Andrew Gunn

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Education

Department of Earth & Environmental Science, University of Pennsylvania — Philadelphia, U.S.A
Doctor of Philosophy — *August 2016 – current (expected: March 2020)*
GPA: 3.92. 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 — *February 2015 – December 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 — *February 2012 – December 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 — *August 2016 – current (expected: March 2020)*
Advisor: Douglas Jerolmack. Research: atmospheric boundary layer (ABL) and dune field interactions, sediment transport measurement techniques, continental slope failure & rheology. Methods: experiments, fieldwork, computer simulations, remote sensing, theory.

Research Fellow — Philadelphia, U.S.A
Earth & Environmental Science, University of Pennsylvania — *June 2016 – August 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 — *August 2015 – November 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 — *November 2014 – February 2015*
Advisors: Maxim Nikurashin, Peter Strutton. Research: Semi-analytical MOC coupling with biogeochemical parameterisation model sensitivity and dynamics testing. Methods: theory, computer simulations.

Publications

1. **Gunn, A.,** P. Schmutz, M. Wanker, D. Edmonds, R. Ewing, and D. Jerolmack, Macroscopic flow disequilibrium over aeolian dune fields, *Geophysical Research Letters (doi:10.1029/2020GL088773).*
2. Gadal, C., C. Narteau, R. Ewing, **A. Gunn,** D. Jerolmack, B. Andreotti, P. Claudin, Spatial and temporal development of the dune instability, *Geophysical Research Letters (doi:10.1029/2020GL088919).*
3. **Gunn, A.,** M. Wanker, N. Lancaster, D. Edmonds, R. Ewing, and D. Jerolmack, Circadian rhythm of dune-field activity, *Geophysical Research Letters (doi:10.1029/2020GL090924).*

In review or submitted
1. Seiphoori, A., **A. Gunn**, S. Kosgodagan Acharige, P. Arratia and D. Jerolmack, Tuning sedimentation through surface charge and particle shape, *Geophysical Research Letters (in review) (EarthArXiv:1738).*
2. **Gunn, A.** and D. Jerolmack, Conditions for aeolian transport in the Solar System, *Nature Astronomy (in review) (EarthArXiv:1872).*
3. **Gunn, A.,** G. Casasanta, L. Di Liberto, F. Falcini, N. Lancaster and D. Jerolmack, What sets aeolian dune height? *Nature (submitted).*
4. **Gunn, A.,** A. East and D. Jerolmack, 21st-century stagnation in sand-sea activity. *Nature Climate Change (submitted).*

In preparation
1. **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, * denotes scheduled)

Invited Talks & Seminars
1. **International Society for Aeolian Research,** Virtuaeolian Seminar Series, *8 January 2021,* "Scale-dependent coupling between aeolian flow & form".
2. ***Texas A&M University,** Geology & Geophysics Seminar, *19 March 2021,* "Scale-dependent coupling between aeolian flow & form".
3. ***University of Minnesota,** Saint Anthony Falls Laboratory Seminar, *9 March 2021,* "Scale-dependent coupling between aeolian flow & form".
4. **University of Pennsylvania,** Physics & Astronomy 'Disordered Colloids, Nanoparticles, Atoms, and Particulates' Seminar, *23 October 2020,* "Tuning sedimentation through surface charge and particle shape".

5. **University of Pennsylvania,** Physics & Astronomy 'Disordered Colloids, Nanoparticles, Atoms, and Particulates' Seminar, *25 June 2020,* "Conditions for aeolian transport across the Solar System".
6. **Princeton University**, Environmental Fluid Mechanics Seminar, *20 May 2019,* "Land-atmosphere coupling at White Sands Dune Field, NM".
7. **University of Pennsylvania**, BenTalks, *17 March 2017,* "Turbulence suppresses glacial cycles".
8. **University of Pennsylvania**, Earth & Environmental Science Lunch Seminar, *12 September 2016*, "Diapyncal mixing inhibits ocean carbon storage".
9. **University of Tasmania**, Thesis Defence Seminar, *24 November 2015*, "The role of mixing and wind for the meridional overturning circulation and ocean carbon".
10. **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".
11. **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".
12. **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".
13. **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. **A. Gunn,** M. Wanker, N. Lancaster, D. Edmonds, R. Ewing, and D. Jerolmack, (2021) Circadian rhythm of dune-field activity, *Australian Earth Sciences Convention,* **Oral Session**.
2. *A. Seiphoori, **A. Gunn**, S. Kosgodagan Acharige, P. Arratia, D. Jerolmack, (2021) Tuning sedimentation through surface charge and particle shape, *American Physical Society March Meeting,* Oral Session.
3. **A. Gunn**, D. Jerolmack, (2020) Conditions for aeolian transport in the Solar System, *American Geophysical Union Fall Meeting,* **Oral Session**.
4. K. Cho, **A. Gunn**, D. Jerolmack, (2020) Understanding formative winds of intracrater aeolian dunes on Mars, *American Geophysical Union Fall Meeting,* Poster Session.
5. **A. Gunn**, G. Casasanta, F. Falcini, N. Lancaster, D. Jerolmack, (2020) Long-term dune geometry bounded by geology and climate, *American Geophysical Union Fall Meeting,* **Oral Session**.
6. 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,* Online Poster.
7. **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.**
8. 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.
9. **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**.
10. **A. Gunn**, D. Jerolmack, (2019) Dune geometry extraction from DEMs, *EarthCube, OpenTopography, U. Potsdam Point-cloud Workshop,* **Oral Session**.
11. **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**.
12. 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.
13. **A. Gunn**, D. Jerolmack, (2019) Turbidity Current Rheology, *Northeast Complex Fluids & Soft Matter Symposium*, Poster Session.
14. **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**.
15. **A. Gunn**, J. Daif, D. Jerolmack, (2018) Experimental Turbidity Current Onset: Breaching Front Rheology, *American Geophysical Union Fall Meeting*, **Oral Session**.
16. **A. Gunn**, D. Jerolmack, (2018) Experimental Turbidity Current Onset: Breaching Front Rheology, *Binghamton Geomorphology Symposium,* Poster Session.
17. **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**.
18. **A. Gunn**, D. Jerolmack, (2018) Coupled climate and dune feedbacks, *Wolman Club,* Poster Session.
19. **A. Gunn**, D. Jerolmack, (2018) Turbidity Current Rheology, *Northeast Complex Fluids & Soft Matter Symposium*, Poster Session.
20. **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**.
21. **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**.
22. **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.
23. **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.
24. **A. Gunn**, D. Jerolmack, (2017) Diurnal atmospheric stability cycles control transport at White Sands, New Mexico, *Amtrak Club,* Poster Session.
25. 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.
26. **A. Gunn**, D. Lee, P. Arratia, D. Jerolmack, (2017) Geophysical flows: 2D turbulence, lagrangian coherent structures, and particles, *Exxon Mobil Presentation*, Poster Session.
27. **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.
28. 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.
29. **A. Gunn**, M. Nikurashin, (2016) Diapyncal mixing inhibits ocean carbon storage, *Ocean Carbon Biogeochemistry Workshop,* Poster Session.
30. **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)

- **Schmidt Science Fellowship, Institutional Nomination,** *2020,* Invitation to advance to global-round as Penn representative.
- **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, Co-Instructor,** *2021,* sediment transport and fluid mechanics lectures, 18 students.
- **'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

- **Peer Reviewer,** *Ongoing,* journals: Geophysical Research Letters, Journal of Geophysical Research: Atmospheres, Journal of Geophysical Research: Earth Surface; book: Treatise on Geomorphology.
- **Good Data Institute, Volunteer,** *Ongoing,* consultant coder for NFPs on analytics and data-practices.
- **Trinity College Alumni Career Event, Science Panelist,** *4 Sept 2020,* career mentoring for science undergraduates at my alma mater.
- **American Geophysical Union Fall Meeting, Session Primary Convener,** *1-17 Dec 2020,* "Granular and Fluid Physics in Geomorphology".
- **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.
- **Titjimbat Teachabout Inc., Science Program Coordinator,** *Aug 2013-Feb 2014,* devised and implemented a 4-week STEM program for indigenous Australian 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 saftey net,** *12 Feb 2019*, course on colloborating 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 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.