Chad A. Greene, Ph.D.

NASA / Jet Propulsion Laboratory

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Education

Ph.D. 2017, Geological Sciences, *The University of Texas at Austin*
Thesis: Drivers of change in East Antarctic ice shelves

M.S. 2010, Mechanical Engineering, *The University of Texas at Austin*
Thesis: Low-frequency acoustics of methane hydrates

B.S. 2007, Mechanical Engineering with honors, *Virginia Commonwealth University*

Professional Experience

Dr. Greene is a satellite remote sensing and machine learning specialist in the Sea Level and Ice Group at JPL/Caltech, where he is a member of the PREFIRE and MEaSUREs ITS_LIVE Earth data development teams. He has conducted multiple seasons of airborne geophysical surveys in Antarctica and Greenland, and carried out ship-based science in the Arctic, Gulf of Mexico, and Baltic Sea. Dr. Greene is a prolific coder, creator of many open-source MATLAB packages, and has a passion for thorough documentation. He has served on the MathWorks Community Advisory Board and as editor of the *Proceedings of the National Academy of Sciences*.

Employment History

NASA Jet Propulsion Laboratory Pasadena, CA
Ice Sheet and Glacier Remote Sensing Research Scientist: Jan 2023 to present
Postdoctoral Research Fellow: Feb 2019 to Jan 2023

Institute for Geophysics Austin, TX
Research Engineering/Scientist: Sept 2015 to Feb 2019
Graduate Research & Teaching Assistant: Aug 2011 to Sept 2015

Applied Research Laboratories Austin, TX
Graduate Research Assistant: Jun 2007 to Aug 2011

Virginia Commonwealth University Richmond, VA
Teaching Assistant: Jan. 2007 to May 2007

Federal Reserve Bank Richmond, VA
Currency Systems Engineer Intern: May 2006 to Aug 2006

Peer-Reviewed Publications (Lead Author)

CA Greene & AS Gardner. Seasonal dynamics of Earth's glaciers and ice sheets. *Science*, in revision.

CA Greene, AS Gardner, M Wood, JK Cuzzone. Ubiquitous acceleration in Greenland Ice Sheet calving from 1985 to 2022. *Nature*, 2024.

CA Greene & others. The Tide Model Driver for MATLAB. *Journal of Open Source Software*, 2024.

CA Greene, AS Gardner, NJ Schlegel, AD Fraser. Antarctic calving loss rivals ice-shelf thinning. *Nature,* 2022.

CA Greene, AS Gardner, LC Andrews. Detecting seasonal ice dynamics in satellite images. *The Cryosphere*, 2020.

CA Greene & others. The Climate Data Toolbox for MATLAB. *Geochemistry, Geophysics, Geosystems*, 2019.

CA Greene & K Thirumalai. It's time to shift emphasis away from code sharing. *Eos*, 2019.

CA Greene & others. Seasonal dynamics of Totten Ice Shelf controlled by sea ice buttressing. *The Cryosphere*, 2018.

CA Greene & DD Blankenship. A Method of Repeat Photoclinometry for Detecting Kilometer-Scale Ice Sheet Surface Evolution. *IEEE Transactions on Geoscience and Remote Sensing*, 2018.

CA Greene & others. Wind causes Totten Ice Shelf melt and acceleration. *Science Advances*, 2017.

CA Greene, DE Gwyther, DD Blankenship. Antarctic Mapping Tools for Matlab. *Computers & Geosciences*, 2017.

CA Greene & PS Wilson. Laboratory investigation of a passive acoustic method for measurement of underwater gas seep ebullition. *Journal of the Acoustical Society of America*, 2011.

Peer-Reviewed Publications (Contributing Author)

K Matsuoka,…, **CA Greene**, & others. Towards an improved understanding of the Antarctic coastal zone and its contribution to future global sea level. *Reviews of Geophysics*, submitted.

KD Mankoff, **CA Greene**, & others. Ice sheet mass flows. *Journal of Glaciology*, in review.

AS Gardner, **CA Greene**, & others. ITS_LIVE global glacier velocity data in near real time. *The Cryosphere*, in press.

LA López, AS Gardner, **CA Greene**, & others. ITS_LIVE: A Cloud-Native Approach to Monitoring Glaciers from Space. *Computing in Science & Engineering*, 2024.

B Davison,..., **CA Greene**, & others. Annual mass budget of Antarctic ice shelves from 1997 to 2021. *Science Advances*, 2023.

F Paolo, AS Gardner, **CA Greene**, & others. Widespread slowdown in thinning rates of West Antarctic ice shelves. *The Cryosphere*, 2023.

I Vaňková,..., **CA Greene**, & others. High spatial melt rate variability near the Totten Glacier grounding zone explained by new bathymetry inversion. *Geophysical Research Letters*, 2023.

Y Nakayama, T Hirata, D Goldberg, **CA Greene**. What determines the shape of a Pine-Island-like ice shelf? *Geophysical Research Letters*, 2022.

Y Nakayama, **CA Greene,** & others. Antarctic Slope Current modulates ocean heat intrusions towards Totten Glacier. *Geophysical Research Letters*, 2021.

W Wei,..., **CA Greene**, & others Getz Ice Shelf melt enhanced by freshwater discharge from beneath the West Antarctic Ice Sheet. *The Cryosphere*, 2020.

CF Dow, WS Lee, JS Greenbaum, **CA Greene**, & others. Basal channels drive active surface hydrology and transverse ice-shelf fracture. *Science Advances*, 2018.

KM Thyng, **CA Greene**, & others. True colors of oceanography: Guidelines for effective and accurate colormap selection. *Oceanography*, 2016.

CJ Wilson, PS Wilson, **CA Greene**, KH Dunton. Seagrass meadows provide an acoustic refuge for estuarine fish. *Marine Ecology Progress Series*, 2013.

CJ Wilson, PS Wilson, **CA Greene**, KH Dunton. Seagrass leaves in 3-D: Using computed tomography and low-frequency acoustics to investigate the material properties of seagrass tissue. *Journal of Experimental Marine Biology and Ecology*, 2010.

Non-Peer-Reviewed Publications

CA Greene & AS Gardner. Greenland's glaciers are retreating everywhere and all at once. *Nature*, 2024.

AD Fraser & **CA Greene**. Ice shelves hold back Antarctica's glaciers from adding to sea levels – but they're crumbling. *The Conversation*, 2022.

Datasets

DA Young,..., **CA Greene**, & others. Geophysical Investigations of Marie Byrd Land Lithospheric Evolution (GIMBLE) Airborne VHF Radar Transects: 2012/2013 and 2014/2015. *Texas Data Repository*, 2024.

CA Greene, AS Gardner, M Wood, & JK Cuzzone. MEaSUREs ITS_LIVE Greenland Monthly 120 m Ice Sheet Extent Masks, 1972-2022, Version 1. *National Snow and Ice Data Center*, 2024.

SL Howard, **CA Greene**, & others. CATS2008_v2023: Circum-Antarctic Tidal Simulation 2008, version 2023. *U.S. Antarctic Program (USAP) Data Center*, 2024.

FS Paolo, AS Gardner, **CA Greene**, & NJ Schlegel. MEaSUREs ITS_LIVE Antarctic Quarterly 1920 m Ice Shelf Height Change and Basal Melt Rates, 1992-2017, Version 1. *National Snow and Ice Data Center*, 2023.

CA Greene, AS Gardner, NJ Schlegel, & AD Fraser. MEaSUREs ITS_LIVE Antarctic Annual 240 m Ice Sheet Extent Masks, 1997-2021, Version 1. *National Snow and Ice Data Center*, 2022.

Awards, Accreditations, & Accomplishments

NASA JPL Voyager Award 2024, 2025

NASA Postdoctoral Program Fellowship 2019–2023

MathWorks (MATLAB) Community Advisory Board 2016–2022

National Science Foundation Early Career Scientist Award June 2018

NASA Young Investigator Award July 2016

Univ. of Texas Institute for Geophysics Outstanding Graduate Student Award May 2016

MathWorks Award for Outstanding Contributions 2015

MATLAB File Exchange Pick-of-the-Week July 2012, July 2013, July 2014

United States Congressional Antarctic Service Medal 2013

Univ. of Texas College of Engineering Fellowship 2007–2008

NCEES Fundamentals of Engineering Exam passed 2007

Wright Merit Scholarship 2002–2007

Virginia Commonwealth University Dean's List 2003–2005

Virginia Commonwealth University Honors Program 2002–2005

Bicycled self-supported over 4200 miles from Oregon to North Carolina 2005

Eagle Scout 2002

Virginia State Certified Emergency Medical Technician 2002

Field Work

Pituffik Space Base Pituffik (Thule), Greenland
Airborne surveys: Apr to May 2024

Casey Station Wilkes Land, Antarctica
Airborne surveys: Dec 2017 to Feb 2018

Byrd Field Camp Marie Byrd Land, Antarctica
Airborne surveys: Dec 2012 to Feb 2013

Gulf of Mexico Port Aransas, TX
Marine habitat acoustic study: 2009 to 2011

Eckernförde Bay Kiel, Germany
Sediment acoustics survey: Jun 2010 to Jul 2020

Beaufort Sea Arctic Ocean
USCG Polar Sea expedition Sep to Oct 2009

In the News

Wall Street Journal 2025: The U.S. Nuclear Base Hidden Under Greenland's Ice for Decades.
Newsweek 2024: NASA Image Reveals Lost US Military Base—'City Under the Ice'.
Popular Science 2024: NASA radar picks up frozen, buried Cold War base Camp Century.
Smithsonian Magazine 2024: NASA Radar Detects Abandoned Site of Secret Cold War Project in Greenland.
National Geographic 2024: The U.S. built a covert Cold War base under a Greenland glacier.
The New Yorker 2024 (background consultation): When the Arctic Melts.
FactCheck.org 2024: Antarctic Ice Loss Is Significant, Contrary to Claims.
New York Times 2024: How much ice is Greenland losing? Researchers found an answer.
The Atlantic 2024: A counterintuitive effect of global warming.
Rolling Stone 2024: Greenland's glaciers are melting way faster than we thought.
Washington Post 2024: Greenland is losing more ice than we thought. Here's what it means for our oceans.
The Guardian 2024: Greenland losing 30m tonnes of ice an hour, study reveals.
Arizona Daily Star 2024: Tucson scientist records album while recording decline of Greenland glaciers.
Smithsonian Magazine 2023: The World's Largest Iceberg Is Drifting Three Miles Into the Ocean Each Day
New Scientist 2023: Where is the iceberg that broke off Antarctica and is it a threat?
CNN 2022: World's largest ice sheet crumbling faster than previously thought, satellite imagery shows.
Time 2022: NASA Satellites Paint Grim Picture For The Future of Antarctica's Ice Shelves.
Forbes 2022: Antarctica's Coastal Glaciers Crumbling At Faster Rate Than Previously Believed.
Washington Post 2022: Climate change's impact intensifies as U.S. prepares to take action.
Washington Post 2022: Foreboding new studies show the climate battle is not over.
Scientific American 2018: Why Are Glaciers Melting from the Bottom? It's Complicated.
Scientific American 2017: How Wind Might Nudge a Sleeping Giant in Antarctica.
Wired 2017: For Scientists Predicting Sea Level Rise, Wind is the Biggest Unknown.

Research Presentations

CA Greene & others. ITS_LIVE Version 2: Cloud-based data for modern glaciology. *Fall meeting of the American Geophysical Union*. Washington DC, USA, Dec 2024.

CA Greene. Remote Sensing of Glaciers and Ice Sheets. *Measuring and Modelling Mountain glaciers and ice caps in a Changing ClimAte (M3OCCA).* Kinding, Germany, Oct, 2024.

CA Greene. Methods and limitations of measuring ice sheet mass balance. *Joint Commission on Ice-Ocean Interactions (JCIOI)*. Copenhagen, Denmark, Sep 2024.

CA Greene & others. ITS_LIVE Version 2: A new generation of glacier observations. *Scientific Committee on Antarctic Research Open Science Conference*. Pucón, Chile. Aug 2024.

CA Greene. NASA in Greenland: 2024 UAVSAR Campaign. *Pituffik Space Base Science Forum*, Pituffik (formerly Thule), Greenland, Apr 2024.

CA Greene & AS Gardner. Freshwater anomalies from calving of the Greenland and Antarctic ice sheets. *Anomalous Freshwater Forcing for Climate Models Workshop*, Feb 2024. [invited]

CA Greene & others. Calving of the Greenland Ice Sheet since 1985. *Fall meeting of the American Geophysical Union*. San Francisco, USA, Dec 2023.

AS Gardner, R Hugonnet **CA Greene**, & others. Global Glacier Mass Change from Satellite Laser Altimetry. *Fall meeting of the American Geophysical Union*. San Francisco, USA, Dec 2023.

CA Greene & others. Calving of the Greenland Ice Sheet since 1985. *International Union of Geodesy and Geophysics General Assembly*. Berlin, Germany, July 2023. [invited]

CA Greene & others. Firn model performance assessment with ICESat-2. *ICESat-2 Science Symposium*. Austin, TX, Oct 2022.

CA Greene & others. Airborne opportunities in Antarctica. *First International Workshop on Antarctic RINGS*, Tromsø, Norway, July 2022.

CA Greene & others. Coastal retreat doubles previous estimates of Antarctic ice shelf loss. *European Geophysical Union General Assembly*. Vienna, Austria, May 2022.

CA Greene & others. Antarctica's grounded-ice response to observed calving. *Fall meeting of the American Geophysical Union*. New Orleans, LA, Dec 2021.

AS Gardner,…, **CA Greene**, & others. Surface topography observations needed to advance cryospheric science in the coming decades. *Fall meeting of the American Geophysical Union*. New Orleans, LA, Dec 2021.

AS Gardner,…, **CA Greene**, & others. The NASA MEaSUREs ITS_LIVE project: Accelerating glacier science through satellite data synthesis. *Fall meeting of the American Geophysical Union*. New Orleans, LA, Dec 2021.

W Wei, …, **CA Greene**, & others. A new bathymetry surrounding and beneath the West Ice Shelf in East Antarctica. *Fall meeting of the American Geophysical Union*. New Orleans, LA, Dec 2021.

Y Nakayama, **CA Greene**, & others. Antarctic slope current controls warm ocean intrusions towards Totten Glacier. *European Geophysical Union General Assembly*. April 2021.

Y Nakayama, **CA Greene**, & others. The development of East Antarctic ocean simulation with a focus on the Totten Glacier. *Fall meeting of the American Geophysical Union*. Dec 2020.

CA Greene. Insights from satellite velocity maps. *Oates Land Workshop*. Hobart, Australia, Jan 2020.

CA Greene & AS Gardner. Satellite observations of Antarctic ice velocity variability. *Fall meeting of the American Geophysical Union*. San Francisco, USA, Dec 2019.

F Ferraccioli,…, & **CA Greene**. Antarctic geothermal heat flux: past, present, and future perspectives. *Fall meeting of the American Geophysical Union*. San Francisco, USA, Dec 2019.

CA Greene, AS Gardner, FS Paolo, & MP Schodlok. Satellite observations of Antarctic ice velocity variability. *Forum for Research into Ice Shelf Processes*. Oxford, UK, Sep 2019.

CA Greene. Potential sea level contributions from Antarctica's Aurora Subglacial Basin. *Sea Level Summer School*. Delft, Netherlands, July, 2019.

CA Greene & DD Blankenship. Surface features of Totten Ice Shelf from satellite images and laser altimetry. *Forum for Research into Ice Shelf Processes*. Aussois, France, Sep 2018.

CA Greene & others. Seasonal Control on Totten Ice Shelf Dynamics by Sea Ice Buttressing. *POLAR2018 SCAR Meetings and Open Science Conference.* Davos, Switzerland, Jun 2018.

CF Dow,…, **CA Greene**, & others. The role of basal channels in ice shelf calving. *Fall meeting of the American Geophysical Union*. Dec 2017.

CA Greene & others. Upwelling drives melt and acceleration of Totten Ice Shelf. *Forum for Research into Ice Shelf Processes.* Bergen, Norway, Jun 2017.

CA Greene. Low-Quality Satellite Images Reveal Dynamic Ice Shelf Processes. *University of Texas Institute for Geophysics Seminar Series*. Austin TX, Mar 2017.

DA Young,…, **CA Greene**, & others. High-resolution subglacial hydrology of a potential old ice target near Dome C, Antarctica. *XXXIV SCAR Meetings and Open Science Conference*. Aug 2016.

CA Greene & others. Spatiotemporal patterns of surface elevation change for Totten Glacier ice shelf. *IGS International Symposium on Interactions of Ice Sheets and Glaciers with the Ocean.* La Jolla, CA, Jul 2016.

GR Muldoon, **CA Greene**, & K Thirumalai. Data visualization tips and tricks. *University of Texas Institute for Geophysics Seminar Series*. Austin, TX, Feb. 2016.

CA Greene. Antarctic Mapping Tools for MATLAB. *University of Texas Institute for Geophysics Seminar Series.* Austin, TX, Sep 2014.

CA Greene, AK Bliss, & DD Blankenship. A Bedmap2 Toolbox for MATLAB. *Fall Meeting of the American Geophysical Union*. San Francisco, CA, Dec 2013.

CS Jackson,…, **CA Greene**, & others. Representation of Thwaites Glacier Bed Uncertainty for Modeling Experiments. *Fall Meeting of the American Geophysical Union*. San Francisco, TX, Dec 2013.

DA Young, DD Blankenship, SD Kempf, & **CA Greene**. How well can we determine ice thickness? Examples from Thwaites Glacier. *International Symposium on Radioglaciology: A Meeting of the International Glaciological Society*. Sept 2013.

CA Greene. Bubbles and acoustics: An introduction to physical concepts in underwater sound. *University of Texas Institute for Geophysics Seminar Series*. Austin, TX, Mar 2013.

C.S. Jackson, **CA Greene**, & others. Ice bed geometry: Estimates of known unknowns. *Proceedings of the Society for Industrial and Applied Mathematics Conference on Uncertainty Quantification*. 120 2012.

CA Greene & others. Acoustic determination of methane hydrate dissociation pressures. 7th International Conference on Gas Hydrates Edinburgh, Scotland, 2011.

CA Greene & others. Laboratory measurements on gas hydrates and bubbly liquids using active and passive low-frequency acoustic techniques. *Meeting of the Acoustical Society of America*. Seattle, WA, May 2011. [invited]

CA Greene. Low-frequency acoustic techniques for detection of gas hydrates, gassy sediments, and methane seeps. *Leibniz Institute of Marine Sciences at the University of Kiel IFM-GEOMAR*. Kiel, Germany, Jun 2010. [invited]

CA Greene. The didgeridoo—an ancient acoustic resonator. *Meeting of the Acoustical Society of America*. Baltimore, MD, Apr 2010. [invited]

CA Greene & PS Wilson. Toward passive acoustic remote sensing of ocean-bottom gas seeps. *Meeting of the Acoustical Society of America*. Baltimore, MD, Apr 2010.

CA Greene. Low-Frequency Acoustics of Methane Hydrates. *The University of Texas at Austin, Department of Mechanical Engineering. Seminars in Acoustics*, Austin, TX, Apr 2010. [invited]

CA Greene, PS Wilson, & RB Coffin. Measurements of the Acoustic Properties of Methane Hydrates. *Methane in the Arctic Shelf: American Geophysical Union Post-Cruise Workshop*, San Francisco, CA, Dec 2009. [invited]

PS Wilson, TF Argo IV, & **CA Greene**. A demonstration of acoustic damping using bubbly liquid for Project Listen Up. *Meeting of the Acoustical Society of America* San Antonio, Nov 2009. [invited]

CA Greene & PS Wilson. Measurements of sound speed in bubbly liquids under high-pressure conditions. *Meeting of the Acoustical Society of America.* San Antonio, Nov 2009.

.**CA Greene**. An Introduction to Sediment Acoustics. *Methane in the Arctic Shelf Expedition Scientists' Meeting*, USCG Polar Sea, Beaufort Sea, Sep 2009. [invited]

TF Argo IV, **CA Greene**, & PS Wilson. A simple experiment for understanding resonant air columns. *Meeting of the Acoustical Society of America.* Portland, OR, May 2009.

CA Greene & others. A Helmholtz resonator experiment for the Listen Up project. *Meeting of the Acoustical Society of America.* Miami, FL, Nov 2008.

MJ Isakson, **CA Greene**, & others. Finite element modeling of range-dependent acoustic wave propagation in shallow water. Office of Naval Research Reverberation Workshop II. Austin, TX, May 2008.