GAGE
SAGE

Operated by EarthScope Consortium

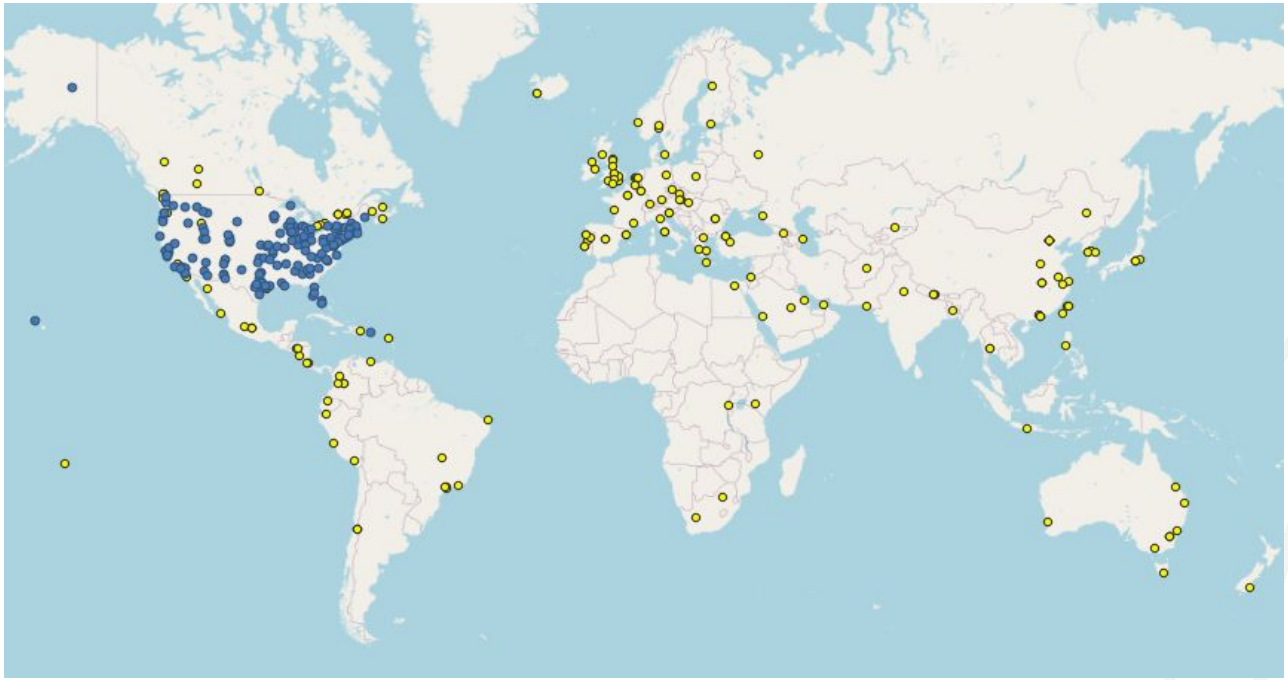
Introduction to EarthScope and Cloud Computing

What We Do

We give scientists the tools to examine the Earth with extreme precision to better understand natural hazards and our changing planet.

About EarthScope

EarthScope is a global community of scientists, scholars, and educators of 400 voting and associate members



voting members

associate members

About EarthScope

- Maintain and Design Advanced Geophysical Instrumentation
  - Spans frequency spectrum
  - Extreme environments, long periods of time
- Enable Transformative Data Analysis and Modeling
  - Adopt standards for data archival, discovery, distribution
  - Support multidisciplinary research and analysis
  - Modeling, simulation, machine learning
- Investigate Processes and Hazards That Shape the Planet
  - Inner core to outer atmosphere
  - Build infrastructure for hazard monitoring
- Educational Outreach and Workforce Development
  - Equip students to engage real-world career opportunities.
  - Environmental management, urban planning, emergency management, surveying, etc.

Geodesy & Seismology Support

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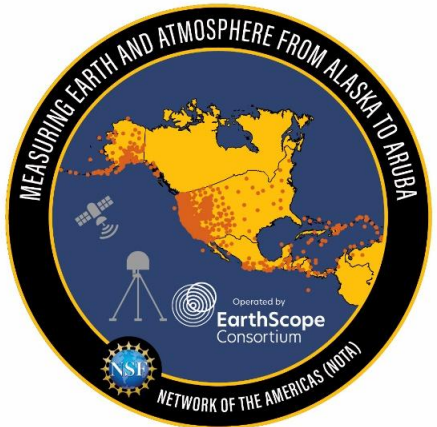
	Geodetic	Seismologic
Data Archival	GNSS (RINEX), SAR, borehole strainmeters	Short-period and broadband timeseries (miniSEED), associated metadata
Operational Network(s)	Network of the Americas (NOTA)	Global Seismograph Network (GSN), Polar network
Portable Instrumentation Services	GNSS, terrestrial laser scanning, UAV mapping	Seismometers, GPR, magnetotelluric

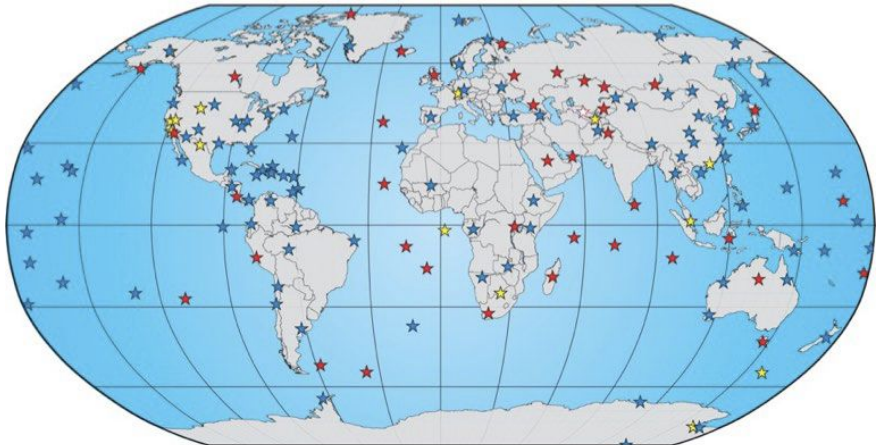
Geodesy support

- **Data archiving**: GNSS, SAR,borehole strain/etc.
- **Network of the Americas** operation (GNSS and borehole)
- **NASA Global GNSS Network** support
- **Portable instrumentation services**: GNSS, terrestrial laser scanning, UAV structure from motion

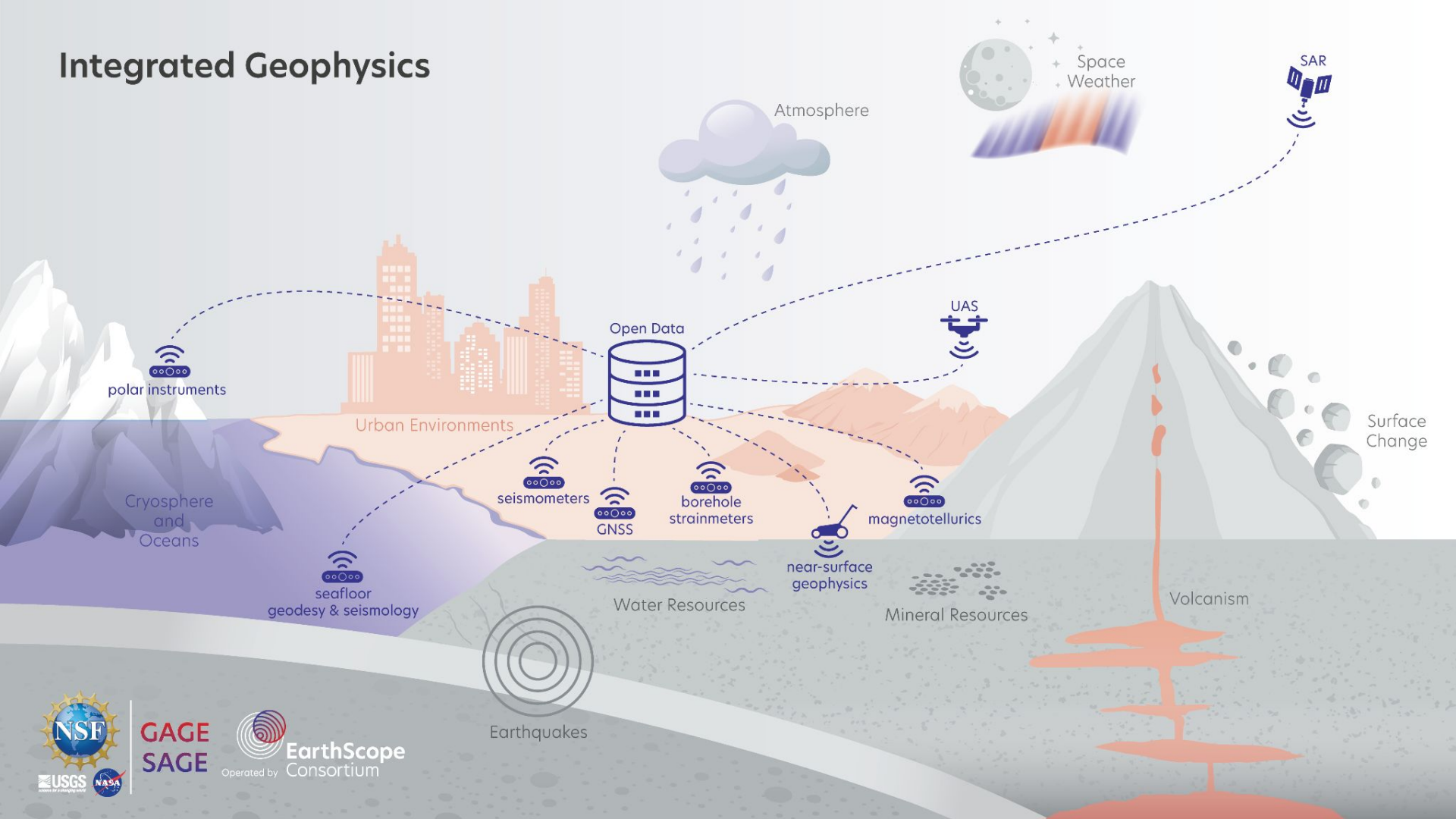


Seismology support

- **Data archiving**: raw seismic and derived products
- **Global Seismographic Network** operation (with USGS)
- **Portable instrumentation services**: seismometers, active-source support, magnetotelluric, ground penetrating radar



Integrated Geophysics

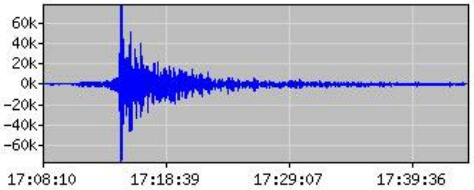


NSF USGS NASA GAGE SAGE Operated by EarthScope Consortium

Data

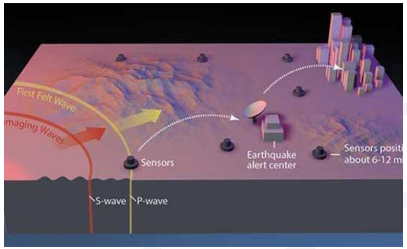
NSF SAGE Data

https://service.iris.edu/

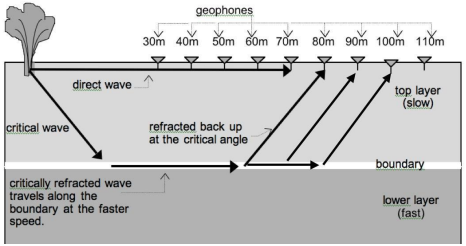


Time Series Data

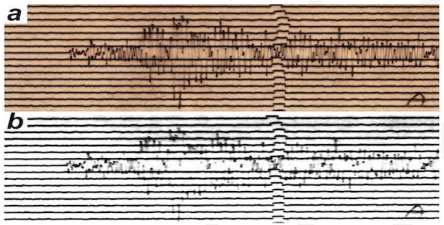
Metadata



Event Data



Assembled Data



Historical Data

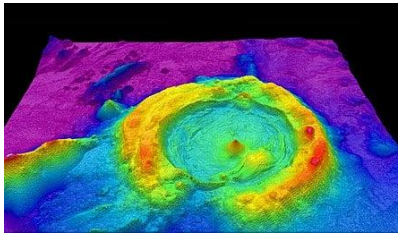
Current SAGE Data Access

- Web services: https://service.iris.edu/
- Download tools:
  - FetchData – https://earthscope.github.io/fetch-scripts/
  - Rover – https://earthscope.github.io/rover/
  - Wilber – https://ds.iris.edu/wilber3/
- Python packages:
  - Obspy
  - MsPASS
- Real-time - SeedLink

NSF GAGE Data

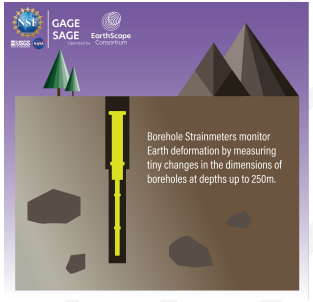
GPS/GNSS Data

Synthetic Aperture Radar (SAR)



LIDAR/SfM

Tropospheric Data

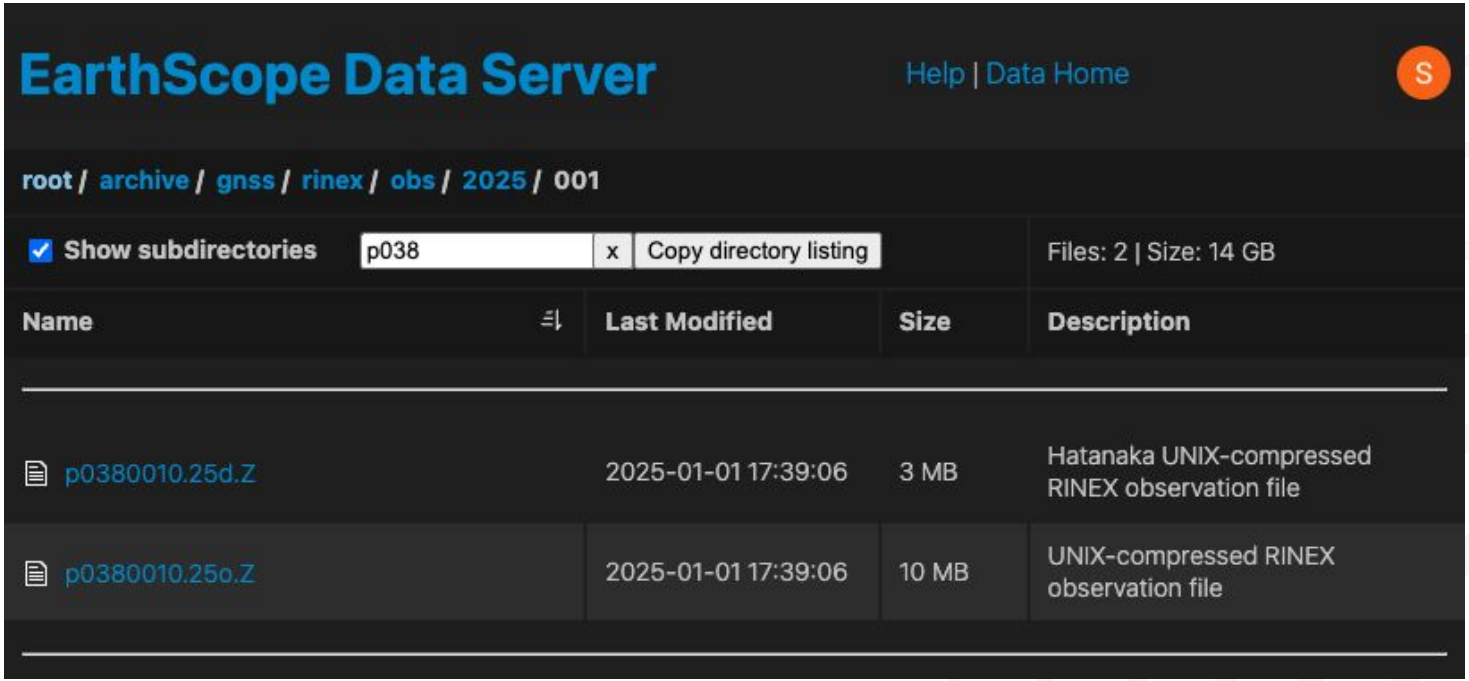


Strain & Seismic Data

Current GAGE Data Access

File server

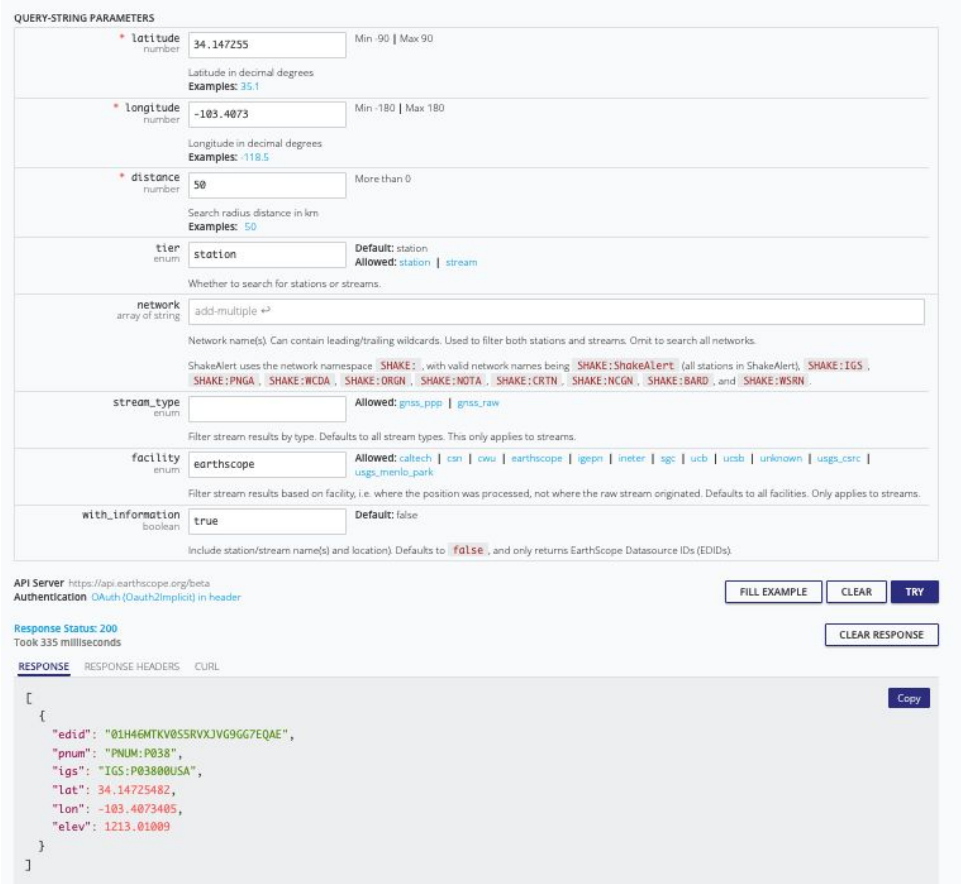
https://data.earthscope.org/



Current GAGE Data Access

https://api.earthscope.org/

Requires authentication with EarthScope CLI



Observable Notebooks (@earthscope)

Use open-source notebooks for data access, analysis, visualization:

- Create RINEX data requests
- Geoid Height Calculator
- Earth Model Collaboration (EMC) contribution and visualization
- GMV and other SPUD products

https://observablehq.com/@earthscope

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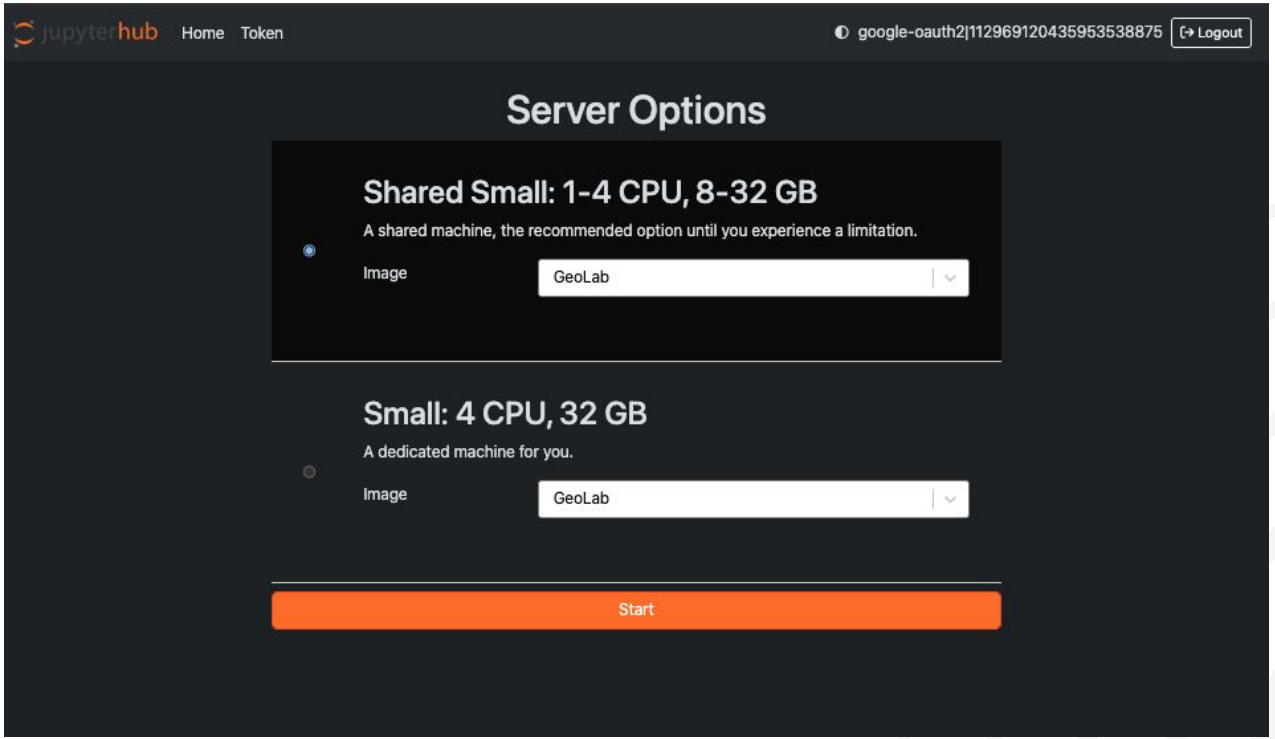
Hands-on with Jupyter, GeoLab, and Git

JupyterHub and GeoLab

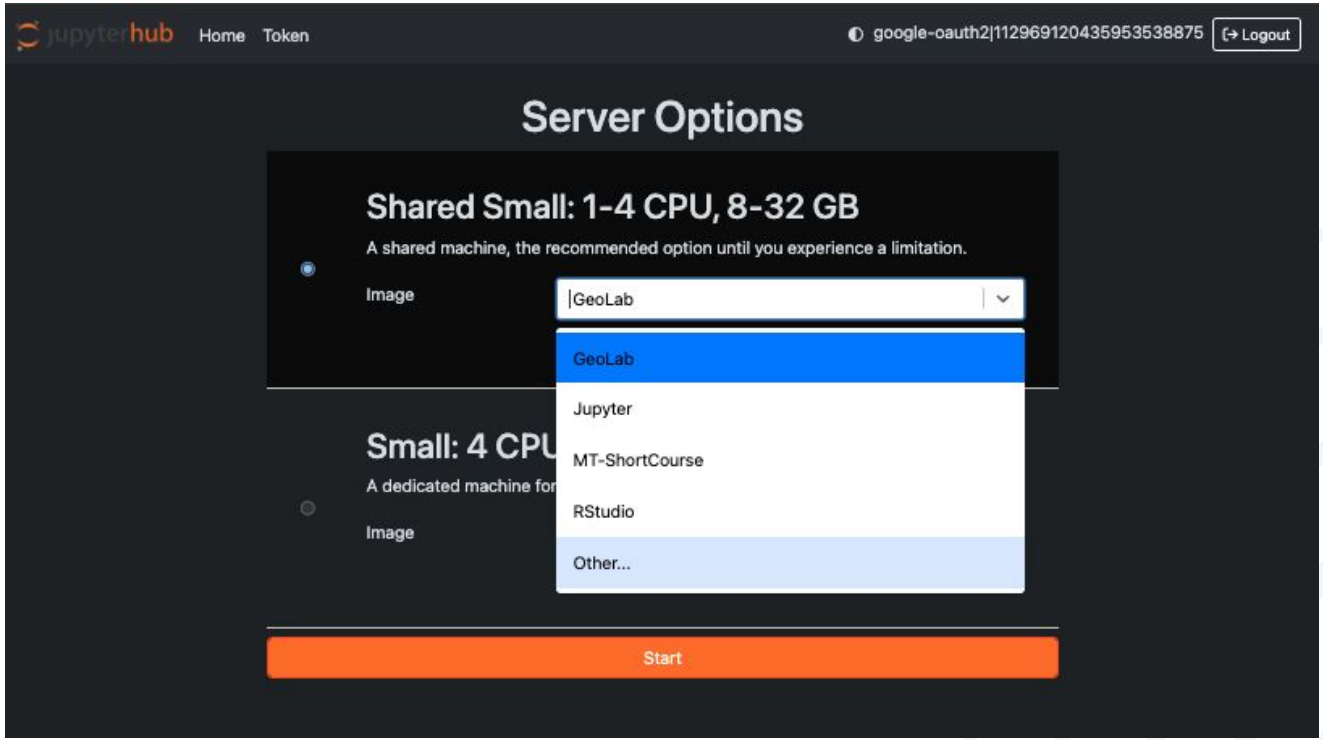
- JupyterHub offers compute environments hosted on shared infrastructure
- GeoLab is a cloud computing platform for the geophysical community, built in collaboration with 2i2c.
- Adjacent to EarthScope-operated data archives

GeoLab

https://geolab.earthscope.org/

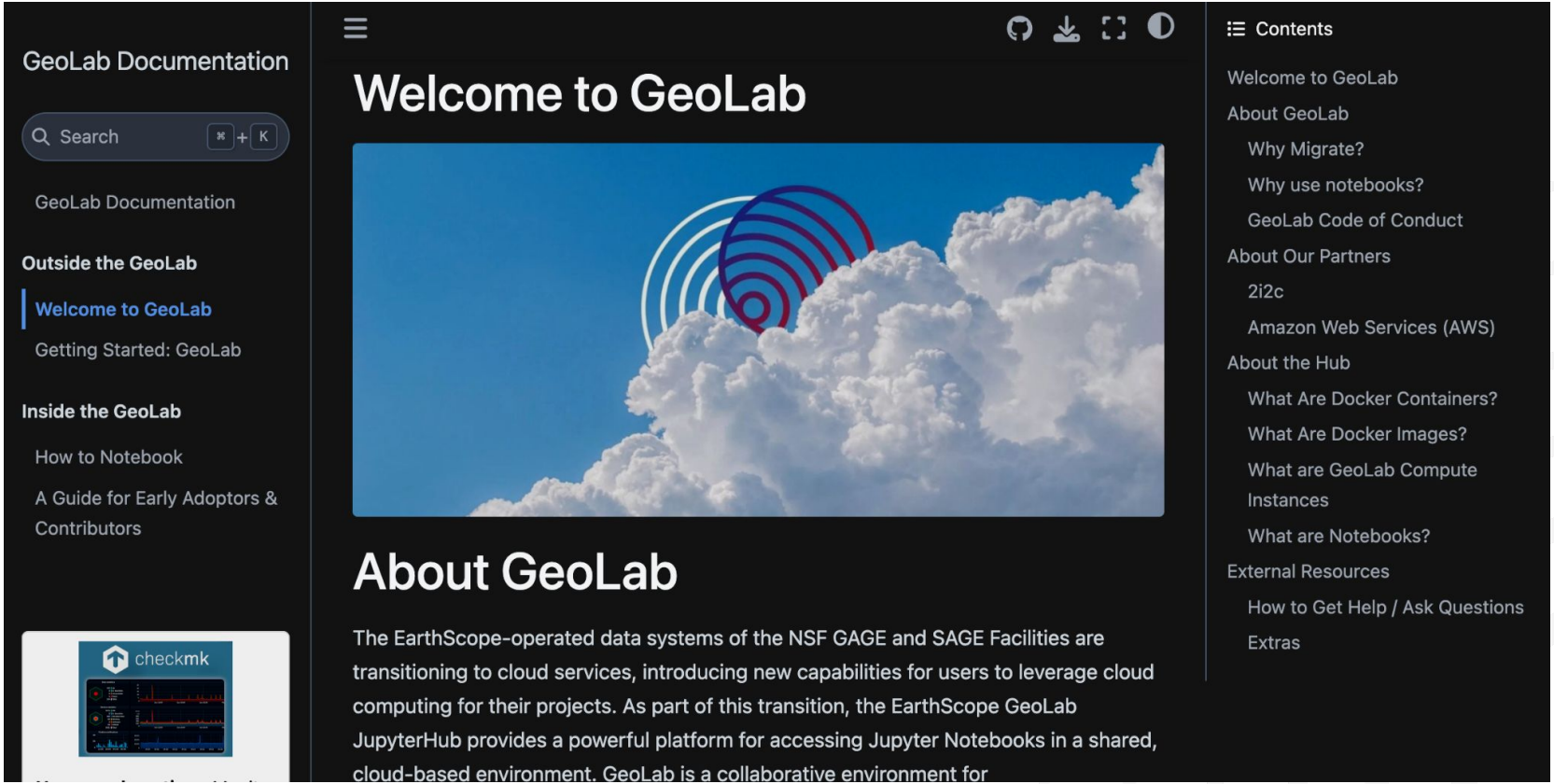


GeoLab: Server Options

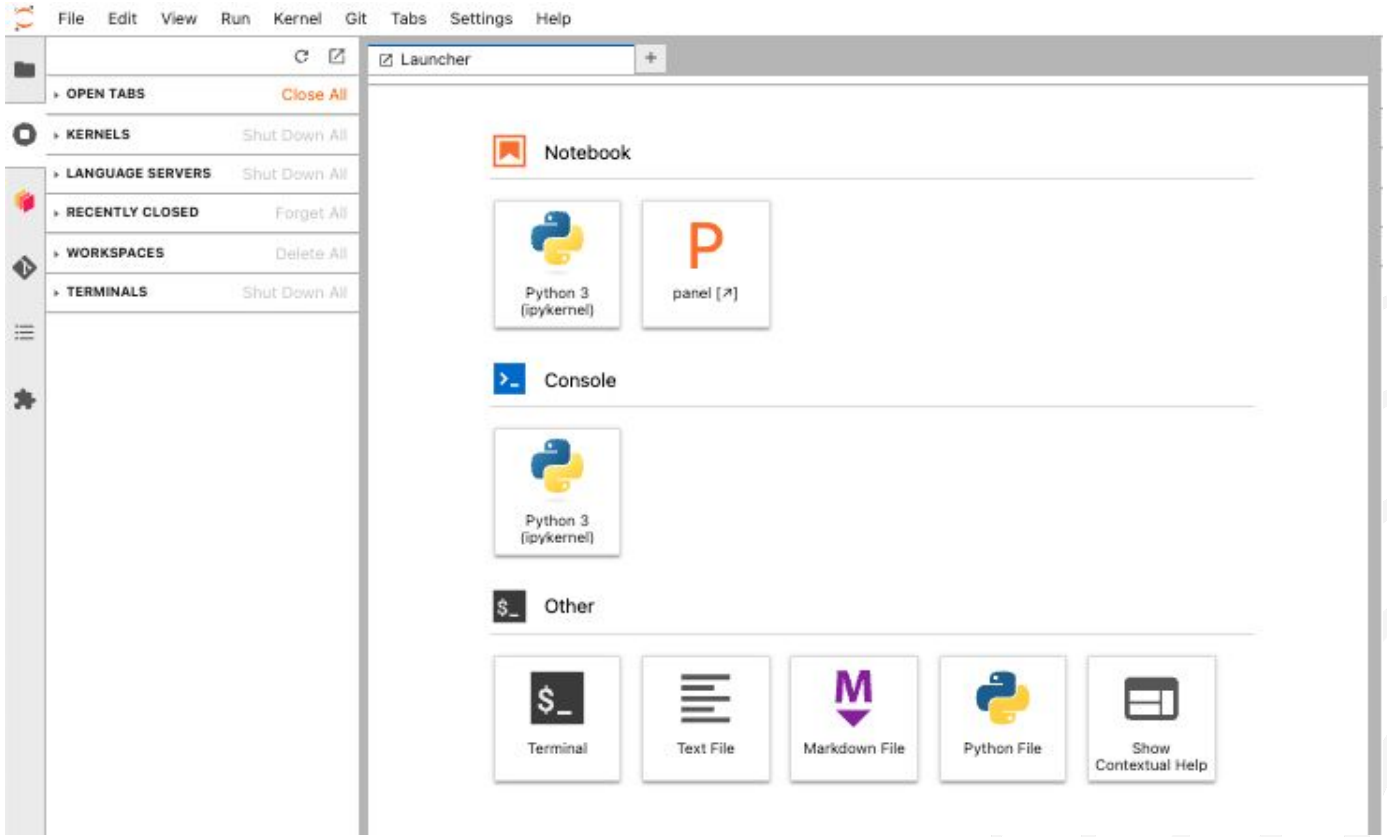


GeoLab: Read the Docs

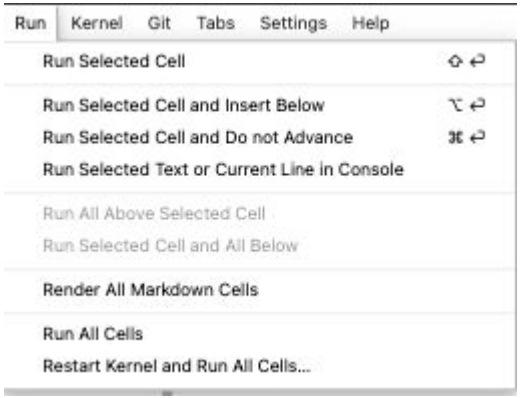
https://docs.earthscope.org/projects/GeoLab

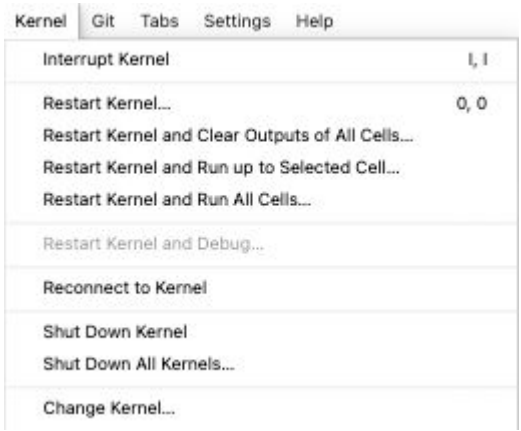


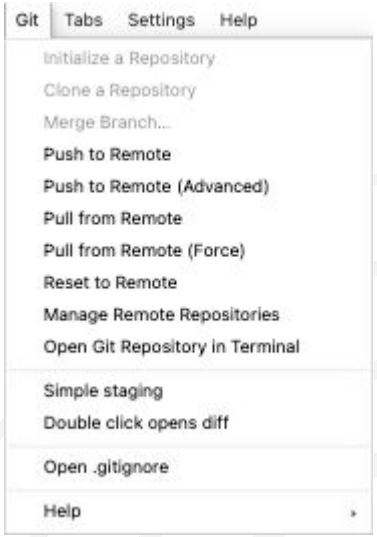
JupyterHub Tour

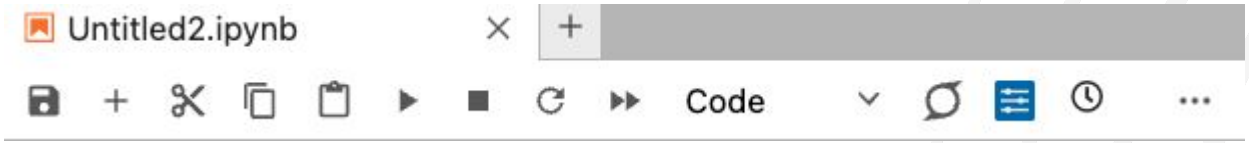


GeoLab Tour


Run
Kernel
Git
Tabs
Settings
Help
Run Selected Cell
Run Selected Cell and Insert Below
Run Selected Cell and Do not Advance
Run Selected Text or Current Line in Console
Run All Above Selected Cell
Run Selected Cell and All Below
Render All Markdown Cells
Run All Cells
Restart Kernel and Run All Cells...


Kernel
Git
Tabs
Settings
Help
Interrupt Kernel
I, I
Restart Kernel...
0, 0
Restart Kernel and Clear Outputs of All Cells...
Restart Kernel and Run up to Selected Cell...
Restart Kernel and Run All Cells...
Restart Kernel and Debug...
Reconnect to Kernel
Shut Down Kernel
Shut Down All Kernels...
Change Kernel...


Git
Tabs
Settings
Help
Initialize a Repository
Clone a Repository
Merge Branch...
Push to Remote
Push to Remote (Advanced)
Pull from Remote
Pull from Remote (Force)
Reset to Remote
Manage Remote Repositories
Open Git Repository in Terminal
Simple staging
Double click opens diff
Open .gitignore
Help


Untitled2.ipynb
Code

Collaboration with Git

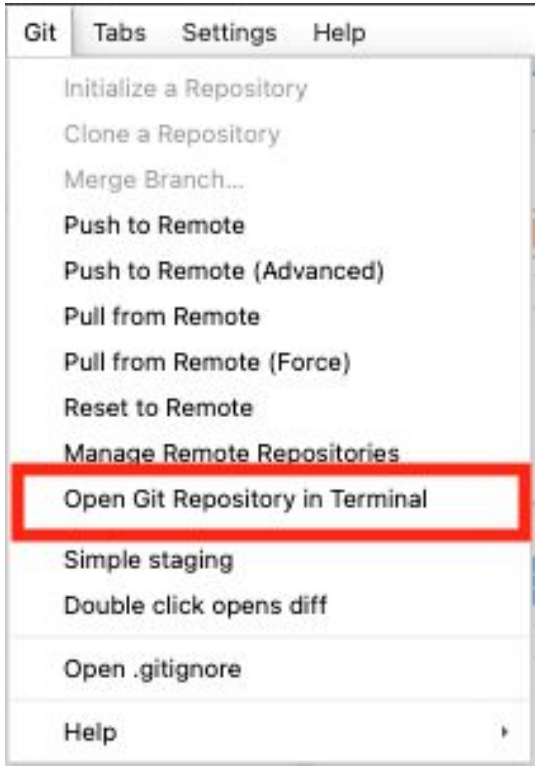
Git is a version control system that:

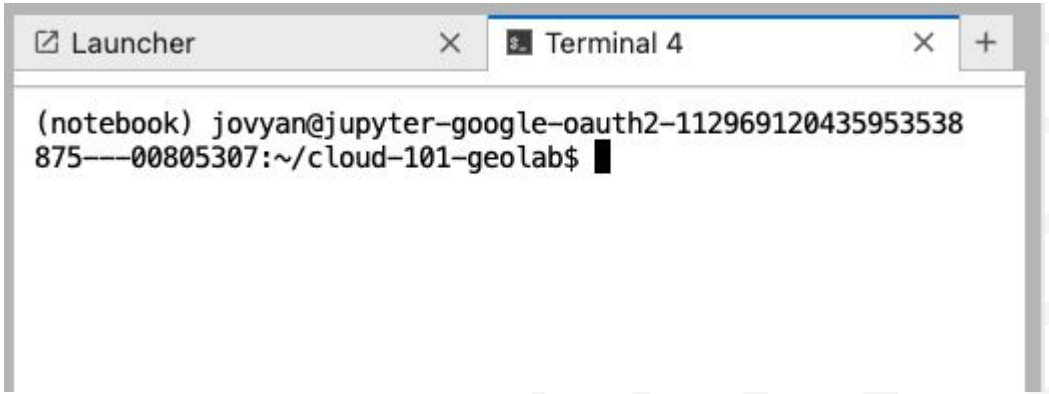
- Tracks code changes in files
- Tracks who made changes
- Enables coding collaboration

Two commonly used git providers

- GitHub
- GitLab

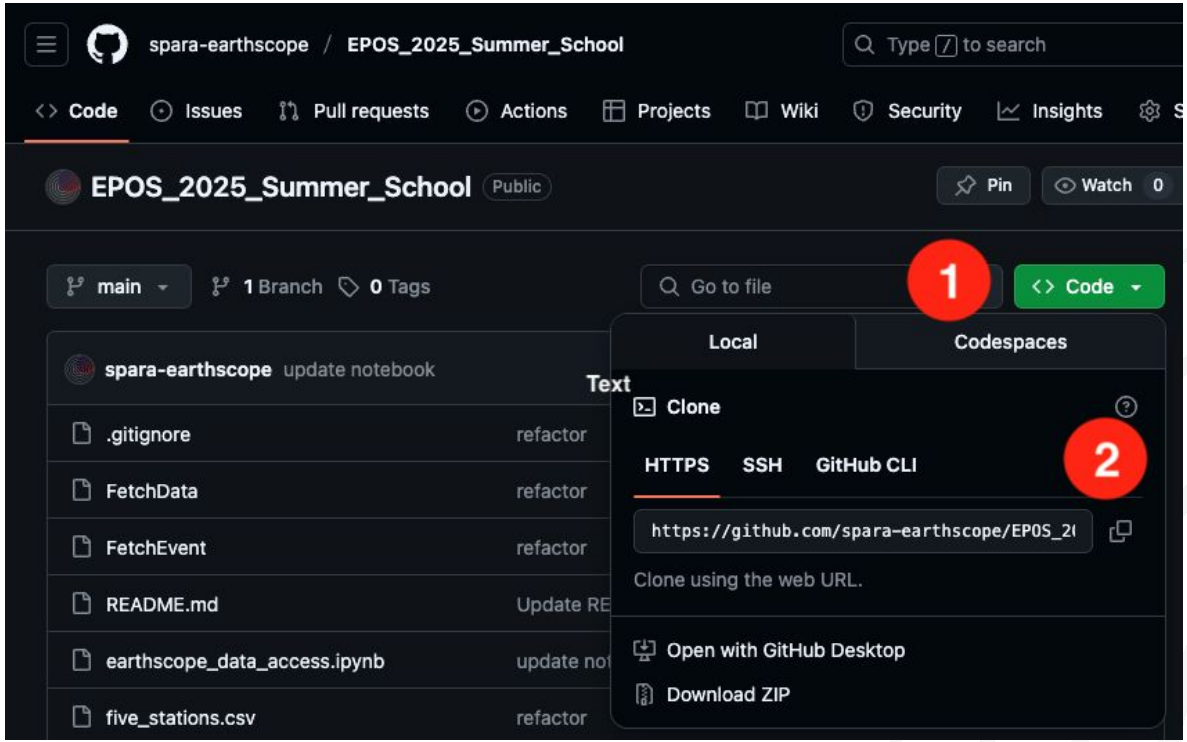
Getting Started with git





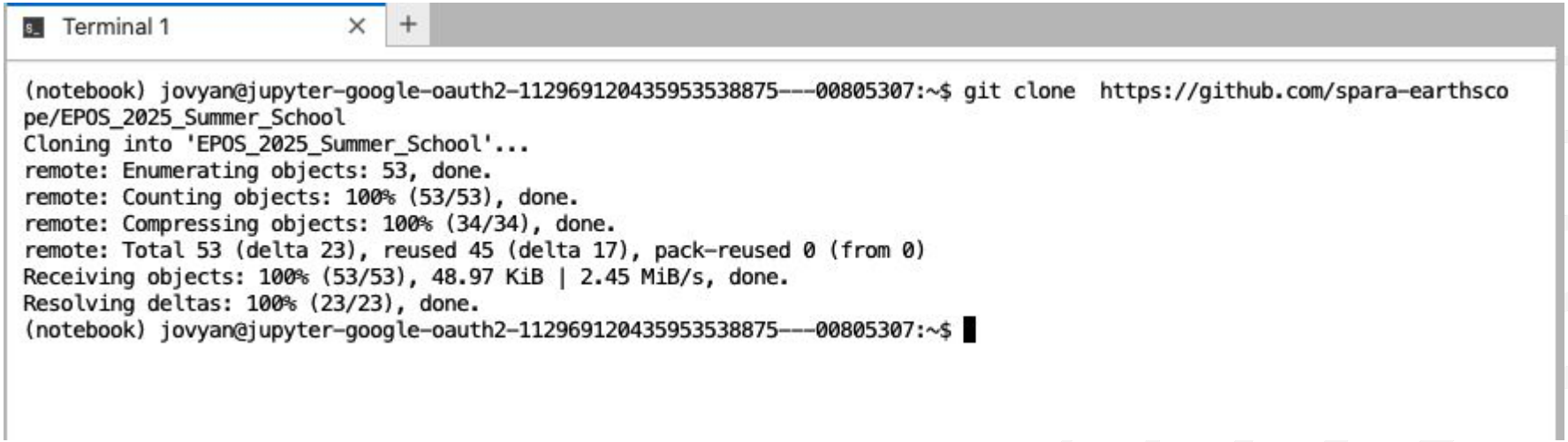
Clone repository

https://github.com/spara-earthscope/EPOS_2025_Summer_School



Clone repository

git clone https://github.com/spara-earthscope/EPOS_2025_Summer_School



Let’s get to work!