). Part I: Mean states. Ocean Modelling, 73 (0).

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16. Speer, K. and G. Forget (2013): Global distribution and formation of mode waters. Chapter 9 in: Ocean Circulation and Climate: a 21st Century Perspective, 211–226, doi:10.1016/B978-0-12-391851- 2.00009-X.

15. Chaudhuri, A. H., R. M. Ponte, G. Forget, and P. Heimbach, 2013: A comparison of atmospheric reanalysis surface products over the ocean and implications for uncertainties in air–sea boundary forcing. Journal of Climate, 26 (1), 153–170.

14. Roquet, F., C. Wunsch, G. Forget, P. Heimbach et al., 2013: Estimates of the southern ocean general circulation improved by animal-borne instruments. GRL, 40 (23), 6176–6180.

13. Forget, G., G. Maze, M. Buckley, and J. Marshall, 2011: Estimated seasonal cycle of North Atlantic eighteen-degree water volume. Journal of Physical Oceanography, 41 (2).

12. Heimbach, P., C. Wunsch, R. M. Ponte, G. Forget, C. Hill, and J. Utke, 2011: Timescales and regions of the sensitivity of Atlantic meridional volume and heat transport: Toward observing system design. Deep Sea Research II: Topical Studies in Oceanography, 58 (17).

11. Forget, G., 2010: Mapping ocean observations in a dynamical framework: A 2004-06 ocean atlas. Journal of Physical Oceanography, 40 (6), 1201–1221. 10. Maze, G., G. Forget, M. Buckley, J. Marshall, and I. Cerovecki, 2009: Using transformation and formation maps to study the role of air–sea heat fluxes in North Atlantic Eighteen Degree Water formation. Journal of Physical Oceanography, 39, 1818–1835

9. Hoteit, I., B. Cornuelle, S. Kim, G. Forget, A. Kohl, and E. Terrill, 2009: Assessing 4d-var for dynamical mapping of coastal high-frequency radar in san diego. Dynamics of Atmospheres and Oceans, 48 (1), 175–197.

8. Heimbach, P., G. Forget et al., 2009: Observational requirements for global-scale ocean climate analysis: Lessons from ocean state estimation. Proc. of the OceanObs09 Conf.: Sustained Ocean Observations and Information for Society, Venice, Italy, Vol. 2

7. Rienecker, M., et. al., 2009: Synthesis and assimilation systems - essential adjuncts to the global ocean observing system. Proc. of the OceanObs09 Conference: Sustained Ocean Observations and Information for Society, Venice, Italy, Vol. 1.

6. Marshall, J., et al., 2009: Observing the cycle of convection and restratification over the gulf stream and the subtropical gyre of the North Atlantic ocean: preliminary results from the CLIMODE field campaign. Bull. Amer. Meteor. Soc., 90, 1337–1350.

5. Forget, G., B. Ferron, and H. Mercier, 2008: Combining Argo profiles with a general circulation model in the North Atlantic. Part 1: Estimation of hydrographic and circulation anomalies from synthetic profiles, over a year. Ocean Modelling, 20 (1), 1–16.

4. Forget, G., H. Mercier, and B. Ferron, 2008: Combining Argo profiles with a general circulation model in the North Atlantic. Part 2: Realistic transports and improved hydrography, between spring 2002 and spring 2003. Ocean Modelling, 20 (1), 17–34.

3. Forget, G. and C. Wunsch, 2007: Estimated Global Hydrographic Variability. Journal of Physical Oceanography, 37 (8), 1997–2008.

2. Heimbach, P., R. Ponte, C. Evangelinos, G. Forget, M. Mazloff, D. Menemenlis, S. Vinogradov, and C. Wunsch, 2006: Combining altimetric and all other data with a general circulation model. Proceedings of the 15 Years of Progress in Radar Altimetry Symposium, Venice, Vol. 13, 18

1. Forget, G., 2005: Profils ARGO et assimilation 4Dvar pour le suivi climatique de l'ocean Nord Atlantique. Ph.D. thesis, University of Brest (UBO), Brittany, France

NON PEER REVIEWED	The ECCO Consortium (Forget, G., et al.), 2015: Estimating the Circulation and Climate of the Ocean (ECCO): Advancing CLIVAR Science. CLIVAR Exchanges, 67, 41-45.
	The NASA Sea Level Change Team (Nerem, R. S., et al.), 2015: Advancing Sea Level Science; Decadal Survey in Earth Science and Applications from Space; White Paper
SELECTED TALKS	(2023) *Digital Twins for all Ocean Robots*, WHOI, Applied Ocean Physics & Engineering seminar (*Invited speaker*).
	(2023) *Global workshop on Earth Observation with Julia*, JuliaEO23, Azores (*Invited speaker and co-organizer of the event*).
	(2022) *Digital Twins for all Ocean Robots*, Terceira Island, Symposium on Advances in Ocean Observation (*Invited speaker*).
	(2020) *Global ocean heat transport dominated by heat export from the tropical Pacific*, WHOI, Physical Oceanography Seminar (*Invited speaker*).
	(2019) *Bridging Large-Scale Processes and Observed Temporal/Spatial Variations*, Simons Foundation, SCOPE annual meeting (*Invited speaker*)
	(2019) *Diagnostics Of Ocean Transport From Air-Sea Flux Maps, Ocean Observations, And Models*, Plymouth Marine Laboratory, UK (*Invited speaker*).
	(2015) *ECCO v4: non-linear inverse modeling framework and state estimate*, University of Liège, International Liège Colloquium on Ocean Dynamics.
	(2015) *Fitting general circulation dynamics to ocean data*, Lamont-Doherty Earth Observatory, Ocean and Climate Physics (OCP) (*Invited speaker*).
	(2014) *The partition of regional sea level variability*, French Research Institute for Exploitation of the Sea (IFREMER, Brest) (*Invited speaker*).
	(2014) *Global estimates of mixing parameters, upper ocean, abyss and sea surface height variability*, Scripps Institution of Oceanography, Climate, Atmospheric Science and Physical Oceanography (CASPO) (*Invited speaker*)
TEACHING EXPERIENCE	Massachusetts Institute of Technology

- Outreach activity: Junior Climate Scientists, Revere Public Schools, spring 2022
- Non-credit course: Practical Computing Tutorials for Earth Scientists, Winter 2020
- Non-credit course: Introduction to Data-Model Analysis, Winter 2015, 2016
- Mentored graduate students and postdoctoral fellows
- Co-advised Master's students, Undergraduates

University of Brittany (UBO), Brittany, France

- Teaching Assistant, Oceanography, (Graduate)

SERVICES	Peer review: National Science Foundation, Journal of Physical Oceanography, Geophysical Research Letters, Ocean Modeling, Journal of Geophysical Research, Progress in Oceanography, Journal of Open Source Software.
	Open Science: MITgcm general circulation model, ECCO ocean state estimates, Matlab & Julia software packages, JuliaClimate and JuliaOcean organizations.