Dr. Joseph H. Kennedy

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Staff Scientist

I am a Scientist and Software Engineer with extensive multi-institutional project leadership and management experience. I specialize in bridging the gap between scientists and software engineers, building ground-up Cloud and HPC data processing/analysis platforms for users, managing global-scale processing campaigns, working with PB-scale Big Data, and generating analysis-ready Earth Observing/Modeling data. I have expertise in open-source development, packaging, and distribution of scientific software, especially within the scientific python ecosystem.

Highlights

Lead the transformation of internally and externally developed science (algorithm and processing) prototypes into Cloud and HPC production services, and effectively managed $1.5M (2022-2023) to execute multiple global-scale processing campaigns.

- Executed the ITS_LIVE global glacier velocity campaign, processing ≈25 million scene-pairs in two months, covering every available ice-intersecting Landsat 4-9, Sentinel-2, and Sentinel-1 scene.
- Productionized the HydroSAR flood monitoring service for the Hindu Kush Himalayas (HKH) region and successfully transitioned the service to ICIMOD, our local partners in Nepal.
- Transitioned the JPL ARIA processing system to an open-source, serverless framework resulting in 10x reduction in cost per product, significantly growing the ARIA-S1-GUNW archive.

Lead the ground-up redesign and development of ASF's HyP3, an on-demand SAR data processing system making analysis-ready RTC and InSAR data products. *Anyone* may request HyP3 products for free. HyP3 is deployed in NASA's Earthdata Cloud environment and integrated directly into ASF's main data search portal Vertex.

Created LIVVkit, an ice-sheet model verification and validation toolkit, to provide a wide range of validation analysis covering atmosphere-ice and land-ice interactions as well as ice sheet dynamics. These analysis exercise the entire data science pipeline, from data wrangling and cleaning to reporting, and incorporate everything from point measurements (e.g., weather stations and ablation stakes) to airborne radar altimetry (e.g., NASA IceBridge) and satellite observations (e.g., RADARSAT, NASA GRACE).

Professional Experience

Alaska Satellite Facility, Fairbanks, Alaska, USA
Geophysical Institute, University of Alaska Fairbanks — **September 2019 – present**

Staff Scientist — *January 2024 – present*

As a Staff Scientist, I guide strategic research and engineering endeavors that leverage ASF's unique capabilities and resources to meet ASF's mission of "Making Remote-Sensing Data Accessible". My research interests are broadly focused on the computational aspects of remote sensing, ice sheet modeling, and Earth system modeling. I specialize in developing scientific workflows and transforming science (algorithm and processing) prototypes into Cloud and HPC production services. I manage multiple global-scale processing campaigns of Earth observing data, curate "Big" datasets from inception to dissemination, and contribute to and maintain open-source scientific tools and services. This includes Custom HyP3 deployments for grant projects and external customers, STAC Catalogs, and data processing tools. I excel at project management, leading both internal strategic projects and multi-institutional research projects. I serve as a liaison between the scientific community, ASF, and funding agencies, ensuring effective representation and coordination, and advising on research priorities and resource enhancement. I lead science communication efforts, contribute to education and outreach initiatives, and provide mentorship in computational and data science to foster professional growth within ASF and the wider scientific community.

Engineering Supervisor *March 2023 – present*

As an Engineering Supervisor, I currently manage 5 engineers across all levels and am involved in recruiting candidates across the organization. I am responsible for setting performance targets, developing and implementing strategies to achieve them, and monitoring progress to make sure that they are meeting or exceeding expectations. I communicate regularly with employees to provide feedback, guidance, and support as needed, and work to create a positive and productive work environment. I ensure that my employees are properly trained and equipped with the necessary tools to perform their jobs effectively.

Senior Research Software Engineer *July 2021 –December 2023*
Research Software Engineer *September 2019 – July 2021*

As a Senior RSE, I specialize in transforming internally and externally developed science (algorithm and processing) prototypes into Cloud and HPC production services, and manage $800K to execute multiple global-scale processing campaigns. I lead the ground-up redesign and development of ASF's HyP3, an on-demand, Analysis-Ready SAR data processing system freely available to *anyone*. I Build and maintain open-source scientific tools and services to meet ASF's mission of "Making Remote-Sensing Data Accessible" including Custom HyP3 deployments for customers, STAC Catalogs, Esri Image Services, and SAR toolboxes. I curate global datasets, from inception to dissemination, such as the ARIA-S1-GUNW archive and the GLO-30 HAND dataset. I also contribute to and maintain community open-source SAR processing tools, including MintPy, ISCE2, RAiDER, autoRIFT, and more.

Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA
Climate Change Science Institute **January 2015 – September 2019**

Computational Scientist in Glaciology *December 2016 – September 2019*

Perform research tasks using DOE's Earth system model E3SM and ice sheet models (e.g., MPAS-LI, BISICLES, PISM, CISM); coordinate the verification and validation of E3SM, MPAS-LI, and BISICLES simulations; development of the Land Ice Verification and Validation toolkit (LIVVkit), a Python-based toolkit for robust evaluation of ice-sheet models; and develop an extended V&V evaluation tool (EVE) for statistical climate reproducibility testing of ESMs.

Postdoctoral Research Associate *January 2015 – December 2016*

Perform research tasks using the Community Ice Sheet Model (CISM) and coordinate the development of the Land Ice Verification and Validation toolkit (LIVVkit) — a python-based toolkit for robust evaluation of ice-sheet models.
Advisor: Dr. Katherine J. Evans

Education

University of Alaska Fairbanks, Department of Physics, Fairbanks, Alaska, USA
Ph.D., 2015, Physics. Advisor: Dr. Erin C. Pettit

Western Washington University, Department of Physics, Bellingham, Washington, USA
B.S., 2008, Physics. Minor: Astronomy

Certifications

◇ **Certified Scrum Product Owner®** *Scrum Alliance*, 09/30/2022. Expires 9/30/2024.

Technical Skills

Languages:	Python, Julia, R, C++, FORTRAN, Matlab, SQL, Bash, LaTeX
Operating Systems:	Unix/Linux (desktops to HPCs), Windows, OSX
DevOps:	GitHub Actions, GitLab CI/CD, Docker, Git
Data formats:	Zarr, Cloud Optimized GeoTIFFs, HDF5, NetCDF4, CF-conventions, Parquet
SAR processing:	ISCE2/3, RAiDER, MintPy, PyAPS, GAMMA, Xarray-Sentinel
Math/Science Packages:	conda/mamba, Scikit-learn, Pandas, Xarray, Numpy, Scipy
Climate/GIS Tools:	GDAL, QGIS, NCO, PyNIO/PyNGL, NCL, GMT
Data Science:	PCA, multivariate testing, regression analysis
Frameworks/Skills:	Agile software development, test-driven development, verification and validation, unit and integration testing, continuous integration, containerization

Publication Highlight

Kennedy, J.H., A.R. Bennett, Evans, K.J., S. Price, M. Hoffman, W.H. Lipscomb, J. Fyke, L. Vargo, A. Boghozian, M. Norman, P.H. Worley. (2017). LIVVkit: An extensible, python-based, land ice verification and validation toolkit for ice sheet models. Journal of Advances in Modeling Earth Systems, 9(2), 854–869. DOI: 10.1002/2017MS000916

Awards

- 2022 Richardson Medal by the International Glaciology Society
- 2016 ORNL CCSI Professional Development Award, $100,000
- 2013–2014 UAF Thesis Completion Fellowship, $15,000 + tuition
- 2011–2012 NSF CASE GK-12 Fellow, $45,000

Synergistic Activities

2024	Participated in NSF's National Discovery Cloud for Climate Workshop.
2022–2023	Serve on the NASA's ESDS Community Development Best Practices Working Group.
2018	Organized a minisymposium on computational methodologies for next-generation climate models at the European Seminar on Computing (ESCO) 2018 conference in Pilzen, Czech Republic.
2017	Organized an international workshop on human activity at scale in Earth system models at Oak Ridge National Laboratory.

Other Skills and Activities

- Wilderness experience including a continuous 700 mile, 33 day, canoe trip down the Yukon River
- Enjoy outdoor recreation: canoeing, biking, hiking, camping, etc.
- Trained in bear safety