



Frederik J Simons, Ph. D.

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ADDRESS	Department of Geosciences Guyot Hall 321b Princeton, NJ 08544	<i>Faculty Assistant:</i> Ms. Dawn Reading, (609) 258-1589 reading@princeton.edu
POSITIONS	2019–present <i>Associate Department Chair of the Department of Geosciences;</i> 2017–present <i>Professor of Geosciences;</i> 2013–2017 <i>Associate Professor of Geosciences, with tenure;</i> 2006–2013 <i>Assistant Professor of Geosciences, Princeton University;</i> 2016–2020 <i>Executive Committee Member, Program in Archaeology;</i> 2018–present <i>Associated Faculty, Princeton Environmental Institute;</i> 2012–present <i>Associated Faculty, Program in Applied & Computational Mathematics;</i> 2010–2013 <i>Dusenbury Preceptor of Geological and Geophysical Sciences, Princeton U.</i> 2018 <i>Member, Institute for Advanced Study (Astrophysics);</i> 2010–2018 <i>Visiting Fellow, KU Leuven (Earth & Environmental Sciences);</i> 2014–2015 <i>Visitor, Institute for Advanced Study (Astrophysics & Cosmology);</i> 2013 <i>Visitor, U. Cambridge (Bullard Laboratories);</i> 2012 <i>Visitor, U. L. Bruxelles (Applied Mathematics);</i> 2011 <i>Visiting Fellow, University College London (Statistical Science);</i> 2010 <i>Visitor, V. U. Brussel (Mathematics);</i> 2009 <i>Visiting Professor, Institut de Physique du Globe de Paris (Planetary Science);</i> 2008 <i>Visiting Professor, Eidgenössische Technische Hochschule Zürich (Geophysics).</i> 2004–2007 <i>Lecturer of Geophysics, University College London (UCL).</i> 2002–2004 <i>Beck Postdoctoral Teaching Fellow, Council on Science & Technology;</i> <i>Hess Postdoctoral Fellow, Geosciences Department, Princeton University.</i> 2002 <i>Postdoctoral Research Associate;</i> 1996–2002 <i>Research & Teaching Assistant, Earth, Atmospheric & Planetary Sciences,</i> <i>Massachusetts Institute of Technology (MIT).</i> Summer 2001 <i>Research Intern, Shell International Exploration & Production, Houston, TX.</i> Summer 1996 <i>Research Assistant, KU Leuven, Belgium.</i>	
DEGREES	1996–2002 <i>Massachusetts Institute of Technology, Cambridge, MA;</i> <i>Doctor of Philosophy with thesis in Geophysics.</i> 1992–1996 <i>KU Leuven, Belgium;</i> <i>Kandidaat & Licentiaat with thesis in Geology;</i> <i>Grootste onderscheiding (summa cum laude).</i> 1980–1992 <i>Onze-Lieve-Vrouwecollege Jesuit School, Antwerpen, Belgium;</i> <i>Humaniora, Latin & Greek. Primus perpetuus.</i>	

RESEARCH I am a geologically inspired, geophysically educated, computationally motivated and mathematically minded *geoscientist* interested in the seismic, mechanical, thermal and magnetic properties of the Earth's lithosphere — and of the terrestrial planets and moons. I enjoy analyzing complex, large, and heterogeneous geophysical data sets, and design theoretical and computational inverse methods and statistical techniques to be able to do so — especially for partially observed processes modeled on a sphere. No amount of sophistication can cure a fundamental data limitation: I am developing floating hydrophones to open up the sparsely instrumented oceanic domains for global tomography.

AWARDS

2014–2019	Fellow of the Faculty of Sciences, KU Leuven;
2018	IRIS & <i>Seismological Society of America</i> , Distinguished Lecturer;
2016	Outstanding Reviewer, <i>Geophysical Journal International</i> ;
2012	National Science Foundation CAREER Award;
2008	Prix quadriennal <i>Charles Lagrange</i> , Académie Royale de Belgique;
2005	<i>Nuffield</i> Foundation Newly Appointed Lecturer Award;
2004	Editors' Citation for Excellence in Refereeing, JGR-Planets, AGU;
2002	<i>Beck</i> Fellowship, Council on Science & Technology, Princeton;
2001	Outstanding Student Paper Award, Seismology Section, AGU;
1998	<i>Victor J. DeCorte</i> Fellowship, MIT;
1997, 1998	Teaching Assistant Excellence Awards, EAPS, MIT;
1997	Biennial prize for an M. Sc. thesis in Geology, KU Leuven;
1996–2001	<i>Fulbright</i> Fellowship, Commission for Educational Exchange;
1996–1997	Honorary Fellowship, Belgian-American Educational Foundation;
1996–1997	Ambassadorial Scholarship, Rotary International Foundation;
1994	Scholarship, Scottish Universities' International Summer School,
1993	Competitive Scholarship, KU Brussel, <i>for summer semesters on (post-)modernist English literature, U. Edinburgh.</i>

TEACHING

2015–2017	<i>State of the Earth: Shifts and Cycles</i> , with A. Maloof, Princeton FRS135/124;
2008–2017	<i>Global (also: Introductory) Geophysics</i> , Princeton GEO320/371/700/PHY371;
2007–2017	<i>Data, Models & Uncertainty in the Natural Sciences</i> , Princeton GEO422;
2016	<i>Guest Lecturer, Introduction to Archaeology</i> , with D. Vischak, Princeton ART401;
2016	<i>Guest Lecturer, Software Engineering Sci. Comp.</i> , with J. Stone, Princeton APC524;
2008–2015	<i>Fundamentals of the Geosciences</i> , with multiple others, Princeton GEO506;
2013	<i>Guest Lecturer, Introduction to Archaeology</i> , with J. Smith, Princeton ART291;
2011–2013	<i>Earth's Environments, Ancient Civilizations</i> , with A. Maloof, Princeton FRS;
2012	<i>Origin and Evolution of the Lithosphere</i> , with B. Schoene, Princeton GEO556;
2007–2009	<i>Earth's Changing Surface & Climate</i> , with A. Maloof, Princeton FRS;
2005–2006	<i>Global Seismology</i> , UCL GEOL3031;
2005–2006	<i>Earth & Planetary System Science</i> , with Lidunka Vočadlo, UCL GEOL4003;
2006	<i>The Deep Earth</i> , with David P. Dobson, UCL GEOL4005;
2005	<i>Global Tectonics</i> , with Gerald P. Roberts, Birkbeck College;
2003–2006	<i>Field Instructor, Active Tectonics</i> , with Robert A. Phinney, Princeton FRS;
2004	<i>Lab Instructor, Earthquakes, Volcanoes & Hazards</i> , Princeton GEO 210;
2002	<i>Guest Lecturer, Introductory Seismology</i> , Princeton GEO 424;
2002	<i>Guest Lecturer, Elements of Seismology</i> , MIT 12.501/12.201;
2001	<i>Tutor, Advanced Placement Physics</i> , Cambridge Rindge & Latin School;
2000	<i>Instructor, Boston Math Circle</i> ;
1996–2000	<i>Teaching Assistant, Essentials of Geophysics</i> , MIT 12.501/12.201.

FUNDING

- NSF, *Through the ocean to the mantle: Seismic study of the Pacific...* [EAR-1917058], 2019–2021.
- NSF, *A seismic synthesis model for the Eastern North American...* [EAR-1736046], 2017–2020.
- NSF, *Reproducible research & educational software for geoscience...* [EAR-1550732], 2016–2019.
- NSF, *New perspectives on the continental lithosphere* [EAR-1150145], 2012–2017.
- NSF, *Phased testing at sea of the Son-O-Mermaid prototype* [EAR-1318416], 2013–2016.
- NSF, *Mapping the evolution of Antarctica's mass balance* [PLR/EAR-1245788], 2013–2016.
- NSF, *Making the most of GRACE* [EAR-1014606], 2010–2013.
- NSF, *Mechanical anisotropy from gravity/topography coherence* [EAR-0710860], 2007–2012.
- NSF, *Banana-doughnut traveltimes tomography* [EAR-0105387], 2007–2009.
- NASA, *Structure & evolution of the Martian crustal magnetic field* [NNX14AM29G], 2014–2017.
- NASA, *Structure and evolution of the Venusian lithosphere* [NNX11AQ45G], 2011–2014.
- NOAA, *Terrestrial ice mass loss and the sea-level budget* [NA08OAR4320752], 2015–2016.
- NOAA, *Mapping Antarctica's mass loss in space and time* [NA08OAR4320752], 2013–2014.
- ESF, *Conference grant* [MYRES-II], 2006.
- HEFCE, *Equipment grant for observational seismology* [SRIF3], 2005.
- NERC, *Development of MERMAID* [NE/D521449/1], 2005–2008.
- Nuffield Foundation, *Development of autonomous mid-column hydrophones* [NAL/01087/G], 2005.
- DNO, *Waveform inversion of land-based seismic data*, 2019–2021.
- KAUST, *Waveform and tomographic inversion for natural and induced seismic events*, 2017–2020.
- TOTAL USA, *Full-waveform inversion...: Moving beyond the proof-of-concept*, 2017–2019.
- TOTAL USA, *Full-waveform inversion of passive seismic data*, 2015–2017.
- MathWorks, *SLEPIAN: Code & course development for research and education*, 2015–2016.
- Princeton Environmental Institute, *GuyotPhysics: Princeton as an urban science node*, 2016.
- Princeton Environmental Institute, *Mapping Earth's ice mass balance in space and time*, 2015.
- Princeton Geosciences Phillips Fund, *GuyotPhysics: Purchase of a broadband seismometer*, 2016.
- Princeton Geosciences Phillips Fund, *Development of the Son-O-Mermaid instrument*, 2012.
- Princeton 250th Fund, *State of the Earth: Shifts and Cycles* [FRS 135/124], 2015–2017.
- Princeton 250th Fund, *Earth's Environments, Ancient Civilizations* [FRS 171/187], 2011–2013.
- Princeton 250th Fund, *Earth's Changing Surface & Climate* [FRS 145/149], 2008–2010.

SEMINARS *I have given invited seminars on 189 occasions since my first appearance in 1999. A complete listing is available at <http://geoweb.princeton.edu/people/simons/vita2.html#invited>.*

Invited Lectures in Academic Geosciences Departments (asterisks indicate named lectures):

- 2020 [1] MIT
- 2019 [2] ISTerre, Université Grenoble Alpes, McGill Space Institute, Montréal
- 2018 [1] Laboratoire de Géophysique, Papeete
- 2017 [3] King Abdullah U. Science Technol., King Fahd U. Petrol. Miner., U. T. Austin*
[*Edwin Allday Lecture*]
- 2016 [5] U. Science Technol. China, Zhejiang U. (2×), Wuhan U. (2×)
- 2015 [3] Inst. Physique du Globe de Paris, Peking University, Georgia Inst. of Technology
- 2014 [3] Purdue U., KIGAM South Korea, U. C. San Diego Scripps Inst. Oceanography
- 2013 [2] U. Cambridge, U. Chicago
- 2012 [7] U. Toronto, Virginia Tech, U. Oxford, ETH Zürich, MIT, Woods Hole Oceanographic Inst., Rutgers U.
- 2011 [5] Princeton U., Dublin Inst. Adv. Study, U. Cambridge, MIT, Harvard U.
- 2010 [5] Woods Hole Oceanographic Inst., KU Leuven, U. Siegen, U. C. Los Angeles, U. Southern Calif.
- 2009 [7] Cornell U. (2×), U. Michigan* [*William T. Smith Lecture*], U. Michigan, Columbia U. Lamont-Doherty Earth Observatory, U. C. Santa Cruz, SUNY Stony Brook
- 2008 [3] U. College London, U. Edinburgh, ETH Zürich
- 2007 [1] U. Illinois Urbana-Champaign* [*Richard L. Hay Lecture*]
- 2006 [5] U. College London, Carnegie Inst. Washington, Imperial College London, U. Cambridge, U. Oxford
- 2005 [8] U. C. San Diego Scripps Inst. Oceanography, U. Leicester, Harvard U., Princeton U., Stanford U. (2×), U. Southampton Oceanography Centre, U. College London
- 2004 [3] U. Leeds, U. C. Berkeley, U. Chicago
- 2003 [6] Washington U. St. Louis, Princeton U. (2×), Harvard U., U. College London, Penn State U.
- 2002 [5] U. C. Berkeley, Calif. Inst. Technology, U. C. San Diego Scripps Inst. Oceanography, Carnegie Inst. Washington, Princeton U.
- 2001 [3] U. Québec Montréal, Shell Rijswijk, Shell Houston
- 2000 [6] KU Leuven, U. Leeds, U. Oxford, Royal Holloway U. London, Brown U.
- 1999 [2] U. Québec Montréal, Inst. Physique du Globe de Paris

Invited Lectures in Various Other Departments, and Outreach Events:

- 2019 [2] Littlebrook Elementary [*Science Expo*], U-NOW Day Nursery [*Geology Rocks!*]
- 2018 [9] Southwestern Oregon Community College, Hatfield Marine Science Center, Denver Museum of Nature & Science, American Museum of Natural History, U-NOW Day Nursery [*Geology Rocks!*], Littlebrook Elementary [*Science Expo*], Oregon Museum of Science & Industry, TOTAL Exploration & Production, Houston Museum of Natural Science
- 2017 [6] Earth Educators' Rendezvous [*Education*], U-NOW Day Nursery [*Geology Rocks!*], DataRescue Princeton, Littlebrook Elementary [*Science Expo*], Princeton Day of Action Symposium, Princeton-PPPL-APS Conference for Undergraduate Women in Physics
- 2016 [5] Princeton Speaks MATLAB [*Research Computing*], From Zero to MATLAB in Four Days [*KU Leuven Doctoral Summer School*], Earth Educators' Rendezvous [*Education*], U-NOW Day Nursery [*Geology Rocks!*], Littlebrook Elementary [*Science Expo*]
- 2015 [7] New York U. Courant Institute [*Mathematics*], ExxonMobil @ Princeton University [*E-affiliates Meeting*], Carleton College SERC [*Education*], KU Leuven [*Astronomy*], U-NOW Day Nursery [*Geology Rocks!*], Littlebrook Elementary [*Science Expo*], Austrian Academy of Sciences [*Acoustics Research Institute*], Harbin Institute of Technology [*Mathematics*]
- 2014 [6] British Geological Survey (Edinburgh), Littlebrook Elementary [*4th Grade*], ExxonMobil Corporate Strategic Research (Clinton), Princeton U. [*McGraw Center*], Purdue U. [*Applied Mathematics*], Stanford U. [*Applied Mathematics*]
- 2013 [2] Concordia Science & Astronomy Club [*Plainsboro*], Princeton U. [*Colonial Club*]
- 2012 [1] Princeton U. [*Environmental Affairs Forum*]
- 2011 [1] Princeton U. [*Program in Applied & Computational Mathematics*]
- 2010 [1] NASA Goddard Space Flight Center [*Planetary Geodynamics*]
- 2009 [2] The College of New Jersey [*Physics*], Ohio State U. [*Geodesy*]
- 2006 [3] Imperial College London [*Mathematics*], U. Stuttgart [*Geodesy*], Birkbeck College London [*Astrobiology*]
- 2005 [1] Birkbeck College London [*Astrobiology*]
- 2004 [5] Cold Spring Harbor Laboratory, New York U. Courant Institute [*Harmonic Analysis & Signal Processing*], U. Kaiserslautern [*Oberseminar Geomathematik*] (3×)
- 2003 [1] Princeton U. [*Program Integrative Information, Comput. & Application Sciences*]
- 2002 [1] Princeton U. Time-Frequency Seminar [*Applied & Computational Mathematics*]

Invited Conference Presentations (asterisks indicate keynote speeches):

- 2019 [2] U. Grenoble [*Applied Inverse Problems*] (2×)
- 2018 [3] Inst. for Math. & its Applications [*Machine Learning & Computational Methods for Geoscience*] Minneapolis, *Inverse Problems: Modeling and Simulation*, Malta, Simons Found. [*Data Science & Inverse Problems in Geophysics*] Rice U.
- 2015 [4] American Geophysical Union [*Fall Meeting*], *TOPO-EUROPE**, Antibes, *Fête Nolet*, *GéoAzur*, Sophia Antipolis, *Int. Workshop on Mathematical Geophysics*, Harbin, SIAM/AMS/MAA [*Joint Mathematics Meetings*] San Antonio (2×, talks given by A. Plattner and Y. Yuan)
- 2014 [3] Rhein-Main Arbeitskreis [*Mathematics of Computation**] U. Siegen, Royal Society Seminar [*Science on the Sphere*] Newport Pagnell, IRIS/GSH Workshop [*Active Uses of Passive Seismic Data*] Houston, SIAM/AMS/MAA [*Joint Mathematics Meetings*] Baltimore (2×, talks given by C. Harig and A. Plattner)
- 2013 [6] OBSIP [*2013 OBS Workshop*] Redondo Beach, SPIE [*Wavelets and Sparsity XV*] San Diego, AMMCS-2013 [*Applied Mathematics, Modeling and Computational Science*] Waterloo (talk given by A. Plattner), IAHS-IAPSO-IASPEI [*Joint Assembly*] Gothenburg, SIAM [*Annual Meeting*] San Diego, *GeoMathematics* 2013* St. Martin, SIAM/AMS/MAA [*Joint Mathematics Meetings*] San Diego
- 2012 [4] American Association of Physics Teachers (New Jersey) [*Annual Meeting**], SSP-2012 [*IEEE Statistical Signal Processing Workshop*] (talk by A. Plattner), Bayerische Akad. Wissenschaften [*IAG-ICCT Workshop*] (talk given by C. Harig), NASA Goddard Space Flight Center [*Program for Regional Climate Assessment*]
- 2011 [6] Northwestern U. [*Mathematics in the Geosciences*], SPIE [*Wavelets and Sparsity XIV*] San Diego, IUGG [*General Assembly*] Melbourne (2×), Princeton Center for Theoretical Science [*Seismology of the Earth and Stars*], SIAM/AMS/MAA [*Joint Mathematics Meetings*] New Orleans
- 2010 [2] Princeton Center for Theoretical Science Workshop, SIAM/AMS/MAA [*Joint Mathematics Meetings*] San Francisco
- 2009 [2] SPIE [*Wavelets XIII*] San Diego, VII Hotine-Marussi Symposium Rome
- 2008 [2] U. Kaiserslautern [*Geomathematics Workshop*], Seismological Society of America [*Annual Meeting*] Santa Fe
- 2007 [6] SPIE [*Wavelets XII*] San Diego, *Int. Workshop on Modeling of Mantle Convection & Lithospheric Dynamics** Carry-le-Rouet, *Int. Congress on Industrial & Applied Mathematics* Zürich, U. British Columbia [*Applied Inverse Problems*], U. Iceland [*Undur Veraldar** Public Lecture], American Geophysical Union [*Fall Meeting*]
- 2005 [2] U. Kaiserslautern [*Inverse Problems Workshop*], European Geosciences Union General Assembly
- 2004 [5] Colorado School of Mines [*Mathematical Geophysics & Uncertainty*] (2×), MYRES-I Workshop* San Diego, Rensselaer Polytechnic Inst. [*Center for Inverse Problems*], GEOTOP-UQÀM-McGill [*Congrès des Etudiants**]
- 2002 [2] IEEE [*Computer Aided Seismic Analysis & Discrimination Workshop*], MIT [*New England Workshop on Anisotropy & Imaging*]
- 2001 [1] American Geophysical Union [*Spring Meeting*]
- 2000 [1] American Geophysical Union [*Fall Meeting*]

A chronological list of contributed oral presentations given at various scientific meetings is available at <http://geoweb.princeton.edu/people/simons/vita2.html#orals>. Similarly, <http://geoweb.princeton.edu/people/simons/vita2.html#posters> contains a list of contributed poster presentations.

ADVISING *Current Postdocs:*

Lucia Gualtieri (Ph. D. 2014, IPG Paris), supported by KAUST, co-advised with Jeroen Tromp.

Current Graduate Students:

Alex Burky (Ph. D. Geophysics, *2022), co-advised with Jessica Irving;

Joel D. Simon (Ph. D. Geophysics, *2019), supported by NSF.

Former Postdocs:

Dmitry Borisov (Ph. D. 2014, IPG Paris), supported by TOTAL, now at Kansas Geological Survey;

Greg Garner (Ph. D. 2013, Penn State), *Woodrow Wilson School* STEP Fellow, now at Rutgers U.;

Umair bin Waheed (Ph. D. 2015, KAUST), supported by TOTAL, now at KFUPM;

Yanhua O. Yuan (Ph. D. 2016, Princeton), now at ExxonMobil Corporate Strategic Research;

Christopher T. Harig (Ph. D. 2010, U. Colorado Boulder), now at U. Arizona;

Alain Plattner (Ph. D. 2011, ETH Zürich), *Swiss National Fonds* Fellow, now at U. Alabama;

Edwin S. Kite (Ph. D. 2011, U. C. Berkeley), *Hess Postdoctoral Fellow*, now at U. Chicago;

M. Glenn Sterenborg (Ph. D. 2011, Harvard), *Canadian Institute for Advanced Research* Fellow;

Kevin W. Lewis (Ph. D. 2009, Caltech), *Hess Postdoctoral Fellow*, now at Johns Hopkins;

Robert E. Kopp (Ph. D. 2007, Caltech), *Woodrow Wilson School* STEP Fellow, now at Rutgers U.

Former Graduate Students:

Yanhua O. Yuan (Ph. D. Geophysics, *2016), now at ExxonMobil Corporate Strategic Research;

Ariane Ducellier, transferred to U. Washington, co-advised with Jeroen Tromp;

Yue Tian (Ph. D. Geophysics, *2010), now at Chevron, co-advised with Guust Nolet;

Dong V. Wang (M. A. Geophysics, *2010), now at U. North Carolina Chapel Hill.

Visiting Postdocs:

Vladimir Kazei (Ph. D. 2015, St. Petersburg State U.), supported by KAUST.

James P. D. Moore (Ph. D. 2014, U. Oxford), supported by Earth Observatory of Singapore;

Arthur Guillaumin (Ph. D. 2017, U. College London), supported by ERC Consolidator Grant;

François Lavoué (Ph. D. 2014, U. Grenoble), supported by Dublin Institute for Advanced Studies;

Lara M. Kalnins (Ph. D. 2011, U. Oxford), supported by NERC.

Visiting Graduate Students:

Georg Reuber (Ph. D. 2020, University of Mainz), supported by ERC Consolidator Grant;

Yue Hu (Ph. D. 2019, University of Geosciences Wuhan), supported by China Scholarship Council;

Wenyong Pan (Ph. D. 2017, U. Calgary), supported by U. Calgary;

Alice Bates (Ph. D. 2017, Australian National University), supported by ANU;

Verena Lieb (Ph. D. 2016, Deutsches Geodätisches Forschungsinstitut), supported by DAAD;

Chunli Dai (Ph. D. 2015, Ohio State U.), Lei Wang (Ph. D. 2012, Ohio State U.), supported by NSF;

Liyong Wei (Ph. D. 2010, Australian National U.), supported by ANU and NSF.

Research Specialists:

Gabe Eggers (Geosciences, '2013), now at Georgia Institute of Technology.

Undergraduate Research Interns:

Aidan Blaser (Cornell, '2021); Jonah Rubin (U. Vermont, '2021); William Ughetta (Computer Science, '2021); Peter Mwesigwa (Computer Science, '2021); Ben Huang ('2020); Lauren Von Berg ('2020); Elijah Ash ('2019); James Tralie ('2019); Gloria Yin (Mathematics, '2018); Ben Leizman (Computer Science, '2017); Anna van Brummen ('2017); Evan Welch (Physics, '2012); Austin Robbins (Fresno State, '2017); Laura Larsen-Strecker (Harvard, '2009).

Senior Theses Advised: [7]

- Maricela Coronado (Geosciences, '2018): *Underground hydrocarbon pipelines in the United States, and their relationship to the concentration of arsenic in groundwater.*
- Anna van Brummen (Geosciences, '2017): *Calibration and noise characterization of a newly installed seismometer at Princeton University.*
- Alyson Beveridge (Geosciences, '2016): *Measuring the changing mass of glaciers on the Tibetan Plateau using time-variable gravity from the GRACE mission.*
- Weber Liu (Geosciences, '2016): *Analysis of Martian topography via a parameterized spectral approach.*
- Kathleen Ryan (Geosciences, '2014): *Precision and accuracy of low-cost Global Positioning augmentation systems.*
- Gabe Eggers (Geosciences, '2013): *A regionalized maximum-likelihood estimation of the spatial structure of Venusian topography.*
- Evan Welch (Physics, '2012): *Inversion of first order Eulerian gravitational potential perturbations for the seismic moment tensor: a normal modes approach.*

Junior Papers Advised: [14]

- Robert Freeman (Computer Science, '2022): *Evaluating precipitation in landscape evolution model CHILD and improving its algorithmic performance.*
- Laurie Zielinski (Geosciences, '2022): *Reproducibility of overlapping magnetometric surveys at Polis Chrysochous, Cyprus.*
- Alexander Cavoli (Geosciences, '2022): *Development of a software package to recognize cyclicities from outcrop-scale photographs.*
- Angel Fan (Geosciences, '2021): *Spherical-harmonic analysis of the Jovian gravity field: Numerical Experiments.*
- Benjamin Getraer (Geosciences, '2019): *Regional forcing of Greenland ice loss 2002–2017 and Resolving and contextualizing the signal of Greenland ice loss 2014–2017.*
- Mrinalini Basu (Physics, '2015): *Modelling mass change in California with GRACE.*
- Gabe Eggers (Geosciences, '2013): *A coherent, regionalized map of Venus.*
- Garnet Abrams (Geosciences, '2012): *Gravity anomalies or optical illusions? A fine-scale survey of two New Jersey “gravity hills”.*
- Evan Welch (Physics, '2012): *Displacements from the 1-D Earth’s free oscillations.*
- Henry Chu (Operations Research, '2011): *On the inversion for lithospheric geomagnetic potential from scattered, noisy satellite data on bounded spherical domains.*
- Yifeng Wang (Geosciences, '2011): *Analysis of acoustic wave speeds in the ocean with view of deploying hydrophones for global seismic tomography and Analysis of hydroacoustic time series from the High-Frequency Acoustic Recording Package array.*
- Cristian Proistosescu (Physics, '2009): *Trace-element dendrochronology: Creating an age model for ringless trees from low latitudes.*

Non-Princeton Students Advised: [8]

- Jonathan Watson (M. Res., 2006, Birkbeck); Anthony Bloom, Ben Dando & Gary Hayes (M. Sci. 2006, UCL); Caroline Attwood, Rachael Bayliss, Richard Ford & N. Jeshani (B. Sc. 2006, UCL).

High School Mentees: [2]

- David Li, Princeton High School ('2014): *Analysis of seafloor bathymetry using MATLAB;*
- Dmitriy Potylitsin, Holmdel High School ('2012): *Dendroclimatological analysis of Pine species in California,* entered into the 2012 Intel and Siemens Competitions and presented at the 57th Annual New Jersey Academy of Science Junior and Senior Academies Meeting.

EXAMINER *I have served on 17 doctoral and 3 master's examination committees at other institutions or in departments outside of my primary affiliation. A listing of the doctoral committees on which I served within the Department of Geosciences, as of my "normal" duties, is found on page 14.*

2018 Devi K. (Ph. D., Ocean Engineering), Indian Institute of Technology Madras, Chennai,
Assessment of coastal dunes and peatlands methane plumes in coastal plain landforms of India by Ground Penetrating Radar measurements.
Adviser: Rajesh R. Nair.

David R. Dalton (Ph. D., Earth Sciences), Memorial University of Newfoundland,
On Backus average in modelling guided waves.
Adviser: Michael A. Slawinski.

2017 Yudhvir Singh (Ph. D., Ocean Engineering), Indian Institute of Technology Madras, Chennai,
Gas hydrate saturation using effective medium modeling with partially aligned fractures at Krishna Godavari Basin.
Adviser: Rajesh R. Nair.

2016 Verena Lieb (Ph. D., Engineering), T. U. Munich,
Enhanced regional gravity field modeling from the combination of real data via MRR.
Advisers: Roland Pail and Michael Schmidt.

2015 Christian Blick (Ph. D., Mathematics), U. Kaiserslautern,
Multiscale potential methods in geothermal research: Decorrelation reflected post-processing and locally based inversion.
Adviser: Willi Freeden.

Paul Käufel (Ph. D., Geophysics), U. Utrecht,
Rapid probabilistic source inversion using pattern recognition.
Adviser: Jeannot Trampert.

Ramakrushna Reddy T. (Ph. D., Geophysics), Indian Institute of Technology Madras, Chennai,
Seismic early warning using improved multiscale wavelet approach.
Adviser: Rajesh R. Nair.

2014 Anthony Chatu (M. Sc., Geophysics), U. Witwatersrand,
Processing and interpretation of potential field data from Namibia.
Adviser: Gordon R. J. Cooper.

2013 Zubair Khalid (Ph. D., Electrical Engineering), Australian National U.,
Spatio-spectral analysis on the unit sphere.
Adviser: Rodney A. Kennedy.

D. Cornelis Slobbe (Ph. D., Geoscience & Remote Sensing), T. U. Delft,
Roadmap to a mutually consistent set of offshore vertical reference frames.
Adviser: Roland Klees.

- 2012 Sergey Voronin (Ph. D., Applied and Computational Mathematics), Princeton,
Regularization of linear systems with sparsity constraints with applications to large scale inverse problems.
Adviser: Ingrid C. Daubechies.
- Lei Wang (Ph. D., Geodetic Science), Ohio State U.,
Coseismic deformation detection and quantification for great earthquakes using spaceborne gravimetry.
Adviser: C. K. Shum.
- 2011 Eugene Brevdo (Ph. D., Electrical Engineering), Princeton,
Efficient representations of signals in nonlinear signal processing with applications to inverse problems.
Advisers: Peter J. Ramadge and Ingrid C. Daubechies.
- Mélanie Villemaire (*Maîtrise*, Sciences de la Terre), U. Québec à Montréal,
Structure tridimensionnelle du manteau supérieur sous l'est du bouclier canadien et le nord des Appalaches en utilisant la tomographie des ondes P.
Adviser: Fiona A. Darbyshire.
- Doreen Fischer (Ph. D., Mathematics), U. Siegen,
Sparse regularization of a joint inversion of gravitational data and normal mode anomalies.
Adviser: Volker Michel.
- Reyko Schachtschneider (Ph. D., Physics), U. Potsdam,
Error distribution in regional inversions of potential fields from satellite data.
Adviser: Matthias Holschneider.
- 2010 Liying Wei (Ph. D., Electrical Engineering), Australian National U.,
Signal concentration and related concepts in time-frequency and on the unit sphere.
Adviser: Rodney Kennedy.
- 2007 Abel Amirbekyan (Ph. D., Mathematics), U. Kaiserslautern,
The application of reproducing kernel based spline approximation to seismic surface and body wave tomography: Theoretical aspects and numerical results.
Adviser: Volker Michel.
- 2006 Peggy Vermeesch (Ph. D., Geophysics), Imperial College,
Geophysical modelling of the Chicxulub crater.
Advisers: Joanna V. Morgan and Michael Warner.
- 2004 Pascal Audet (*Maîtrise*, Sciences de la Terre), U. Québec à Montréal,
Réponse flexurale de la lithosphère dans le bouclier canadien.
Adviser: Jean-Claude Mareschal.

CONVENER *I have served as co-organizer of the following 22 meetings and special sessions:*

- 2018 *Waveform and Tomographic Inversion for Natural and Induced Seismic Events*, Special Session, Fall AGU; with Lucia Gualtieri (Princeton), Haijiang Zhang (USTC) and Tariq Alkhalifah (KAUST).
- 2017 *Developing Students' Computational Skills*, Mini Workshop, Earth Educators' Rendezvous, U. New Mexico, Albuquerque, NM.
- APS Conference for Undergraduate Women in Physics*, at Princeton University / PPPL, with Shannon Greco (PPPL) and multiple others from Physics, Astrophysical Sciences, and Engineering.
- 2016 *Teaching Geoscience with MATLAB*, Special Session, Fall AGU; with Andrew M. Fisher (U. Tasmania) & Risa D. Madoff (U. North Dakota).
- Princeton Speaks MATLAB*, Users Group Kick-Off Event, Princeton Institute for Computational Science and Engineering (PICSciE) and the Office of Information Technology (OIT) Research Computing; with Charles Augustine (Princeton).
- Teaching Computation in the Sciences Using MATLAB*, International Workshop, Carleton College, Northfield, MN; with Lisa Kempler (MathWorks), Cathryn A. Manduca (Carleton), Kristin Jenkins (BioQUEST), Kelly Roos (Bradley U.) & Wendy Thomas (U. Washington).
- 2015 *Forward and Inverse Problems in Geodesy, Geodynamics, and Geomagnetism*, Minisymposium, SIAM Conference on Mathematical & Computational Issues in the Geosciences; with Alain Plattner (Fresno).
- 2014 *From NARS to Mariscope: Three Decades of Seismological Networks*, Special Session, Fall AGU; with Suzan van der Lee (Northwestern), Jeroen Ritsema (U. Michigan) & Karin Sigloch (Oxford).
- Impact of Waves Along Coastlines*, Institute for Mathematics and its Applications (IMA), Hot Topic Workshop, Minneapolis, MN; with Jed Brown (Argonne), Donna Calhoun (Boise State), Natasha Flyer (NCAR), David George (USGS), Kyle Mandli (Columbia U.), Rosemary Renaut (Arizona State), Grady Wright (Boise State) & Dave Yuen (U. Minnesota).
- Roadmap Workshop*, Consortium for Mathematics in the Geosciences (CMG++), Boise State University; with Jodi Mead & Grady Wright (Boise State), Natasha Flyer (NCAR), Rosemary Renaut (Arizona State), Seth Stein (Northwestern) & Dave Yuen (U. Minnesota).
- Real-Time Seismic Data from the Oceans*, Special Interest Group (SIG) meeting, IRIS Workshop, Sunriver, OR; with Gabi Laske (Scripps) & Guust Nolet (U. Nice).
- 2013 *Geological Data Fusion: Tackling the Statistical Challenges of Interpreting Past Environmental Change*, DIMACS Workshop, Rutgers University; with Bob Kopp (Rutgers U.).
- 2012 *Bridging the Gap between the Geosciences and Mathematics, Statistics, and Computer Science*, NSF and Princeton Center for Theoretical Science; with Don Estep (Colorado State), Natasha Flyer (NCAR), Michael Ghil (UCLA), Ridg Scott (U. Chicago), Michael Stein (UCLA), Seth Stein (Northwestern), Grady Wright (Boise State) & Dave Yuen (U. Minnesota).
- 2010 *Advances in Signal Processing Methods for Seismology*, Special Session, Fall AGU; with Youshun Sun (MIT) & Po Chen (U. Wyoming).

- 2008 *Models of the Deep Earth*, Special Session,
Fall AGU; with S.-H. Dan Shim (MIT) & Michael Thorne (U. Utah).
- 2007 *Rheological Anisotropy: Geological and Geophysical Perspectives*, Special Session,
Fall AGU; with Einat Lev (MIT), Pascal Audet (UBC) & Throstur Thorsteinsson (U. Iceland).
- 2006 MYRES-II: *Dynamics of the Lithosphere*,
Verbania, Italy; with Laurent Montési (WHOI) & Giulio di Toro (U. Padova).
- 2005 *Analysis and Representation of Geophysical Data on the Sphere*, Special Session,
Fall AGU; with Mark Wieczorek (IPG Paris), Andy Jackson (U. Leeds) & Dave Yuen (U. Minnesota).
- Wavelet and Time-Frequency Analysis in the Earth Sciences*, Special Session,
Spring EGU; with Jonathan Lilly (IPG Paris) & Sofia Olhede (Imperial College).
- 2004 MYRES-I: *Heat, Helium, Hotspots, and Whole Mantle Convection*,
La Jolla, CA; with Thorsten Becker (USC) & Jamie Kellogg (UCLA).
- Crust-Mantle Interaction and Lithospheric Deformation*, Special Session,
Fall AGU; with Corné Kreemer (U. Nevada) & Oliver Heidbach (U. Karlsruhe).
- 2002 *Structure, Composition & Evolution of Deep Continental Lithosphere*, Special Session,
Fall AGU; with Cin-Ty Lee (Rice U.).

SERVICE

Editorial

Editor, *Geophysical Journal International*, since 2017;
 Advisory Board Member, *Springer Geosystems Mathematics Books*, since 2014;
 Editor, *International Journal on Geomathematics*, since 2010;
 Editorial Advisory Board, *Journal of Geodetic Science*, since 2010;
 Editorial Advisory Board, *Earth & Planetary Science Letters*, 2007–2018;
 Associate Editor, *Journal of Geophysical Research (Solid Earth)*, 2004–2009.

Refereeing

Manuscripts [280+] for journals, publishers, and funding agencies: *Adv. Space Res.*, *AGU Monographs*, *Appl. Comput. Harmon. Anal.*, *Arab. J. Geosci.*, *Artificial Satellites*, *Bull. Seismol. Soc. Amer.*, *Cambridge U. Press*, *Czech Sci. Found.*, *Climatic Change*, *Comput. Geosci.*, *Earth Planets Space*, *Earth Sci. Res. J.*, *Earth & Planet. Sc. Lett.*, *Eos Trans. AGU*, *European Research Council*, *European Science Foundation*, *Fédération Wallonie-Bruxelles*, *Free U. Brussels GOA*, *G-Cubed*, *Geology*, *Geophysics*, *Geoph. J. Int.*, *Geoph. Res. Lett.*, *Geosphere*, *GSA Spec. Pub.*, *Harvard U. Press*, *Icarus*, *IEEE Sig. Proc. Lett.*, *IEEE Stat. Sig. Proc. Workshop*, *IEEE Trans. Sig. Proc.*, *IEEE Trans. Geosc. Remote Sens.*, *Inst. National Sciences de l'Univers*, *Int. J. Geomath.*, *Inv. Probl. Sci. Eng.*, *Israel Sci. Found.*, *J. Appl. Geophys.*, *J. Coastal Conserv.*, *J. Fourier Anal. Appl.*, *J. Geodyn.*, *J. Geodesy*, *J. Geodet. Sci.*, *J. Geophys. Eng.*, *J. Geoph. Res.*, *J. Roy. Stat. Soc.*, *Kentucky Sci. & Eng. Found.*, *King Abdullah U. Sci. Tech.*, *Lithosphere*, *Louisiana Board of Regents*, *National Aeronautics and Space Administration* (including for the NASA Postdoctoral Program), *National Science Foundation* (including as panelist on 1 panel), *Natural Sci. & Eng. Res. Council Canada*, *Neth. Org. Sci. Res.* (including as panelist on 1 panel), *Neth. Space Office*, *NYY Abu Dhabi*, *Ocean Modelling*, *Phys. Earth. Planet. Int.*, *Proc. Roy. Soc. Lond. Ser. A*, *Princeton U. Press*, *Science*, *Science Advances*, *Seismol. Res. Lett.*, *Smithsonian Channel USA*, *Symm. Integr. Geom. Meth. Appl.*, *Studia Geophys. Geodaet.*, *Surveys Geophys.*, *Swiss National Science Fonds*, *Taylor & Francis*, *Tectonophysics*, *U. K. Natural Environment Res. Council*, *U. K. Particle Phys. Astron. Res. Council*, *U. S. Dept. of Defense*, *U. S. Dept. of Energy*, *Water Resources Res.*

Community

President, *Earthscope-Oceans Steering Committee*, since 2016;
 Member, *Comput. Infrastructure Geodyn. Executive Committee*, since 2016;
 Member, *EOAS Earth Observations & Forecasting Committee*, Rutgers U., 2017;
 Member, *EarthScope Education and Outreach SubCommittee*, 2014–2019;
 Member, *IAG Inter-Commission Committee on Theory Joint Study Groups*
Multiresolutional aspects of potential field theory (2015–2019) &
Current methodologies in regional gravity field modeling (2011–2015);
 Member, Jury *UBC/PIMS Math. Sciences Young Faculty Award*, 2018–2020;
 Alternate Rep., *Consortium Materials Properties Res. Earth Sci.*, since 2008;
 Alternate Rep., *Incorporated Research Institutions for Seismology*, 2006–2013;
 Co-coordinator, *AGU Fall Meeting*, *OSP Awards*, *Seismology*, 2018;
 Co-organizer, *AGU Meeting of the Americas*, *Tectonophysics*, 2009–2010.

Princeton

Doctoral Exam Committees: [21]

Pathikrit Bhattacharya (Seismology, *2016), Susannah Dorfman (Mineral Physics, *2011), Blake Dyer (Geology, *2016), Brian Gertsch (Paleontology, *2010), Jessica Hawthorne (Seismology, *2012), Jon Husson (Geology, *2014), Brenhin Keller (Geochemistry, *2016), Wenjie Lei (Seismology, *2019), Yang Luo (Seismology, *2012), Ryan Modrak (Seismology, *2016), Tarje Nissen-Meyer (Seismology, *2008), Yajun Peng (Seismology, *2018), Yves Plancherel (Oceanography, *2011), Kyle Samperton (Geology, *2017), James Smith (Seismology, *2019), Yue Tian (Seismology, *2010), Makoto Suwa (Geochemistry, *2007), Garrett Tate (Geology, *2014), Enning Wang (Seismology, *2013), Hejun Zhu (Seismology, *2013).

General Exam Committees: [30]

Andrew Babbitt (Biogeochemistry, *2014), Pathikrit Bhattacharya (Seismology, *2016), Susannah Dorfman (Mineral Physics, *2011), Rajkrishna Dutta (Mineral Physics, *2018), Blake Dyer (Geology, *2016), Sirius Han (Mineral Physics, *2022), Jessica Hawthorne (Seismology, *2012), Jon Husson (Geology, *2014), Sarah Johnston (Geology, *2008), Jennifer Kasbohm (Geology, *2019), Kelly Kearney (Oceanography, *2010), Brenhin Keller (Geochemistry, *2016), Leah Langer (Seismology, *2019), Wenjie Lei (Seismology, *2018), Tianyi Li (Seismology, *2017), Yang Luo (Seismology, *2012), Scott MacLennan (Geochemistry, *2019), Ryan Modrak (Seismology, *2016), Yajun Peng (Seismology, *2018), Yves Plancherel (Oceanography, *2010), Joel Simon (Seismology, *2019), James Smith (Seismology, *2018), Garrett Tate (Geology, *2014), Shannon Tronick (Biogeochemistry, *2010), Uno Vaaland (Applied Mathematics, *2020), Philip Vetter (Applied Mathematics, *2010), Enning Wang (Seismology, *2013), Jue Wang (Mineral Physics, *2014), Yanhua Yuan (Seismology, *2016), Lisha Xie (Mineral Physics, *2009), Hejun Zhu (Seismology, *2013).

Other Committees:

Faculty *Steering Committee for Service And Civic Engagement* (2017–2018);
Faculty *Committee on Committees* (2014–2017 & Spring 2020);

Geosciences *Development Committee* (2013–);

Geosciences *Diversity Committee* (2013–);

Geosciences *Departmental Lecture Series* (Co-)Organizer (2007 & 2013–2018);

Geosciences *Harry Hess Fellows Search Committee* (2013);

Geosciences *Graduate Work & Admissions Committee* (2007–2012);

Geosciences *Faculty Search Committees* (2007–2008);

Geosciences *Website Committee* (2007–2008);

PACE Center, *Personal Success vs. Serving The World?* Panelist (2017);

PICSciE, *PIXI17 Visualization Challenge*, Organizer & Panelist (2017);

Andlinger Center & Princeton Environmental Institute, Proposal Panelist (2014);

Andlinger Center, *E-affiliates Advisory Committee* Substitute (2014, 2016);

McGraw Center, *Teaching Data Visualization*, Panelist (2018);

McGraw Center, *New Faculty Orientation*, Panelist (2009);

The Graduate School, *The Evolving Geosciences at Princeton*, Panelist (2012).

College Fellowships:

Wilson College Faculty Fellow, 2011–2019

CLASSES

In the following pages I provide short descriptions of the classes that I have developed and/or taught since joining the Princeton faculty. A complete list was found on page 2 of this document. A general selection of student comments, from the Student Course Guide website, can be found at <http://geoweb.princeton.edu/people/simons/fjsimons-feedback.html>

DATA, MODELS & UNCERTAINTY IN THE NATURAL SCIENCES GEO422
Offered in 2007 [8 enrolled], 2008 [6], 2010 [14], 2012 [25], 2015 [30], 2017 [21], 2019 [XX]
<http://geoweb.princeton.edu/people/simons/GEO422-feedback.html>

For those who want to turn data into models and evaluate their uniqueness and uncertainty. Three main topics are elementary statistics, heuristic time series analysis, and model parameter estimation via matrix inverse methods. While examples will be derived mostly from the physical sciences, students are encouraged to bring their own data sets for classroom discussion and in-depth analysis. Problem sets and MATLAB computer programming exercises form integral parts of the course.

GLOBAL GEOPHYSICS GEO371/PHY371
INTRODUCTORY GEOPHYSICS GEO320/GEO700
Offered in 2008 [6 enrolled], 2009 [8], 2013 [7], 2015 [2], 2017 [17], 2019 [XX]
<http://geoweb.princeton.edu/people/simons/GEO371-feedback.html>

An introduction to the fundamental principles of global geophysics. Four parts, taught over three weeks each in an order allowing the material to build up to form a final coherent picture of (how we know) the structure and evolution of the solid Earth: *Gravity and Magnetism*: description and study of the Earth's magnetic and gravitational fields. *Seismology*: body waves, surface waves and free oscillations. *Geodynamics*: heat flow, cooling of the Earth, mantle convection. The emphasis is on physical principles including the mathematical derivation and solution of the governing equations.

ORIGIN AND EVOLUTION OF THE CONTINENTAL LITHOSPHERE GEO556
Offered in 2012 [4 enrolled]
<http://geoweb.princeton.edu/people/simons/GEO556-feedback.html>

Despite its volumetric insignificance, the continental lithosphere is an immensely important geochemical reservoir, hosts the terrestrial biosphere, and impacts plate tectonics and mantle convection. This course surveys how and why continental lithosphere is formed, preserved, and destroyed throughout Earth history. We tap into datasets collected using structural geology, geochemistry and petrology, radiogenic and stable isotopes, seismology, gravity, and heat flow, all of which are used to inform numerical and theoretical models.

Co-taught with Prof. Blair Schoene.

FUNDAMENTALS OF THE GEOSCIENCES GEO505/506
Offered in 2008 [9 enrolled], 2012 [4], 2013 [9], 2014 [9], 2015 [4+7], 2019 [14]

A survey of fundamental topics in the geosciences. *Co-taught with other Geosciences Faculty.*

RESPONSIBLE CONDUCT OF RESEARCH IN GEOSCIENCES GEO503
Offered in 2019 [15 enrolled] *Co-taught with other Geosciences Faculty.*

CROPS, CULTURE, AND CLIMATE (IN ITALY)

FRS161

Offered in 2019

<http://geoweb.princeton.edu/people/simons/FRS-CCCI.html>

<http://geoweb.princeton.edu/people/simons/FRS-CCCIfeedback.html>

In this Freshman Seminar, you combine satellite remote sensing and geological and geophysical field observations with modeling, interpretation, and reporting, to answer questions on the impact of climate, topography, and geography on agricultural crop production. *How is the energy of Earth and the Sun harnessed in its various forms? What is the impact of agriculture and resource extraction on landscapes and how do climate and topography influence what can be grown, what can be mined, where humans settle? How have civilizations through the ages reconciled opportunity and threat: of fertile volcanoes, powerful rivers, burning forests?* In the classroom, around campus, and in the field abroad, using both instruments and your own senses, you gain practical experience collecting data in geographic context. You analyze these data using statistical techniques such as regression and geospatial analysis, while learning the programming language MATLAB. You write a research paper and typeset it in L^AT_EX. The week-long Fall Break field trip centers around staying at, and studying, a mid-size Italian olive farm, along with exploration of the geological and archaeological environment nearby. The classroom component of this Freshman Seminar will have graded (bi)weekly assignments built around on-campus data collection, data preparation or analysis, and scientific programming. A significant part of your assessment comes from writing assignments that teach you to communicate your scientific results, and culminate in an original research paper and an oral presentation for an audience of peers, Freshman Seminar alumni, and invited guests from the university community.

Co-taught with Prof. Adam Maloof.

STATE OF THE EARTH: SHIFTS AND CYCLES (IN SPAIN)

FRS135/124

Offered in 2015 [13 enrolled], 2017 [14], 2017 [10]

<http://geoweb.princeton.edu/people/simons/FRS-SESC.html>

<http://geoweb.princeton.edu/people/simons/FRS-SESC-feedback.html>

In this Freshman Seminar, you will combine field observations of the natural world with quantitative modeling and interpretation to answer questions like: *How have Earth and human histories been recorded in the geology of Princeton, the Catskills, and Spain, and what experiments can you do to query such archives of the past?* In the classroom, through problem sets, and around campus, you will gain practical experience collecting geological and geophysical data in geographic context, and analyzing these data using statistical techniques such as regression and time series analysis, with the programming language MATLAB. During the required one-day trip to the Catskills and week-long term break trip to France and Spain, you will engage in research projects that focus on the cycles and shifts in Earth's shape, climate, and life that occur now on timescales of days, and have been recorded in rocks over timescales of millions of years. The classroom component of this Freshman Seminar will have graded (bi)weekly assignments built around on-campus data collection, data preparation or analysis, and scientific programming. A significant part of your assessment comes from writing assignments that teach you to communicate your scientific results, and culminate in an original research paper and an oral presentation for an audience of peers, Freshman Seminar alumni, and invited guests from the university community.

Co-taught with Prof. Adam Maloof.

EARTH'S ENVIRONMENTS & ANCIENT CIVILIZATIONS (IN CYPRUS)

FRS171/187

Offered in 2011 [12 enrolled], 2012 [15], 2013 [13]

<http://geoweb.princeton.edu/people/simons/FRS-EEAC.html>

<http://geoweb.princeton.edu/people/simons/FRS-EEAC-feedback.html>

In this Freshman Seminar, you will combine field observations of the natural world with quantitative modeling and interpretation in order to answer questions like: *How does environmental change alter the course of civilization, and how do civilizations modify their environment? How have Earth and human histories been recorded in the geology and archaeology of Cyprus, and what experiments can we do to query such archives of the past?* In the classroom, through problem sets, and on campus excursions, you will gain practical experience collecting geological and geophysical data in geographic context, and analyzing these using software and programming languages like ArcGIS and MATLAB. During the required week-long trip to Cyprus, you will engage in research projects that focus on the interplay between active tectonic landscapes, changing climate, and ancient civilizations, and then turn what you learn into three progressively more elaborate research papers. The classroom component of the seminar will have graded assignments built around data collection, preparation, or analysis, software handling and the beginnings of scientific programming; but, also, expository and research writing which culminates in an original research paper, a poster and a public oral presentation. The field location for this course is appropriate not only for its geoscientific importance but also for the tie-in with the *Department of Art & Archaeology* which has been conducting archaeological excavations in the city of Polis Chrysochous for three decades. This is a *science* class: you should come prepared with an aptitude for, and a willingness to learn the quantitative aspects of scientific inquiry.

Co-taught with Prof. Adam Maloof.

EARTH'S CHANGING SURFACE & CLIMATE (IN CALIFORNIA)

FRS145/149

Offered in 2007 [20 enrolled], 2008 [13], 2009 [15]

<http://geoweb.princeton.edu/people/simons/FRS-ECSC.html>

<http://geoweb.princeton.edu/people/simons/FRS-ECSC-feedback.html>

The surface of Earth today, an amalgamation of mountain ranges, basins, and the hydrosphere, records an integrated history of processes that act on a range of time scales spanning seventeen orders of magnitude. The central question treated in this Freshman Seminar is: *How does Earth's surface evolve in response to internal (e.g., tectonic and magmatic), surficial (e.g., weather, climate, and anthropogenic effects), and external (e.g., extraterrestrial) forcing?* This Freshman Seminar provides you with practical experience making geological and geophysical observations, and in particular, focuses on quantitative analysis of observables such as topography, gravity, and weather. The classroom seminar is complimented by a mandatory week-long field trip to the western United States. During this trip, you will develop research projects that involve geological and geophysical mapping of the interplay between recent volcanic explosion craters, changing climate, and anthropogenic demands on water resources in the Mono Lake region. This seminar is *not* a comprehensive introduction to the geological sciences, but rather a look at a select few processes of import to understand changes to the Earth's surface in space and time. While certain fundamental principles of geology are explained in class and through reading assignments, the emphasis is on how *you* can be a natural scientist with a background of nothing but high school math and physics, a keen observational sense, a knack for spatial and quantitative analysis, and a careful and precise way with words.

Co-taught with Prof. Adam Maloof.

PAPERS

The following is a chronological list of peer-reviewed papers published by major research journals (on papers that appeared since my joining Princeton, asterisks denote Princeton graduate students, circles denote Princeton postdocs, daggers visiting or collaborating graduate students or postdocs, and dollar signs undergraduates; superscripts P for tenured Princeton faculty and T for tenured faculty at other institutions). Links to the journal pages are provided; a direct link to the published papers in PDF form is <http://geoweb.princeton.edu/people/simons/reprints.html>. The Bib_T_E_X archive is at <http://geoweb.princeton.edu/people/simons/fjspubs.html>.

- 2019 Arthur P. Guillaumain and Adam M. Sykulski and Sofia C. Olhede & **F. J. Simons**,
Efficient parameter estimation of sampled random fields,
J. Am. Stat. Assoc., 15+15 pp, *submitted*
- Joel D. Simon, **F. J. Simons** & Guust Nolet,
Multiscale estimation of event arrival times and their uncertainties in hydroacoustic records from autonomous oceanic floats,
B. Seismol. Soc. Am., 43 pp, *submitted*
- Yanhua O. Yuan, Ebru Bozdağ, Caio Ciardelli, Fuchun Gao & **F. J. Simons**,
The exponentiated phase measurement, & objective-function hybridization for adjoint waveform tomography,
Geoph. J. Int., 17 pp, *in revision*
- Eli Galanti, Yohai Kaspi, **F. J. Simons**, Daniele Durante, Marzia Parisi and Scott J. Bolton,
Determining the depth of Jupiter's Great Red Spot with Juno: A Slepian approach,
Astroph. J. Lett., 7 pp, <http://dx.doi.org/10.3847/2041-8213/ab1086>
- Michael Bevis, Christopher Harig, Shfaqat A. Khan, Abel Brown, **F. J. Simons**, Michael Willis, Xavier Fettweis, Michiel R. van den Broeke, Finn Bo Madsen, Eric Kendrick, Dana J. Caccamise II, Tonie van Dam, Per Knudsen & Thomas Nylen,
Accelerating changes in ice mass within Greenland, and the ice sheet's sensitivity to atmospheric forcing,
Proc. Natl. Acad. Sc., 6+22 pp, <http://dx.doi.org/10.1073/pnas.1806562116>
- Guust Nolet, Yann Hello, Suzan van der Lee, Sébastien Bonnieux, Mario Ruiz, Nelson Pazmino, Anne Deschamps, Marc Regnier, Yvonne Font, Yongshun J. Chen & **F. J. Simons**,
Imaging the Galápagos mantle plume with an unconventional application of floating seismometers,
Sci. Rep., 12+6 pp, <http://dx.doi.org/10.1038/s41598-018-36835-w>
- 2018 Alyson K. Beveridge[§], Christopher Harig & **F. J. Simons**,
The changing mass of glaciers on the Tibetan Plateau, 2002–2016, using time-variable gravity from the GRACE satellite mission,
J. Geodetic Sci., 15 pp, <http://dx.doi.org/10.1515/jogs-2018-0010>
- Willi Freeden, Volker Michel & **F. J. Simons**,
Spherical-harmonics based special function systems and constructive approximation methods,
Handbook of Mathematical Geodesy, edited by W. Freeden & M. Z. Nashed,
Springer Verlag, 67 pp, http://dx.doi.org/10.1007/978-3-319-57181-2_12

- 2017 Volker Michel & **F. J. Simons**,
A general approach to regularizing inverse problems with regional data using Slepian wavelets,
Inv. Prob., 28 pp, <http://dx.doi.org/10.1088/1361-6420/aa9909>
- Alain Plattner & **F. J. Simons**,
Internal and external potential-field estimation from regional vector data at varying satellite altitude,
Geoph. J. Int., 32 pp, <http://dx.doi.org/10.1093/gji/ggx244>
- 2016 Yanhua O. Yuan*, **F. J. Simons** & Jeroen Tromp,
Double-difference adjoint seismic tomography,
Geoph. J. Int., 20 pp, <http://dx.doi.org/10.1093/gji/ggw233>
- Christopher Harig^o & **F. J. Simons**,
Ice mass loss in Greenland, the Gulf of Alaska and Canadian Archipelago: Seasonal cycles and decadal trends,
Geoph. Res. Lett., 10 pp, <http://dx.doi.org/10.1002/2016GL067759>
- 2015 Alain Plattner & **F. J. Simons**,
High-resolution local magnetic field models for the Martian South Pole from Mars Global Surveyor data,
J. Geoph. Res., 24 pp, <http://dx.doi.org/10.1002/2015JE004869>
- Yanhua O. Yuan*, **F. J. Simons** & Ebru Bozdağ,
Multiscale adjoint waveform tomography for surface and body waves,
Geophysics, 22 pp, <http://dx.doi.org/10.1190/GEO2014-0461.1>
- Alexey Sukhovich, Sébastien Bonnieux, Yann Hello, Jean-Olivier Irisson, **F. J. Simons** & Guust Nolet,
Seismic monitoring in the oceans using autonomous floats,
Nature Commun., 6 pp, <http://dx.doi.org/10.1038/ncomms9027>
- Lara M. Kalnins, **F. J. Simons**, Jon F. Kirby, Dong V. Wang & Sofia C. Olhede,
On the robustness of estimates of mechanical anisotropy in the continental lithosphere: A North American case study and global reanalysis,
Earth & Planet. Sc. Lett., 9+46 pp, <http://dx.doi.org/10.1016/j.epsl.2015.02.041>
- Christopher Harig^o & **F. J. Simons**,
Accelerated West Antarctic ice mass loss continues to outpace East Antarctic gains,
Earth & Planet. Sc. Lett., 8+7 pp, <http://dx.doi.org/10.1016/j.epsl.2015.01.029>
- Alain Plattner^o & **F. J. Simons**,
Potential-field estimation using scalar and vector Slepian functions at satellite altitude,
Handbook of Geomathematics (2nd edition), edited by W. Freeden, M. Z. Nashed & T. Sonar,
Springer Verlag, 47 pp, http://dx.doi.org/10.1007/978-3-642-54551-1_64
- F. J. Simons** & Alain Plattner^o,
Scalar and vector Slepian functions, spherical signal estimation and spectral analysis,
Handbook of Geomathematics (2nd edition), edited by W. Freeden, M. Z. Nashed & T. Sonar,
Springer Verlag, 46 pp, http://dx.doi.org/10.1007/978-3-642-54551-1_30

- 2014 Yanhua O. Yuan* & **F. J. Simons**,
Multiscale adjoint waveform-difference tomography using wavelets,
Geophysics, 17 pp, <http://dx.doi.org/10.1190/GEO2013-0383.1>
- Alain Plattner^o & **F. J. Simons**,
Spatiospectral concentration of vector fields on a sphere,
Appl. Comput. Harm. Anal., 23 pp, <http://dx.doi.org/10.1016/j.acha.2012.12.001>
- 2013 Alain Plattner^o & **F. J. Simons**,
A spatio-spectral localization approach for analyzing and representing vector-valued functions on spherical surfaces,
Proc. SPIE, Invited Paper, 15 pp, <http://dx.doi.org/10.1117/12.2024703>
- Jean Charléty[†], Sergey Voronin*, G. Nolet^T, Ignace Loris^T, **F. J. Simons**, Karin Sigloch & I. C. Daubechies^T,
Global seismic tomography with sparsity constraints: Comparison with smoothing & damping regularization,
J. Geoph. Res., 13 pp, <http://dx.doi.org/10.1002/jgrb.50326>
- F. J. Simons** & Sofia C. Olhede^T,
Maximum-likelihood estimation of lithospheric flexural rigidity, initial-loading fraction, and load correlation, under isotropy,
Geoph. J. Int., 43 pp, <http://dx.doi.org/10.1093/gji/ggt056>
- R. E. Kopp, **F. J. Simons**, J. X. Mitrovica^T, A. C. Maloof^P & M. Oppenheimer^P,
A probabilistic assessment of sea level variations within the last interglacial stage,
Geoph. J. Int., 6 pp, <http://dx.doi.org/10.1093/gji/ggt029>
- Ciarán D. Beggan, Jarno Saarimäki[†], Kathy Whaler^T & **F. J. Simons**,
Spectral and spatial decomposition of lithospheric magnetic field models using spherical Slepian functions,
Geoph. J. Int., 13 pp, <http://dx.doi.org/10.1093/gji/ggs122>

- 2012 Christopher Harig^o & **F. J. Simons**,
Mapping Greenland's mass loss in space and time,
Proc. Natl. Acad. Sc., 4+9 pp, <http://dx.doi.org/10.1073/pnas.1206785109>
- Kevin W. Lewis^o & **F. J. Simons**,
Local spectral variability and the origin of the Martian crustal magnetic field,
Geoph. Res. Lett., 6+4 pp, <http://dx.doi.org/10.1029/2012GL052708>
- Lei Wang[†], C. K. Shum^T, **F. J. Simons**, Andrés Tassara, Kamil Erkan[†], Christopher Jekeli^T, Alexander Braun, Chungyen Kuo, Hyongki Lee & Dah-Ning Yuan,
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