Alexander E. Huth

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Employment and Research Appointments

Research Physical Scientist, NOAA Geophysical Fluid Dynamics Laboratory (GFDL) 10/22-present

Developing the coupled ice sheet/ice shelf/iceberg components of GFDL climate models.

NSF-OPP Postdoctoral Research Fellow, AOS Program, Princeton University 1/22-10/22

Host: Olga Sergienko. Developed a scheme for time-varying ice-shelf damage models that accounts for the pressure on ice-shelf rift flank walls from seawater, contact between flanks, and ice mélange that can also transmit stresses between flanks. Demonstrated that these processes can influence rift paths and simulated the 2017 calving of Iceberg A-68 from Larsen C ice shelf.

Postdoctoral Research Associate, AOS Program, Princeton University 1/20-1/22

Hosts: Alistair Adcroft and Olga Sergienko. Parameterized iceberg breakup within climate models, allowing realistic representation of iceberg sizes and trajectories. Developed a bonded-particle method for tabular iceberg drift and decay within climate models; used the method to simulate a "rift-calving" breakup event of iceberg A68a, revealing that it was caused by a previously-unknown mechanism of breakup: ocean-current shear.

Research Assistant, Applied Physics Lab., U. of Washington, Seattle 9/18-12/19

PI: Benjamin Smith. Processed and interpreted ICESat-2 data. Developed algorithms to improve detection of ice sheet surface height by eliminating the effects of photon scattering from blowing snow.

NASA Earth and Space Science Fellow, U. of Washington, Seattle 9/15-9/18

Developed a material point method (MPM) for shallow ice shelf flow, enabling error-free advection of history variables (e.g. ice shelf damage and thickness) and natural boundary tracking for large deformation flow within a particle-based finite element framework. Developed an anisotropic creep damage model within the MPM framework that captures ice-shelf crevassing and rifting, and its feedback on flow.

Graduate Research Assistant, Applied Physics Lab/U. of Washington, Seattle 6/14-9/15

PI: Benjamin Smith. Reprocessed raw CryoSat-2 altimetry data by writing an algorithm that retracked radar return signals to better determine ambiguous data. Supported a project that used the reprocessed data to measure changes in ice sheet volume and infer ice dynamics, revealing a system of subglacial lakes under Thwaites Glacier and their drainage in 2013.

Education

University of Washington, Seattle, WA
PhD, Earth and Space Sciences – Glaciology
Dissertation: *A generalized interpolation material point method and anisotropic creep damage model for shallow ice shelves*
Committee: B.E. Smith (chair), R. Duddu, I. Joughin, M. Koutnik, K. Christianson, and B. Light

Cornell University, Ithaca, NY
BA in Science of Earth Systems, Minor in music.

Funding

NSF 2139002 ($335,551, Lead PI/Fellow): Calving, Icebergs, and Climate. PI: Alexander Huth. NSF Office of Polar Programs Postdoctoral Research Fellowship (NSF OPP-PRF). 2022-2023. Terminated 2-year fellowship in 10/2022 to accept Research Physical Scientist position at NOAA/GFDL.

NASA 80NSSC21K1003 ($455,397, Science PI without funding): Modeling Antarctic glacier and ice-shelf calving and stability (MAGICS) using computation, data, and machine learning. 2021-2024.

NASA NNX15AN99H ($104,999, Fellow): Triggers for the collapse of ice shelves in Antarctica: Investigating Compressive arch failure with numerical models. NASA Earth and Space Science Fellowship (NESSF). 2015-2018.

Honors

NSF Office of Polar Programs Postdoctoral Research Fellowship (NSF OPP-PRF)	2022
NASA Earth and Space Science Fellowship (NESSF)	2015-2018
Henry David Thoreau Fellow	Class of 2013
Society of Exploration Geophysicists Foundation Scholarship	2009

Skills

GFDL models, Fortran, Python, MATLAB, Elmer FEM

Advisees

Nuzhat Khan (Hunter College), Summer-Winter 2021. *Cooperative Institute for Modeling the Earth System (CIMES) Research Intern at Princeton University*, Princeton, NJ.

Juleanna de la Cruz (University of California Los Angeles), Summer 2022. *Cooperative Institute for Modeling the Earth System (CIMES) Research Intern at Princeton University*, Princeton, NJ.

Haemah Akhtar (The College of New Jersey), Summer 2023. *Cooperative Institute for Modeling the Earth System (CIMES) Research Intern at Princeton University*, Princeton, NJ.

Teaching

Teaching Assistant, *ESS 505: The Cryosphere*, U. of Washington, Seattle, WA 2019
Teaching Assistant, *Satellite Remote Sensing Training Program,* Cornell University, Ithaca, NY 2012
Teaching Assistant, *Introduction to Oceanography*, Cornell University, Ithaca, NY 2011

Publications

Huth, A., Duddu, R., Smith, B., & Sergienko, O. (2023). Simulating the processes controlling ice-shelf rift paths using damage mechanics. *Journal of Glaciology,* 1-14. https://doi.org/10.1017/jog.2023.71.

Huth, A., Adcroft, A., Sergienko, O., & Khan, N. (2022). Ocean Currents Break up a Tabular Iceberg. *Science Advances,* 8, eabq6974. https://doi.org/10.1126/sciadv.abq6974.

Huth, A., Adcroft, A., & Sergienko, O. (2022). Parameterizing tabular-iceberg decay in an ocean model. *Journal of Advances in Modeling Earth Systems*, 14, e2021MS002869. https://doi.org/10.1029/2021MS002869

Huth, A., Duddu, R., & Smith, B. (2021). A generalized interpolation material point method for shallow ice shelves. 1: Shallow shelf approximation and ice thickness evolution. *Journal of Advances in Modeling Earth Systems*, 13, e2020MS002277. https://doi.org/10.1029/2020MS002277

Huth, A., Duddu, R., & Smith, B. (2021). A generalized interpolation material point method for shallow ice shelves. 2: Anisotropic nonlocal damage mechanics and rift propagation. *Journal of Advances in Modeling Earth Systems*, 13, e2020MS002292. https://doi.org/10.1029/2020MS002292

Huth, A. (2020). A generalized interpolation material point method and anisotropic creep damage model for shallow ice shelves. *(PhD Thesis).* University of Washington. https://hdl.handle.net/1773/45655

Smith, B. E., H. A. Fricker, N. Holschuh, A. S. Gardner, S. Adusumilli, K. M. Brunt, B. Csatho, K. Harbeck, **A. Huth**, T. Neumann, J. Nilsson, and M. R. Siegfried (2019), Land ice height-retrieval algorithms for NASA's ICESat-2 photon-counting laser altimeter, *Remote Sensing of the Environment*, *233*. 111352. https://doi.org/10.1016/j.rse.2019.111352.

Smith, B. E., N. Gourmelen, **A. Huth**, and I. Joughin (2017), Connected subglacial lake drainage beneath Thwaites Glacier, West Antarctica, *The Cryosphere*, 11, 451-46. https://doi.org/10.5194/tc-11-451-2017

Invited Talks

Modeling the drift and decay of giant tabular icebergs (6/14/23). CESM Workshop. Boulder, CO, USA.

The role of the ocean in breaking up tabular icebergs (5/2/23). NCAR GCD Seminar, Boulder, CO, USA.

The role of ocean currents in breaking up a tabular iceberg (12/14/22). AGU Fall Meeting, Chicago, IL, USA.

Tabular icebergs and climate (11/4/22). Yao Lai research group at Princeton University.

Ocean currents break up a tabular iceberg (6/17/22). Georgia Institute of Technology glaciology group.

Modeling breakup of tabular icebergs (3/7/22). Mathematics on Ice Forum, an international glaciology seminar.

Selected Conference Presentations (non-invited)

Huth, A, Duddu, R., Smith, B, Sergienko, O (2023).Simulating How Ice Mélange Influences Ice-Shelf Rift Paths. Abstract C13D-1151. Poster presentation at the AGU Fall Meeting, San Francisco, CA.

Huth, A, Duddu, R., Smith, B, Sergienko, O (2022). Modeling the Processes that Control Ice-Shelf Rift Paths Using Damage Mechanics. Abstract C32D-0849. Poster presentation at the AGU Fall Meeting, Chicago, IL.

Huth, A, Duddu, R., Smith, B, Sergienko, O (2022). Modeling the processes that determine the propagation paths of ice-shelf rifts. Poster presentation at the 29th WAIS Workshop, Estes Park, CO.

Huth, **A**, Adcroft, A., Sergienko, O (2021). Modeling tabular icebergs and their breakup in climate models. Abstract C35C-0884. Poster presentation at the AGU Fall Meeting, New Orleans, LA.

Khan, N., **Huth**, **A**, Adcroft, A., Sergienko, O (2021). Retrieving Iceberg Characteristics From Satellite Images. Abstract C41A-06. Oral presentation at the AGU Fall Meeting, New Orleans, LA.

Huth, **A**, B. E. Smith, and R. Duddu (2018). Modeling ice shelf weakening with damage mechanics and the material point method. Abstract C34A. Oral presentation at the AGU Fall Meeting, Washington, D.C.

Huth, **A**. and B. E. Smith (2018). Modeling ice shelf weakening with damage mechanics and the generalized interpolation material point method. Oral presentation at the 11th Material Point Method Workshop, Oak Ridge National Laboratory, Oak Ridge, TN.

Huth, **A**. and B. E. Smith (2017). Simulating ice shelf response to potential triggers of collapse, Oral presentation at the Forum for Research into Ice Shelf Processes, Bergen, Norway.

Huth, A. and B. E. Smith (2015). Triggers for the collapse of ice shelves in Antarctica: Investigating compressive arch failure with numerical models. Abstract C11B-0761. Poster presentation at the AGU Fall Meeting, San Francisco, CA.

Smith, B. E., D. Shean, **A. Huth**, P. Morin, and I. Joughin (2014). Twelve years of Amundsen and Bellingshausen Coast thinning observed with altimetry and photogrammetry. Abstract C12A-06. Oral presentation at the AGU Fall Meeting, San Francisco, CA.

Huth, A., R. Lohman, and W. Barnhart (2010). InSAR time series in a fold and thrust belt. Abstract 1-144. Poster presentation at the SCEC Annual Meeting, Palm Springs, CA.

Selected Workshops and Training

11th Material Point Method Workshop, Oak Ridge National Laboratory, Oak Ridge, TN	2018
Advanced Elmer/Ice Workshop, LGGE, Grenoble, France	2015