Geoffrey J. Stanley

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Education

- Doctor of Philosophy, University of Oxford, UK (2018)
  Atmospheric, Oceanic, & Planetary Physics
  Thesis: *Tales from Topological Oceans.*
  Supervisor: David Marshall
- Master of Science, University of Victoria, Canada (2013)
  School of Earth and Ocean Sciences
  Thesis: *From winds to eddies to diapycnal mixing of the deep ocean: the abyssal meridional overturning circulation driven by the surface wind-stress.*
  Supervisors: Oleg Saenko and Andrew Weaver
- Bachelor of Mathematics, University of Waterloo, Canada (2011)
  Applied Mathematics (Mathematical Physics) & Pure Mathematics Double Major
  Dean's Honours List, With Distinction

Academic Employment

- Oct 2022 - present: Banting Postdoctoral Researcher
  - School of Earth and Ocean Sciences, University of Victoria, Canada
  - Supervisors: Adam Monahan, James Anstey
- Jul 2021 - Sept 2022: Visiting Fellow
  - Research School of Earth Sciences, Australian National University, Australia
  - Supervisor: Andy Hogg
- Jan 2019 - Sept 2022: Postdoctoral Fellow
  - School of Mathematics and Statistics, University of New South Wales, Australia
  - Supervisor: Trevor McDougall

Journal Articles

- Lang Y., **Stanley, G. J.**, & McDougall, T. J.. (2023). Spurious Dianeutral Advection and Methods for Its Minimization. Journal of Physical Oceanography. https://doi.org/10.1175/JPO-D-22-0174.1
- Bisits, J. I., **Stanley, G. J.**, & Zika, J. D. (2022). Can We Accurately Quantify a Lateral Diffusivity from A Single Tracer Release? Journal of Physical Oceanography. https://doi.org/10.1175/JPO-D-22-0145.1
- Malan, N., Roughan, M., **Stanley, G. J.**, Holmes, R., & Li, J. (2022). Quantifying cross-shelf transport in the East Australian Current System: A budget-based approach. Journal of Physical Oceanography, 52(10), 2555-2572. https://doi.org/10.1175/JPO-D-21-0193.1
- **Stanley, G. J.**, & Marshall, D. P. (2022). Why Mean Potential Vorticity Cannot Be Materially Conserved in the Eddying Southern Ocean. Journal of Physical Oceanography, 52(8), 1629–1654. https://doi.org/10.1175/JPO-D-21-0195.1

- **Stanley, G. J.**, McDougall, T. J., & Barker, P. M. (2021). Algorithmic improvements to finding approximately neutral surfaces. Journal of Advances in Modeling Earth Systems, 13(5), e2020MS002436. https://doi.org/10.1029/2020MS002436
- McDougall, T. J., Barker, P. M., & **Stanley, G. J.** (2021). Spice variables and their use in physical oceanography. Journal of Geophysical Research: Oceans, 126(2), e2019JC015936. https://doi.org/10.1029/2019JC015936
- Lang, Y., **Stanley, G. J.**, McDougall, T. J., & Barker, P. M. (2020). A pressure-invariant Neutral Density variable for the World's Oceans. Journal of Physical Oceanography, 50(12), 3585-3604. https://doi.org/10.1175/JPO-D-19-0321.1
- **Stanley, G. J.**, Dowling, T. E., Bradley, M. E., & Marshall, D. P. (2020). Ertel Potential Vorticity versus Bernoulli Potential on Approximately Neutral Surfaces in the Antarctic Circumpolar Current. Journal of Physical Oceanography, 50(9), 2621-2648. https://doi.org/10.1175/JPO-D-19-0140.1
- Groeskamp, S., de Lavergne, C., Holmes, R., Tamsitt, V., Frenger, I., Chapman, C. C., Newsom, E., & **Stanley, G. J.** (2019). Climate Recorded in Seawater: A Workshop on Water-Mass Transformation Analysis for Ocean and Climate Studies. Bulletin of the American Meteorological Society, 100(9), ES243-ES247. https://doi.org/10.1175/BAMS-D-19-0153.1
- Padget, O., **Stanley, G.**, Willis, J. K., Fayet, A. L., Bond, S., Maurice, L., Shoji, A., Dean, B., Kirk, H., Juarez-Martinez, I., Freeman, R., Bolton, M., & Guilford, T. (2019). Shearwaters know the direction and distance home but fail to encode intervening obstacles after free-ranging foraging trips. Proceedings of the National Academy of Sciences, 116(43), 21629-21633. https://doi.org/10.1073/pnas.1903829116
- **Stanley, G. J.** (2019b). The exact geostrophic streamfunction for neutral surfaces. Ocean Modelling, 138, 107-121. https://doi.org/10.1016/j.ocemod.2019.04.002
- **Stanley, G. J.** (2019a). Neutral surface topology. Ocean Modelling, 138, 88-106. https://doi.org/10.1016/j.ocemod.2019.01.008
- Cheng, R., Jackson, D. M., & **Stanley, G. J.** (2018). Combinatorial Aspects of the Quantized Universal Enveloping Algebra of $\mathfrak{sl}_{n+1}$. Annals of Combinatorics, 22(4), 681-710. https://doi.org/10.1007/s00026-018-0404-2
- **Stanley, G. J.**, & Saenko, O. A. (2014). Bottom-Enhanced Diapycnal Mixing Driven by Mesoscale Eddies: Sensitivity to Wind Energy Supply. Journal of Physical Oceanography, 44(1), 68-85. https://doi.org/10.1175/JPO-D-13-0116.1

Preprints / non-peer reviewed articles

- Bennetts, L. G., Shakespeare, C. J., Vreugdenhil, C. A., et al. (2023). Closing the loops on Southern Ocean dynamics: From the circumpolar current to ice shelves and from bottom mixing to surface waves. ESS Open Archive. https://doi.org/10.22541/essoar.168882017.73914213/v1
- Nurser, A. J. G., Griffies, S. M., Zika, J. D., & **Stanley, G. J.** (2022). A mathematical formalism for circulation in water mass configuration space. ESS Open Archive. https://doi.org/10.1002/essoar.10511370.2
- **Stanley, G.**, 2014: The most minimal seed for transition to turbulence in shear flow. Tech. Rep. Proceedings Volume 2014, Woods Hole Oceanographic Institution, 359–384 pp.

Conference Proceedings / Seminars / Workshops

Conference Presentations: Oral

- **Stanley G. J.**, T. J. McDougall, and P. M. Barker, Algorithmic improvements to finding approximately neutral surfaces Ocean Sciences Meeting, Abstract Number 3737, 28 February–4 March 2022.
- **Stanley G. J.**, The topology of neutral surfaces and their exact geostrophic streamfunction Ocean Sciences Meeting, Abstract Number PL53B-06, 16–21 February 2020. San Diego, CA, USA.
- **Stanley G. J.**, The topology of neutral surfaces and their exact geostrophic streamfunction, IUGG General Assembly, 8–18 July, 2019. Montreal, Canada.
- **Stanley G. J.**, Neutral Surface Topology, Physical Oceanography Dissertation Symposium X, 21–25 October 2018. Kona, HI, USA.

- **Stanley G. J.**, An exact geostrophic stream function on a neutral surface, Ocean Modelling Group, 9 September 2016. Liverpool, UK.
- **Stanley G. J.** and D. P. Marshall, Inferring Large-Scale Bottom Velocity from Sparse Data, Ocean Modelling Group, 21–22 September 2015. Corpus Christi College, Cambridge, UK.
- **Stanley G. J.** and D. P. Marshall, Predicting Bottom Velocities from Deep ARGO, IUGG General Assembly, 22 June–2 July 2 2015. Prague, Czech Republic.
- **Stanley G. J.** and O. A. Saenko, Diapycnal mixing parameterized by energy release from mesoscale eddies, IAHS-IAPSO-IASPEI Joint Assembly, Abstract Number P03S3.06, 22–26 July 2013. Gothenburg, Sweden.

Conference Presentations: Posters

- **Stanley, G. J.**, T. E. Dowling, M. E. Bradley, D. P. Marshall, Ertel Potential Vorticity versus Bernoulli Potential on Approximately Neutral Surfaces in the Antarctic Circumpolar Current, IUGG General Assembly, 8–18 July, 2019. Montreal, Canada.
- **Stanley G. J.** and D. P. Marshall, Inferring Large-Scale Bottom Velocity from Sparse Data, Ocean Sciences Meeting, Abstract Number OD14B-2421, 21–26 February 2016. New Orleans, LA, USA.
- **Stanley G. J.** and O. A. Saenko, On the Energetics of Oceanic Mesoscale Eddies and their Parameterization Modified to Induce Diapycnal Mixing, AGU Fall Meeting, 3–7 December 2012. San Francisco, CA, USA.
- **Stanley G. J.** and O. A. Saenko, On the Energetics of Oceanic Mesoscale Eddies and their Parameterization Modified to Induce Diapycnal Mixing, Graduate Climate Conference, 26–28 October 2012. Pack Forest, WA, USA.

Seminars

- **Stanley G. J.**, Untangling multi-valued functional relations using the Reeb graph on oceanic neutral surfaces, June 2, 2023. Aspen Center for Physics, Aspen CO, USA.
- **Stanley G. J.**, Using Topology to learn about Neutral Surfaces in the Ocean, January 31, 2023. University of Victoria, Victoria BC, Canada.
- **Stanley G. J.**, Topology and Optimization for Neutral Surfaces in the Ocean, One World Mathematics of Climate, April 5, 2022. Online global seminar series.
- **Stanley G. J.**, The topology of neutral surfaces and their exact geostrophic streamfunction, September 3, 2019. University of Toronto, Toronto ON, Canada.
- **Stanley G. J.**, The topology of neutral surfaces and their exact geostrophic streamfunction, August 2, 2019. Woods Hole Oceanographic Institution Geophysical Fluid Dynamics Summer School, Woods Hole, MA, USA.
- **Stanley G. J.**, The topology of neutral surfaces and their exact geostrophic streamfunction, May 21, 2019. Institute for Marine and Antarctic Studies, Hobart, Australia.
- **Stanley G. J.**, The topology of neutral surfaces and their exact geostrophic streamfunction, 7 March 2019. University of New South Wales, Sydney, Australia.
- **Stanley G. J.** and N. R. Lebovitz, The Most Minimal Seed for the Onset of Shear Turbulence, Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, 19 August 2014. Woods Hole, MA, USA.
- **Stanley G. J.** and O. A. Saenko, From Winds to Eddies to Diapycnal Mixing over Topography: Driving the Abyssal Meridional Overturning Circulation, National Oceanography Centre, 19 March 2014. Southampton, UK.

Workshops

- Geometric and Field Theoretic Methods for Astro-, Geo-, and Bio-physical Fluids, 29 May - 9 June 2023. Aspen Center for Physics, Aspen CO, USA.
- Multiscale Dynamics of the Southern Ocean, 4–5 July 2022. Australian National University, Canberra, Australia.
- Water Mass Transformation for Ocean Physics and Biogeochemistry, 4–6 February 2019. UNSW Sydney, NSW, Australia.

Software contributions

- `neutral-surfaces`: MATLAB software for computing topobaric surfaces, omega surfaces, geostrophic streamfunctions. Available at https://github.com/geoffstanley/neutral-surfaces
- `neutralocean`: Python software for computing omega surfaces. Available at https://github.com/geoffstanley/neutralocean

Grants

- Banting Postdoctoral Fellowships Program 2021-09-22
  140,000 CAD
  Oct 2022 - Sept 2024
  Understanding geophysical turbulence and planetary shockwaves for prediction of Sudden Stratospheric Warming events

Mentoring Experience

• Jan 2019 – Feb 2023	Aaron Lang (co-advisor)	UNSW Mathematics PhD student
• Feb – Nov 2021	Josef Bisits (co-advisor)	UNSW Mathematics Honours student (First Class)
• Feb – Nov 2020	Alexander Robinson (primary advisor)	UNSW Mathematics Honours student (First Class)
• May – Oct 2020	Garrett Finucane (primary advisor)	University of Washington, summer research assistant
• June – Aug 2019	Houssam Yassin (co-advisor)	Woods Hole Oceanographic Institution, Geophysical Fluid Dynamics summer school Fellow

Teaching Experience

• 2023	Lecturer and coordinator of multivariate calculus and ordinary differential equations (90 students, 2 TAs)	MATH 202, U Victoria
• 2016	Tutor for Geophysical Fluid Dynamics	Masters course in Mathematical Physics, U Oxford
• 2014	Tutor for Flows, Fluctuations, and Complexity	3rd year course B1, Mansfield College, U Oxford
• 2012	Lab Instructor for Oceans and Atmospheres	EOS 110, U Victoria
• 2011	Marker for Earth System Modelling	EOS 225, U Victoria
• 2007	Marker for Advanced Calculus 1	MATH 147, U Waterloo

Selected Academic Awards

• 2018	Physical Oceanography Dissertation Symposium (PODS) Invited Participant	National Science Foundation (US)
• 2014	Geophysical Fluid Dynamics Fellowship	Woods Hole Oceanographic Institution
• 2013 — 2016	Clarendon Fund Scholarship	U Oxford
• 2013 — 2016	Canadian Alumni Scholarship	Linacre College, Oxford
• 2012	Gagnon Memorial Scholarship	U Victoria
• 2011	NSERC Julie Payette Research Scholarship (to the top 24 applicants for MSc funding)	Canada
• 2011	K.D. Fryer Gold Medal (to one of the top Math graduates also exemplifying good student citizenship)	U Waterloo
• 2006 — 2010	René Descartes Scholarship	U Waterloo
• 2006 — 2010	Queen Elizabeth II Aiming for the Top Scholarship	Ontario
• 2007, 2008, 2010	NSERC Undergraduate Student Research Awards	Canada
• 2009	Robert Schaefer Memorial Award	U Waterloo
• 2008	President's Research Award	U Waterloo

Professional Activities

- 2019 — Staff member at the Geophysical Fluid Dynamics summer school, Woods Hole Oceanographic Institution
- 2015 — Scientist aboard the *RRS Discovery* on the Extended Ellett Line
- 2015 — Organizer of a 2-day Software Carpentry workshop, AOPP, U Oxford
- 2013 — 2015 — Graduate Student Representative, U Oxford
- 2010 — Undergraduate Representative to the Chair Selection Committee
- — Department of Combinatorics and Optimization, University of Waterloo
- 2010 — Conference Staff Volunteer, Canadian Undergraduate Mathematics Conference
- 2015 — ongoing — Peer reviewer for the Journal of Physical Oceanography, Fluids, Ocean Sciences, Journal of Geophysical Research: Oceans, Journal of Marine Science and Engineering, Journal of Climate, and the National Science Foundation (USA).

Research Assistantships

- 2010 — Department of Combinatorics and Optimization University of Waterloo
  Project: *Straightening formulas in the quantized universal enveloping algebra* sl_2
  Supervisor: David M. Jackson
- 2008 — Department of Physics and Astronomy, University of Waterloo
  Project: *Numerical simulation of entropy evolution in merging galaxy clusters*
  Supervisor: Michael Balogh
- 2007 — Institute for Quantum Computing, University of Waterloo
  Project: *Numerical simulation of a superconducting flux qubit and the fidelity of its quantum state*
  Supervisor: Frank Wilhelm
- 2006 — Richard Lewar Centre for Excellence, Heart & Stroke Lab, University of Toronto
  Project: *Examining the electrophysiological structure of cardiac sodium ion channels*
  Supervisor: Peter Backx

Extracurricular Experience

- 2014 — 2015 — Green Student: Technical & Financial Support
  Linacre College, Oxford
- 2012 — 2013 — Co-Coordinator of Café Scientifique, a grassroots public science series
  Faculty of Science, University of Victoria
- 2008 — 2010 — Residence Don, University of Waterloo Housing and Residence
  Leader and role model to over 100 students for 3 terms; awarded "Rookie of the Term"