

Andrew Gunn

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Education

Department of Earth & Environmental Science, University of Pennsylvania

Philadelphia, U.S.A

Doctor of Philosophy

2016-current

GPA: 3.91. Advisor: Douglas Jerolmack. Thesis: Scale-dependent coupling between aeolian flow & form.

Institute for Marine & Antarctic Studies, University of Tasmania

Hobart, Australia

Bachelor of Marine Science, Honours

2015

GPA: 4.0. Advisor: Maxim Nikurashin. Thesis: The role of mixing and wind for the meridional overturning circulation and ocean carbon.

School of Mathematics and Statistics, University of Melbourne

Melbourne, Australia

Bachelor of Science

2012-2014

GPA: 3.1. Major: Applied Mathematics. Minor: Ocean & Atmosphere Science.

Fellowships & Appointments

Benjamin Franklin Fellow

Philadelphia, U.S.A

Earth & Environmental Science, University of Pennsylvania

2016-current

Advisor: Douglas Jerolmack. Research: atmospheric boundary layer (ABL) and dune field interactions, sediment transport measurement techniques, continental slope failure & rheology. Methods: experiments, fieldwork, remote sensing, theory.

Research Fellow

Philadelphia, U.S.A

Earth & Environmental Science, University of Pennsylvania

2016

Advisor: Irina Marinov. Research: GFDL GCM Weddell Sea convection dynamics, phytoplankton functional-type ecology models.

Methods: computer simulations.

Tsuneichi Fujii Scholar

Sapporo, Japan

Graduate School of Environmental Science, University of Hokkaido

2015

Advisors: Masakazu Yoshimori, Maxim Nikurashin. Research: Meridional overturning circulation (MOC) polynomials, MITgcm mixing and westerly MOC sensitivity testing, carbon-phosphate PDE coupling to MOC polynomials applied to the Last Glacial Maximum.

Methods: theory, computer simulations.

Australian Research Council Climate System Science Scholar

Hobart, Australia

Institute for Marine & Antarctic Studies, University of Tasmania

2015

Advisors: Maxim Nikurashin, Peter Strutton. Research: Semi-analytical MOC coupling with biogeochemical parameterisation model sensitivity and dynamics testing. Methods: theory, computer simulations.

Publications

In review

1. **Gunn, A.**, M. Wanker, N. Lancaster, D. Edmonds, R. Ewing, and D. Jerolmack, Circadian rhythm of dune-field activity, *PNAS* ([arXiv:1812.03612](https://arxiv.org/abs/1812.03612)).
2. **Gunn, A.**, P. Schmutz, M. Wanker, D. Edmonds, R. Ewing, and D. Jerolmack, Macroscopic flow disequilibrium over aeolian dune fields, *GRL* ([EarthArXiv:s32vc](https://arxiv.org/abs/EarthArXiv:s32vc)).
3. Gadal, C., C. Narteau, R. Ewing, **A. Gunn**, D. Jerolmack, B. Andreotti, P. Claudin, Spatial and temporal development of the dune instability, *GRL*.

In preparation

1. **Gunn, A.** and D. Jerolmack, Conditions for aeolian transport in the solar system.
2. **Gunn, A.**, J. Nield, P. Delorme, M. Baddock, G. Wiggs, R. Ewing, and D. Jerolmack, In situ laser-plane imaging of wind-blown sand.

Seminars, Conference Proceedings & Invited Talks (underline denotes student mentee)

Invited Talks & Seminars

1. **Princeton University**, Environmental Fluid Mechanics Seminar, 20 May 2019, "Land-atmosphere coupling at White Sands Dune Field, NM".
2. **University of Pennsylvania**, BenTalks, 17 March 2017, "Turbulence suppresses glacial cycles".
3. **University of Pennsylvania**, Department Seminar, 20 February 2017, "Turbulence dampens glacial cycles".
4. **University of Pennsylvania**, Lunch Seminar, 12 September 2016, "Diapycnal mixing inhibits ocean carbon storage".
5. **University of Tasmania**, Thesis Defence Seminar, 24 November 2015, "The role of mixing and wind for the meridional overturning circulation and ocean carbon".
6. **Australian National University**, Geophysical Fluid Dynamics Seminar, 24 November 2015, "A comparison of the role of mixing and wind for the meridional overturning circulation in theory and the MITgcm".
7. **University of Hokkaido**, Ocean-Atmosphere Climate Dynamics Lecture, 1 September 2015, "The role of ocean mixing and Southern Ocean Westerlies for ocean carbon: theory development and comparison with a GCM".

8. **Commonwealth Scientific & Industrial Research Organisation (CSIRO)**, Lunch Seminar, 30 July 2015, “Understanding ocean carbon’s response to wind and mixing: a theoretical and modelled approach”.
9. **Institute for Marine & Antarctic Studies**, Physical Oceanography Seminar, 11 February 2015, “The role of the deep ocean ventilation for the carbon uptake and storage in the ocean”.

Conference Presentations

1. C. Gadal, C. Narteau, R. Ewing, **A. Gunn**, D. Jerolmack, B. Andreotti, P. Claudin, (2020) Spatial and temporal development of the dune instability at White Sands Dune Field, USA, 6th *International Planetary Dunes Workshop*, Submitted.
2. **A. Gunn**, N. Lancaster, R. Ewing, M. Wanker, D. Edmonds, F. Falcini, G. Casasanta, D. Jerolmack, (2019) Self-building landscapes: Sand seas grow by steering climate, *American Geophysical Union Fall Meeting*, **Oral Session**.
3. **R. Fetell**, **A. Gunn**, D. Jerolmack, (2019) Phase-space of sediment failure spanned by packing-fraction and grain-size, *American Geophysical Union Fall Meeting*, Poster Session.
4. **A. Gunn**, R. Ewing, M. Wanker, D. Edmonds, P. Schmutz, D. Jerolmack, (2019) Internal Boundary Layer Induced by Dune-Field Roughness, *American Physical Society Division of Fluid Dynamics*, **Oral Session**.
5. **A. Gunn**, D. Jerolmack, (2019) Dune geometry extraction from DEMs, *EarthCube, OpenTopography, U. Potsdam Point-cloud Workshop*, **Oral Session**.
6. **A. Gunn**, M. Wanker, D. Edmonds, R. Ewing, D. Jerolmack, (2019) How to make a dust storm: *In situ* observations at White Sands, New Mexico, *Australian Meteorological & Oceanographic Society Conference*, **Oral Session**.
7. D. Jerolmack, M. Houssais, B. Ferdowsi, C. Ortiz, N. Deshpande, **A. Gunn**, (2019) Phase transitions in geophysical flows, *European Geosciences Union General Assembly*, Oral Session.
8. **A. Gunn**, D. Jerolmack, (2019) Turbidity Current Rheology, *Northeast Complex Fluids & Soft Matter Symposium*, Poster Session.
9. **A. Gunn**, M. Wanker, K. Cheffer, D. Edmonds, R. Ewing, D. Jerolmack, (2018) The Unsung Aeolian Movers and Shakers: Atmospheric Stability and Humidity, *American Geophysical Union Fall Meeting*, **Oral Session**.
10. **A. Gunn**, **J. Daif**, D. Jerolmack, (2018) Experimental Turbidity Current Onset: Breaching Front Rheology, *American Geophysical Union Fall Meeting*, **Oral Session**.
11. **A. Gunn**, D. Jerolmack, (2018) Experimental Turbidity Current Onset: Breaching Front Rheology, *Binghamton Geomorphology Symposium*, Poster Session.
12. **A. Gunn**, M. Wanker, D. Edmonds, R. Ewing, D. Jerolmack, (2018) From geostrophic to grain: momentum transfer in aeolian systems, *International Conference on Aeolian Research*, **Oral Session**.
13. **A. Gunn**, D. Jerolmack, (2018) Coupled climate and dune feedbacks, *Wolman Club*, Poster Session.
14. **A. Gunn**, D. Jerolmack, (2018) Turbidity Current Rheology, *Northeast Complex Fluids & Soft Matter Symposium*, Poster Session.
15. **A. Gunn**, D. Jerolmack, D. Edmonds, R. Ewing, M. Wanker, S. David, (2017) Connecting meteorology to surface transport in aeolian landscapes: Peering into the boundary layer with Doppler lidar, *American Geophysical Union Fall Meeting*, **Oral Session**.
16. **A. Gunn**, D. Jerolmack, (2017) Diurnal Ekman layer cycles at White Sands, New Mexico observed with Doppler lidar, *American Physical Society Division of Fluid Dynamics*, **Oral Session**.
17. **A. Gunn**, D. Jerolmack, (2017) The role of diurnal surface heating for dune migration in White Sands, New Mexico, *International Association of Mathematical Geosciences*, Lightning Oral Session.
18. **A. Gunn**, D. Jerolmack, (2017) The role of diurnal surface heating for dune migration in White Sands, New Mexico, *International Association of Mathematical Geosciences*, Poster Session.
19. **A. Gunn**, D. Jerolmack, (2017) Diurnal atmospheric stability cycles control transport at White Sands, New Mexico, *Amtrak Club*, Poster Session.
20. M. Nikurashin, **A. Gunn**, (2017) Sensitivity of the ocean overturning circulation to wind and mixing: theoretical scalings and global ocean models, *European Geosciences Union General Assembly*, Oral Session.
21. **A. Gunn**, D. Lee, P. Arratia, D. Jerolmack, (2017) Geophysical flows: 2D turbulence, lagrangian coherent structures, and particles, *Exxon Mobil Presentation*, Poster Session.
22. **A. Gunn**, I. Marinov, M. Nikurashin, (2016) Novel biogeochemical theory predicts ocean carbon reservoir response to changes in MOC strength and diapycnal mixing, *American Geophysical Union Fall Meeting*, Poster Session.
23. I. Marinov, A. Cabre, **A. Gunn**, A. Gnanadesikan, (2016) Tropical teleconnections via the ocean and atmosphere induced by Southern Ocean deep convective events, *American Geophysical Union Fall Meeting*, Poster Session.
24. **A. Gunn**, M. Nikurashin, (2016) Diapycnal mixing inhibits ocean carbon storage, *Ocean Carbon Biogeochemistry Workshop*, Poster Session.
25. **A. Gunn**, M. Nikurashin, (2015) The role of the Southern Ocean overturning circulation for ocean carbon uptake, *Australian Meteorological & Oceanographic Society Conference*, **Oral Session**.

Scholarships & Awards (research-based values listed, total US\$133,800 excluding stipend)

- **Petroleum Research Fund, New Directions Grant \$110,000, 2020**, American Chemical Society awarded to PI Douglas Jerolmack.
- **Greg & Susan Walker Endowment Award \$1,600, 2019**, competitive departmental award used for AGU 2019.
- **SASGov Travel Award \$300, 2019**, competitive UPenn School of Arts & Sciences graduate student award.
- **GAPSA Travel Award \$800, 2019**, competitive UPenn graduate student award.
- **UNAVCO Point Cloud Travel Award \$1,600, 2019**, competitive US-based participant award to attend U. Potsdam workshop.
- **Greg & Susan Walker Endowment Award \$2,000, 2019**, competitive departmental award used for AMOS 2019.
- **GAPSA Travel Award \$800, 2018**, competitive UPenn graduate student award.
- **Binghamton Student Award \$100, 2018**, symposium conveners’ cash award for best student contributor.
- **NSF Binghamton Student Travel Award \$800, 2018**, competitive student travel award used for BGS.
- **International Society of Aeolian Research Elsevier Research Scholarship \$2,250, 2018**, competitive student research grant.
- **Greg & Susan Walker Endowment Award \$1,400, 2018**, competitive departmental award used for ICAR.
- **SASGov Executive Stipend \$2,000, 2017**, awarded for research purposes by democratic election.
- **IAMG Student Travel Award \$1,200, 2017**, competitive society award for conference.
- **OCB Student Travel Award \$300, 2016**, competitive travel award for students to the 2016 OCB Workshop.
- **Benjamin Franklin Fellowship \$133,000+tuition, 2016-2021**, 4-year stipend for UPenn School of Arts & Sciences PhDs.
- **Tsuneichi Fujii Scholarship \$5,600, 2015**, awarded to 1 graduate student at the universities of Tasmania and Hokkaido for exchange.
- **ARCCSS Summer Student Scholarship \$3,050, 2015**, awarded to 15 Australian students for climate science research projects.
- **Melbourne Global Scholarship, 2014**, awarded on academic merit for exchange to the London School of Economics.
- **Trinity College Student Coordinator Scholarship, 2013**, awarded to 10 Trinity College students for pastoral care.

- **Peter McPhee Award**, 2013, awarded to 4 students at the University of Melbourne for community service.
- **Trinity College Academic Excellence Award**, 2012, awarded for top grades at the University of Melbourne per semester.
- **Western Australian Government Certificate of Excellence Award**, 2011, awarded for top 1% students in that year.
- **Christ Church Grammar School Academic Scholar Award** (x4), 2010-2011, A grades for every subject for 2 years.

Teaching Experience

- **'Earth Surface Processes' GEOL305, Guest Lecturer & Field Teaching Assistant**, 2020, boundary layer section of UPenn class, 20 students to White Sands dunes, administration, mentoring undergraduate field research projects.
- **'Oceanography' GEOL130, Head Teaching Assistant**, 2020, ~300 students, office-hours, teaching, grading, reviews.
- **University of Pennsylvania Center for Teaching & Learning, Teaching Certificate**, 2018-ongoing, multi-component accreditation including teaching; experience, observations, philosophy development, and workshops. Workshops participated:
 - 'Engaging diverse audiences in the classroom'
 - 'Supporting students of diverse backgrounds in science'
 - 'Teaching field courses'
- **'Earth Surface Processes' GEOL305, Field Teaching Assistant**, 2019, 15 students to Algodones dunes, administration, mentoring undergraduate field research projects.
- **'Earth & Life Through Time' GEOL125, Teaching Assistant**, 2019, ~200 students, office-hours, guest lecturing, recitations, grading.
- **'Oceanography' GEOL130, Head Teaching Assistant**, 2018, ~300 students, office-hours, teaching, grading, reviews.
- **'Structured, Active, In-class Learning' (SAIL) Teaching Certificate**, 2017, semester-long course on 'flipped' undergraduate teaching.
- **'Oceanography' GEOL130, Teaching Assistant**, 2017, ~300 students office-hours, teaching, grading, review sessions.
- **GEOL204 'Global Climate Change', Guest Lecturer**, 2016, ~40 students, climate modelling section of UPenn class.
- **Private, Mathematics, Physics and English Tutor**, 2012-2015, employed as tutor for over 15 students between high school and 1st year undergraduate level.
- **MyGuru Ltd., Mathematics Tutor**, Apr 2014-Nov 2015, employed as the primary content creator for online videos for Australian mathematics curricula accessed by thousands of students, as well as other written and in-person tutoring services.

Outreach & Service

- **American Geophysical Union Fall Meeting, Session Co-Convener**, 9-13 Dec 2019, "Centennial Session: Leopoldian, Bagnoldian, and Einsteinian Geomorphology Today: Historical Reflections and New Approaches".
- **Hayden Fellowship Seminar, Discussion host**, 7 Aug 2019, on helping dept. summer scholarship undergraduates apply for graduate school.
- **Penn Prep Summer School 'Climate Change on the Blue Planet', Instructor**, 7 Jul-2 Aug 2019, 2x 2-week course I devised and taught for rising-freshman students mostly on scholarships.
- **Penn Prep Summer School 'Climate Change on the Blue Planet', Instructor**, 24 Jul-3 Aug 2018, 2-week course I devised and taught for rising-freshman students mostly on scholarships.
- **Philadelphia Science Festival, Presenter**, 21-28 Apr 2017, flume river evolution at the Franklin Institute.
- **Teachabout Inc., Science Program Coordinator**, Aug 2013-Feb 2014, devised and implemented a 4-week STEM program for indigenous Australian high school students. I also attracted government, private and university funding for this NGO.
- **River Nile Learning Centre, ESL and Science Tutor**, Feb 2012-Nov 2012, pro-bono tutoring for 10 South Sudanese refugees in Melbourne ranging across mature-aged vocational courses, undergraduate written English help, high school sciences.

Workshops

- **Inclusive & Equitable Teaching Workshop**, Feb 26-Apr 1 2020, U. Penn 5-week course committed to diversity-promoting education.
- **From point clouds and full-waveform data to DEM analysis**, Sept 30-Oct 4 2019, U. Potsdam week on elevation models.
- **Mid-Atlantic Soft Matter Workshop**, 12 Aug 2019, regional conference at Johns Hopkins University.
- **Thinkful City Coho, Git & Github: your coding safety net**, 12 Feb 2019, course on collaborating through Github.
- **Penn Institute for Computational Science, Data Analysis in Python**, 8-9 Apr 2017, data packages i.e. Pandas.
- **Woods Hole Oceanographic Institute, OCB Workshop**, 25-28 Jul 2016, current and future topics in the OCB community.
- **Monash University, ARCCSS Tropical Meteorology Winter School**, 20-24 Jun 2016, course on tropical weather and climate systems.
- **CLIVAR/JAMSTEC, 2nd Session of OMDP: Forcing Ocean-Ice Climate Models**, 14-15 Jan 2016, live stream to session.
- **University of New South Wales, ARCCSS Scientific Writing Workshop**, 17-19 Nov 2015, journal publishing course.
- **University of Queensland, AMOS Software Carpentry Workshop**, 13-15 Jul 2015, Python and Git course.
- **University of Tasmania, DaSH Software Carpentry Workshop**, Jun 2015-Jul 2015, Unix, SQL and R weekly sessions.
- **University of Tasmania, ARCCSS Biogeochemistry Winter School**, 15-19 Jun 2015, course on global nutrient cycle, etc.

Standardised Tests

- **Graduate Record Examinations (GRE)**, Aug 2015, Verbal: 163 (92nd%), Quantitative: 163 (86th%), Analytical: 5.0 (93rd%).
- **Australian Tertiary Admissions Rank (ATAR)**, 2011, 99th% of Australians applying for undergraduate study in 2011.
- **Various Olympiads**, 2011, Higher Distinctions in Australasian Mathematics, Informatics, Computer Science, Economics Olympiads.

Leadership Responsibilities

- **Student Representative, UPenn EES Faculty Meetings**, 2019-2020, represent PhD students to the department faculty.
- **Executive Board Member, Graduate Assembly UPenn**, Aug 2017-Aug 2018, 1 of 6 students elected to represent ~2000 graduate students, maintain a budget of over US\$125K.
- **Department Representative, Graduate Assembly UPenn**, Aug 2016- Aug 2017, represent my department to the wider university.
- **Executive Student Committee, Trinity College**, Oct 2013-Oct 2014, 1 of 8 elected students to represent 350 residential students, oversee a AU\$300k annual budget, organise all social or pastoral activities, and manage an associated incorporated company.

- **Director, Trinity Leadership Challenge**, *Nov 2012-Oct 2013*, led a leadership program in which 8 students raised AU\$20k, participated in professional development seminars, served charities and hiked an important Australian war trail in Papua New Guinea.
- **Editor, Trinity College Students' Publication**, *Feb 2013-Nov 2013*, sole editor of student-led quarterly university publication.