USGS
science for a changing world

Advanced Research Computing

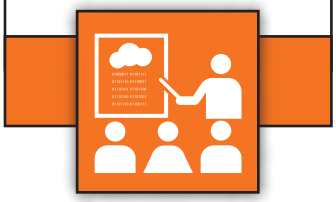
Providing high-performance computing (HPC) capabilities and expertise to scientists for the acceleration of science

Photograph by U.S. Geological Survey

Helping Researchers

User Support

- Training workshops
- Consultations
- Day-to-day technical support for effective use of HPC resources



Computer Science Research

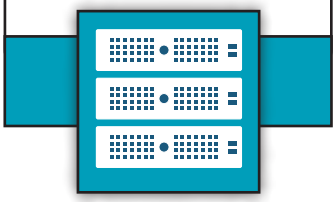
- Research and apply advances in technologies and computational methods to accomplish organizational goals

Collaborate and Contribute

- Cultivate partnerships
- Contribute to the broader high performance and scientific computing communities

Machine Access

- Provide researchers access to in-house, partner, and cloud HPC resources to U.S. Geological Survey (USGS) scientists

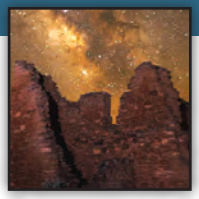


High Performance Computing Systems

General Purpose HPC

- User friendly
- 18,544 central processing unit (CPU) cores
- 36,864 hyperthreads
- 55,296 CUDA cores
- About 590 teraflop per second (TFLOP/s)

Hovenweep



Photograph by Jacob W. Frank, National Park Service

Flagship System

- Large-scale models
- CPU only
- 232 nodes
- 9,280 CPU cores
- 18,560 hyperthreads
- 448 TFLOP/s

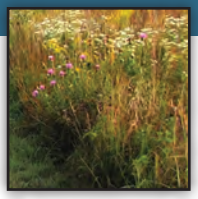
McKinley

Photograph by National Park Service

Exploratory System

- Machine learning (ML) and deep learning (DL) and analytics
- Integrated software
- 22 nodes
- 792 CPU cores
- 122,800 CUDA cores
- 15,360 tensor cores

Tallgrass



Photograph by National Park Service

HPC in the Cloud

- Custom environments
- On demand
- Scalable
- CPU and graphics processing unit (GPU)
- More than 680 software applications

Cloud

Photograph by Lisa McKeon, U.S. Geological Survey

U.S. Department of the Interior
U.S. Geological Survey

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Science Enabled by High-Performance Computing

More than 700 million compute hours since 2019

Advanced Research Computing is part of the USGS Science Analytics and Synthesis program, which serves under the USGS Core Science Systems Mission Area. Our goal is to provide and facilitate access to HPC capabilities and offer expertise to USGS scientists to accelerate and expand scientific discovery.

- We provide training, consulting, and access to HPC resources.
- We promote best practices through webinars, trainings, and other resources such as our online community of practice.
- We participate in USGS policy activities to align our work with bureau requirements.
- We keep up with the ever-changing supercomputing ecosystem by conducting research; the results of which can be applied to improving approaches to USGS HPC practices.

Training Opportunities

Introduction to HPC, R for HPC, Python for HPC, Introduction to Deep Learning, and Advanced Scheduling. Onsite training at science centers as requested.

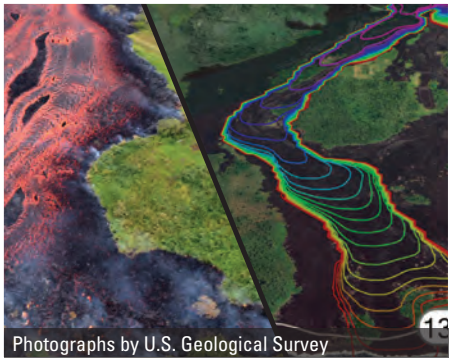
HPC Supports Science in All USGS Mission Areas

- **Core Science Systems**
  Land Change Monitoring, LANDFIRE
- **Ecosystems**
  Environmental deoxyribonucleic acid (eDNA), habitat modeling, and invasive species detection using ML models
- **Energy and Minerals**
  Analysis of electromagnetic data for identification of critical minerals and economic value of pollinators
- **Natural Hazards**
  Lava flow, landslide modeling, wildfire, and active emergency response support
- **Water Resources**
  Water availability assessments, flood mapping, and drought

Photograph by Christian E. Zimmerman, U.S. Geological Survey

Barry Arm Landslide deformation model, Alaska

Landslide and Tsunami Risk



Photographs by U.S. Geological Survey

Lava flow monitoring modeling in Hawaii

Volcanic Eruptions

Photograph by Jason Kean, U.S. Geological Survey

Montecito after fire and debris flow

Wildfire Effects

Photograph by Chris Brown, U.S. Geological Survey

Invasive *Lithobates catesbeianus* (American bullfrog) detection in the Pacific Northwest using ML

Invasive Species Detection

Photograph by U.S. Geological Survey

Drought conditions

Water Availability Assessment

Photograph by U.S. Geological Survey

Emergency flood mapping in Powder Springs, Georgia

Extreme Weather Events

For more information, email hpc@usgs.gov
or visit https://www.usgs.gov/hpc

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