

# Sam Herreid [B.Sc. Ph.D.]

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## Professional biography

I am a geophysicist and software developer with expertise in SAR radar, thermal infrared data acquisition and processing, and global scale problems. Currently, I am serving under Prof. Dr. Eric Rignot as a member of the NASA/JPL science team to fine tune data from NISAR, the \$1.5B SAR that was launched in July 2025. I also work with CSDA, a NASA program that finances the use of private satellite vendors to augment the NASA and USGS archives. I work directly with ICEYE, a private SAR satellite constellation who also has US military contracts. I have tasked ICEYE collect and wrote a stable software package to detect centimeter scale changes of the Antarctic ice sheet.

## Education

**2015-2019 | Ph.D. Glaciology**, Northumbria University

Thesis: Supraglacial debris cover: global distribution, evolution and regional-scale effect on melt  
Supervised by Dr. Francesca Pellicciotti. Examined by Dr. Duncan Quincy and Dr. Matt Westoby.

**2007-2014 | B.Sc. Geology**, University of Alaska Fairbanks

## Employment

**May 2024 – present | Postdoc** Rignot Research Group, University of California Irvine

- Work on the NISAR science team to help NASA/JPL with cal/val and product improvements before public release
- Developed a Python based workflow to use SAR phase data to produce monthly and annual velocity maps for Antarctica and measure tidal fluctuations of ice sheet flexure zones
- Gained expertise using public SAR data (e.g. Sentinel-1, NISAR) as well as coordinating data collection and using commercial SAR constellations (e.g. ICEYE)
- Work on AI and other automated techniques to map grounding lines in Antarctica
- Actively developing an ice flow algorithm that predicts glacier flowlines with only geometry as input making it an effective tool for long past, distant future and extraterrestrial systems

**May 2023 – May 2024 | Postdoc** Byrd Polar and Climate Research Center, Ohio State University

- Develop a deep learning object detection model to predict potential sites of subsurface geologic hydrogen reservoirs at a global scale.
- Develop a parallelized deep learning post processing pipeline.
- DEM analysis of deep learning inference results compared to a very sparse set of known geologic hydrogen associated features.
- Develop problem specific statistical measures of performance functional at a global scale.

## January – July 2019 | Research Assistant, WSL Birmensdorf, Switzerland

- Prepared a global scale analysis of supraglacial debris cover for publication.
- Lead author of a proposal to use changes in sparse debris cover located in the Arctic as a climate change proxy (unsuccessful).
- Contributing author of a proposal to use surface debris to reconstruct past erosion rates.

## 2009 -2014 | Undergraduate Research Assistant / Researcher, University of Alaska Fairbanks

- Manual glacier digitization for GLIMS and the Randolph Glacier Inventory.
- Secured \$59,000USD from 7 successful student proposals submitted to undergraduate and university wide funding programs. With this funding I established a research program on Alaskan debris-covered glaciers, a topic that was not being investigated by any other scientist at UAF.

## Technical skills

- Gamma Remote Sensing InSAR processing tools
- Python, Linux, LaTeX (example code available at: <https://github.com/samherreid>)
- Collecting, processing and interpreting high resolution thermal data from both airborne and ground-based platforms
- Continental scale processing (Antarctica), global scale processing (all mountain glaciers)
- Field-based mass balance and meteorological measurements
- Time-lapse camera deployment and image processing
- Topographic and geophysical surveying: dGPS, GPR
- Able communicator with a strong interest in delivering engaging talks to scientific and public audiences

## External Funding

2019: Using Greenland to fill a wide gap in our understanding of (early) debris cover evolution.  
WSL Birmensdorf, Switzerland internal funding, 60,000CHF (unsuccessful)  
Ghost written for submission by PI Francesca Pellicciotti

2018: Glacial debris: Genesis, transport, and effects on glacier melt and motion.  
NSF/NERC, \$381,000USD (unsuccessful)  
Ghost written for submission by PIs Martin Truffer and Francesca Pellicciotti

2013: Developing a multi-method approach to improve regional-scale glacier melt estimates by considering debris cover.  
UAF internal competitive student research grant, \$5,000USD (successful)

2012: Thermal camera for student use.  
UAF internal competitive student, staff or faculty technology funding, \$23,000USD (successful)

2011: Differential melt of debris-covered glaciers in the Alaska Range.  
UAF internal competitive student research grant, \$2,500USD (successful)

2010: Effects of debris cover on glaciers in Alaska.  
UAF internal competitive student research grant with a competitive second year continuation, \$20,000USD (both successful)

2009: Glacier mass change in the Western Chugach Mountains from GRACE mascon solutions and aircraft laser altimetry.  
NASA Space Grant Fellowship, \$6,000USD (successful)

2009: The 2000-01 surge of Yanert Glacier, Central Alaska Range.  
UAF internal competitive student research grant, \$2,500USD (successful)

## Field Campaigns

I have designed and led 20+ field campaigns of up to several weeks in remote locations throughout the Alaska Range. During these trips, many field assistants worked for me ranging from full professors to non-scientists with no outdoor experience. I designed and built most of my field infrastructure from raw materials (e.g. weather stations) and became proficient at coordinating and leading difficult and remote field logistics with bicycles, packrafts, mountain running, small fixed wing aircraft and helicopters.

I have also worked in the field as an assistant to others researchers including comprehensive glaciological efforts on Yakutat and Yahtse glaciers in South East Alaska, hydrological measurements of the Jarvis Glacier watershed in interior Alaska, structural geology in the Alaska Range, geologic sampling to derive a geochronological uplift history of the Alaska Range and direct dGPS measurements of isostatic rebound of deglaciated South East Alaska.

## Teaching experience

- Co-advised an Undergraduate at UCI who became co-author on a recent publication in PNAS
- Supportive student supervision at WSL Birmensdorf, Switzerland
- Undergraduate computer programming assistance at Northumbria University, UK
- Guest high school science lecturer in Fairbanks, Alaska
- Developed a sub-debris ablation laboratory experiment with applied thermal imaging

## Publications

Rignot, E., Scheuchl, B., Barre, J.B., Brancato, V., Charrier, L., Chen, H., Ciraci, E., Dinh, A., **Herreid, S.**, Jeong, S. and Li, X., (2026) Thirty years of glacier grounding line retreat in Antarctica. *Proceedings of the National Academy of Sciences*.

Benowitz, J., Cooke, M., Terhune, P., **Herreid, S.**, Bemis, S., Toeneboehn, K., Waldien, T. and O'Sullivan, P. (2021) Why is Denali (6,194 m) so big? Caught inside the tectonic wake of a migrating restraining bend. *Terra Nova*.

**Herreid, S.** (2021) What can thermal imagery tell us about glacier melt below rock debris? *Frontiers in Earth Science*.

Ershova, E. and **Herreid, S.** (2021) "Losing the Arctic", a book chapter in *Whither the Arctic Ocean. Research, Knowledge Needs and Development en route towards the New Arctic*. Editor: Paul Wassmann. BBVA Foundation.

Kneib, M., Miles, E., Jola, S., Buri, P., **Herreid, S.**, Bhattacharya, A., Watson, S., Bolch, T., Quincey, D. and Pellicciotti, F. (2021) Mapping ice cliffs on debris-covered glaciers using multispectral satellite images. *Remote Sensing of Environment*.

**Herreid, S.** and Pellicciotti, F. (2020) The state of rock debris covering Earth's glaciers. *Nature Geoscience*.

**Herreid, S.** and Pellicciotti, F. (2018) Automated detection of ice cliffs within supraglacial debris cover. *The Cryosphere*, 12, 1811-1829.

**Herreid, S.** and Truffer, M. (2016) Automated detection of unstable glacier flow and a spectrum of speedup behavior in the Alaska Range. *Journal of Geophysical Research: Earth Surface*, 121(1), 64-81.

**Herreid, S.**, Pellicciotti, F., Ayala, A., Chesnokova, A., Kienholz, C., Shea, J. and Shrestha, A. (2015) Satellite observations show no net change in the percentage of supraglacial debris-covered area in northern Pakistan from 1977 to 2014. *Journal of Glaciology* 61(227), 524-536.

Pellicciotti, F., Stephan, C., Miles, E., **Herreid, S.**, Immerzeel, W., and Bolch, T. (2015) Mass-balance changes of the debris-covered glaciers in the Langtang Himal, Nepal, from 1974 to 1999. *Journal of Glaciology* 61(226), 373-386.

Kienholz, C., **Herreid, S.**, Rich, J.L., Arendt, A.A., Hock, R. and Burgess, E.W. (2015) Derivation and analysis of a complete modern-date glacier inventory for Alaska and northwest Canada. *Journal of Glaciology*, 61(227), 403-420.

Pfeffer, W.T., Arendt, A.A., Bliss, A., Bolch, T., Cogley, J.G., Gardner, A.S., Hagen, J.O., Hock, R., Kaser, G., Kienholz, C. and Miles, E.S., ... **Herreid, S.** ... (2014) The Randolph Glacier Inventory: a globally complete inventory of glaciers. *Journal of Glaciology*, 60(221), 537-552.

McNabb, R.W., Hock, R., O'Neel, S., Rasmussen, L.A., Ahn, Y., Braun, M., Conway, H., **Herreid, S.**, Joughin, I., Pfeffer, W.T. and Smith, B.E. (2012) Using surface velocities to calculate ice thickness and bed topography: a case study at Columbia Glacier, Alaska, USA. *Journal of Glaciology*, 58(212), 1151-1164.

Burrows, R., **Herreid S.**, Adema G., Arendt A.A. and Larsen C.F. (2011) Glacier trends and response to climate in Denali National Park and Preserve, *Park Science (Government internal peer-review)*.

### Select presentations at scientific meetings

**Herreid, S.**, Saurabh K., Howat, I. and Moortgat, J. ( 2023) Combining deep learning and a sparse global dataset of free hydrogen associated fairy circles to inform exploration into a potentially revolutionizing green energy source. *AGU Fall Meeting, San Francisco, USA* (Poster).

**Herreid, S.** (2022) Combining bedrock geology and a new glacier flowline tool to model debris cover evolution. *AGU Fall Meeting, Chicago, USA* (Poster).

**Herreid, S.** (2021) The State of rock debris covering Earth's glaciers. *ETH Glaciological Seminar Series, Zürich, Switzerland* (Remote).

**Herreid, S.** (2018) Time-lapse thermal imagery used to resolve sub-debris glacier melt in Alaska. *Polar2018 SCAR & IASC conference, Davos, Switzerland* (Oral).

**Herreid, S.** & Pellicciotti, F. (2017) A globally complete map of supraglacial debris cover and a new toolkit for debris cover research. *EGU General Assembly, Vienna, Austria* (Oral).

**Herreid, S.**, Pellicciotti, F. & Ayala, A. (2014) Three decades of debris-covered area change for 94 glaciers in Northern Pakistan. *AGU Fall Meeting, San Francisco, USA* (Poster).

**Herreid, S.** & Pellicciotti, F. (2013) A simple 2D model of supraglacial debris cover evolution. *AGU Fall Meeting, San Francisco, USA* (Oral).

**Herreid, S.**, Arendt, A. A., Podrasky, D. & Young, J. (2012) Glacier melt rate reduction from supraglacial debris in the Alaska Range. *IGS, Fairbanks, Alaska; USA* (Poster).

**Herreid, S.**, Truffer, M., Harrison, W. D., & Hock, R. M. (2011) An update on surge-type glaciers and spatial constraint of surge behavior in the Alaska Range. *AGU Fall Meeting, San Francisco, USA* (Oral).

**Herreid, S.**, Arendt, A. A., Hock, R. M., & Kienholz, C. (2010) A new inventory of glaciers and supraglacial debris for the Alaska Range with a case study of rock avalanche loading. *AGU Fall Meeting, San Francisco, USA* (Poster).

## Services to the community

**Journal reviewer:** The Cryosphere, Journal of Glaciology, Journal of Geophysical Research – Earth Surface, Earth Surface Dynamics, Annals of Glaciology, Earth System Science Data, Cold Regions Science and Technology

### Outreach:

- I published a popular science fiction article drawing attention to the climate crisis by telling the story of a future runner running mountain trails around West Antarctic University. To establish a scientifically sound base for the article, I built a 3D digital model of Antarctica in year 2500 using the most advanced bed topography dataset for the Antarctic ice sheet and the best available ice sheet extent and sea level rise estimates derived from plausible climate scenarios. The article, “A letter to the past”, can be found on Freetrail.com or on my website samherreid.io.
- Author of an article titled “A glaciologist in Chamonix” published in Trail Runner Magazine (February 2020) which is distributed nationally in the United States. The article is a commentary on tangible evidence of a changing climate that someone running in an alpine setting will encounter.