WILLIAM H. ARMSTRONG

https://instaar.colorado.edu/people/william-armstrong/
4001 Discovery Drive, Room N202 ◇ Boulder, Colorado 80303
(781) 910-3552 ◇ william.armstrong@colorado.edu

RESEARCH INTERESTS

- Numerical modeling of glaciers and land surface processes
- Large-scale remote sensing approaches to constrain glacier dynamics and earth system change
- Glacier dynamics; patterns of glacier velocity change and underlying physics
- "Big data" analysis; making meaningful observations about natural and human systems from the existing wealth of satellite imagery and social media data
- Development and employment of free and open-source geospatial data analysis packages
- Alpine landscape evolution; links between glacier erosion and glacier dynamics

EDUCATION

University of Colorado at Boulder, Doctor of Philosophy 2012-2017
Department of Geological Sciences (expected)
Institute of Arctic and Alpine Research
Advisor: Dr. Robert S. Anderson
Thesis: *Glacier velocity variability from multiscale remote sensing, geodesy, and numerical modeling*
Advisor: Dr. Robert S. Anderson

Boston College, Bachelor of Science 2006-2010
Department of Geology
Thesis: *Hydroclimatic flood trends in New England*
Major: Environmental Geoscience; Minor: Environmental Studies
Advisor: Dr. Noah P. Snyder

PUBLICATIONS

Published in peer-reviewed journals

Armstrong, W.H., R.S. Anderson, J. Allen, and H. Rajaram, 2016. Modelling the WorldView-derived seasonal velocity evolution of Kennicott Glacier, Alaska. *Journal of Glaciology*, doi: 10.1017/jog.2016.66

Armstrong, W.H., M.J. Collins, and N.P. Snyder, 2014. Hydroclimatic flood trends in the northeastern United States and linkages with large-scale atmospheric circulation patterns. *Hydrological Sciences Journal*, 59(9):1636-1655. doi: 10.1080/02626667.2013.862339

Armstrong, W.H., M.J. Collins, and N.P. Snyder, 2012. Increased frequency of low-magnitude floods in New England. *Journal of the American Water Resources Association*, 48(2):306-320. doi: 10.1111/j.1752-1688.2011.00613.x

In preparation

Armstrong, W.H., R.S. Anderson, and M.A. Fahnestock, in prep.. Topographic control on glacier speedup revealed from repeat image feature tracking. Prepared for Feb 2017 submission to *Geophysical Research Letters*.

Armstrong, W.H., and R.S. Anderson, in prep.. Links between subglacial hydrology and sliding during a spring speedup event. Prepared for Apr 2017 submission to *The Cryosphere*.

TECHNICAL SKILLS AND RELEVANT COURSEWORK

Data processing	DEM and orthoimage generation, image processing, workflow automation, differential GPS, radar processing
Geospatial software	QGIS, ENVI, GDAL, Ames Stereo Pipeline, ArcGIS
Scripting languages	Python, Matlab, bash, R
Field campaigns	GPS, hydrometerology, time lapse photography
Relevant coursework	Advanced remote sensing, numerical methods, glacier mechanics GPS theory, fluid mechanics and modeling, geomechanics

RESEARCH EXPERIENCE

Patterns of glacier basal motion across south-central Alaska Fall 2015 - Present
Research Assistant with Robert Anderson *University of Colorado at Boulder*

· Automating satellite image cross-correlation processing and data analysis to ingest large amounts of remotely-sensed data.
· Find topographic control in limiting extent of glacier seasonal speedup. Manuscript in preparation for submission to *Geophysical Research Letters*.

Hydrology and basal sliding on Kennicott Glacier, Alaska Spring 2012 - Present
Research Assistant with Robert Anderson *University of Colorado at Boulder*

· Investigated surface expression of glacier basal motion and links to subglacial hydrology.
· Worked extensively with cross-correlation of WorldView satellite imagery, all the way from unprocessed images to derivative products of velocity maps.
· Led three field seasons monitoring glacier motion and glacier hydrology using GPS and distributed hydrometeorologic instrumentation.
· Published findings in *Journal of Glaciolgy*.

Northeast U.S. Flood Hydroclimatology August 2009 - January 2012
Research Assistant with Mathias Collins and Noah Snyder *NOAA NMFS, Gloucester, MA*

· Led studies on trends in flood magnitude and frequency in the northeastern United States and teleconnections between the observed trends and large-scale upper atmospheric circulation patterns, such as the North Atlantic Oscillation. Findings published in *Hydrological Sciences Journal* and the *Journal of the American Water Resources Association*.

Long-term floodplain geomorphic evolution June - December 2010
Guest Scientist with David Shelley *Congaree National Park*

· Coordinated and led field expeditions to collect sediment samples using a hand auger and a peat sampler. Processed recovered organic matter for radiocarbon data.
· Analyzed remote sensing and radiocarbon data to constrain long-term river migration and sediment deposition rates.

TEACHING EXPERIENCE

Juneau Icefield Research Program August 2016
Guest Faculty *Foundation for Glacier and Environmental Research*

· Field-based teaching on glacier mechanics and glacier geomorphology for undergraduates.
· Led discussions and exercises. Worked one-on-one and in small groups on student-led research projects.

Department of Geological Sciences August 2012 - present
Teaching Assistant/Lab Instructor *University of Colorado*

· Developed and administered entirely new curriculum for Fluid Mechanics in Earth Science lab. Labs employed hands-on demonstrations, programming exercises, and local field-based experiential learning.

- Worked in small classes with students to enhance knowledge of earth system science.
- Fostered widely-applicable skills in students, such as problem-solving, dimensional analysis, and programming.
- Classes taught: *(1)* Fluid mechanics in Earth Science for upper-level undergraduates; *(2-3)* Geomorphology for upper-level undergraduates (two years); *(4)* Introduction to Surface Processes for sophomores, and; *(5)* Introductory Geology for freshmen.
- Learned from advisor Bob Anderson, who won University's Hazel Barnes prize for excellence in teaching and research.

EMPLOYMENT HISTORY

Department of Geological Sciences August 2012 - present
Research and Teaching Assistant *University of Colorado*

- Collected and analyzed remote sensing, numerical modeling, and field data to investigate glacier dynamics. Published findings in peer-reviewed journals.
- Developed course material and independently taught 5 laboratory courses.

National Oceanic and Atmospheric Administration February 2011 - January 2012
Research Assistant *Gloucester, MA*

- Analyzed hydrologic time series to study long-term hydroclimatic trends in flood frequency and magnitude in the northeastern United States. Published findings in peer-reviewed journals.

Congaree National Park June 2010 - December 2010
Guest Scientist *Hopkins, SC*

- Collected and processed organic samples for radiocarbon dating to constrain long term river meander and floodplain sediment accumulation rates.

Department of Geology June 2008 - May 2010
Research Assistant *Boston College*

- Assisted in research investigated river response to dam removal and impacts of glaciation in Noah Snyder's fluvial geomorphology research group.

U.S. Department of Justice: Environment and Natural Resources April 2008 - April 2009
Paralegal/Office Assistant *Newton, MA*

- Worked extensively with CERCLA and RCRA litigation, occasionally performing legal research.
- Performed legal work such as summarizing depositions, creating exhibits for use in trial, editing memoranda, and coordinating with a legal team in Washington, D.C.

AWARDS

Awards received

- **CU Boulder Department of Geosciences**, Travel grant 2016
- **Geographical Information Systems (GIS) Colorado**, Scholarship 2015
- **Shell Research Award**, Graduate Student Research Grant 2015
- **Best Education Research Poster**, CU Graduate Teacher Program 2015
- **Best Should Teach**, Pedagogy Award 2014

INVITED TALKS

- **University of Minnesota**, Earth Sciences Department Apr 2017
- **Purdue University**, Dept. of Earth, Atmospheric, and Planetary Sciences (*declined*) Nov 2016

SELECT PRESENTATIONS

Armstrong, W.H., R.S. Anderson, M.A. Fahnestock, and A. Pope. Patterns of glacier basal motion across south-central Alaska from cross-correlation of Landsat imagery. American Geophysical Union, San Francisco, CA, December 2016.

Armstrong, W.H., R.S. Anderson, J. Allen, and H. Rajaram. Sliding from space: observing and modeling glacier speedup. Northwest Glaciologists Meeting, Portland, OR, October 2015.

Armstrong, W.H. Seasonal cycle and spatial distribution of basal sliding quantified from correlation of high-resolution optical satellite imagery. Lamont-Doherty Subglacial Hydrology Workshop, Palisades, NY, October 2014.

Armstrong, W.H., L.S. Anderson, R.S. Anderson, E.C. Pettit. Comparison of glacier surface velocity fields extracted from high-resolution satellite imagery with GPS-derived point velocities on the Kennicott Glacier, Wrangell Mountains, Alaska. Geological Society of America, Denver, CO, October 2013.

Armstrong, W.H., R.S. Anderson, H. Rajaram. Velocity and hydrology of the Kennicott Glacier, near McCarthy, Alaska, USA. Canadian Quatenary Association, Edmonton, AB, Canada, August 2013.

Shelley, D.C., D. Dvoracek, **W.H. Armstrong**, J.C. Howard. New Radiocarbon data on feature ages, river migration rates, and floodplain sedimentation in Congaree National Park. Geological Society of America, Charlotte, NC, October 2012.

Armstrong, W.H., M.J. Collins, N.P. Snyder. Trends in New England flood magnitude and frequency revealed by partial duration flood series analyses of long gauge records. Northeast Fish and Wildlife Conference, Newton, MA, April 2010.

OUTREACH, VOLUNTEER WORK, AND COMMUNITY ENGAGEMENT

Juneau Icefield Research Program August 2016

· Provided glaciology instruction for undergraduates and advanced high school students.

Graduate Teacher Program August 2014 - May 2015

· Served as Lead Graduate Teacher for the Department of Geological Sciences. Videotaped and consulted one-on-one with other graduate students to improve teaching ability. Developed departmental pedagogy workshop. Promoted and attended University-sponsored teaching workshops.

INSTAAR Graduate Speaker Series Fall 2013 - present

· Solicited speakers and organized Institute lecture series for Institute of Arctic and Alpine Research.

INSTAAR directorate 2014 - present

· Represented students for INSTAAR's directorate. Developed appreciation for university administration.

Science Fairs and Poster Sessions 2013 - present

· Judged elementary school science fair projects and undergraduate poster presentations. This serves an important role in encouraging interest in science and scientific research.

PROFESSIONAL SOCIETY MEMBERSHIPS

International Glaciological Society 2016 – present
American Geophysical Union 2011 – present
Geological Society of America 2009 – present