Roadmap to Mapping: Geospatial Data Analysis and Visualization

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Roadmap to Mapping – SET UP

Geospatial Data Analysis and Visualization

Login to your MathWorks account

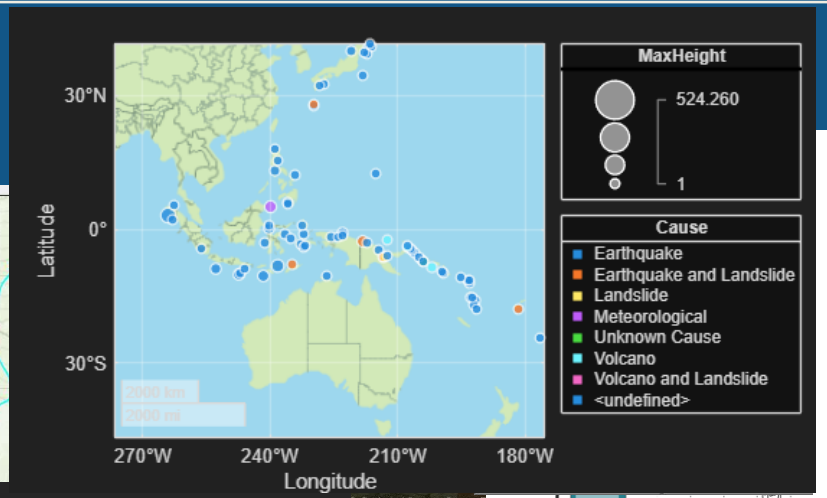
Github.com/drLKeen/MappingWorkshop
Open in MATLAB Online or Download

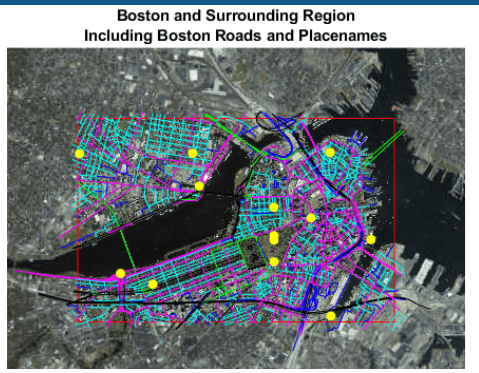
Agenda

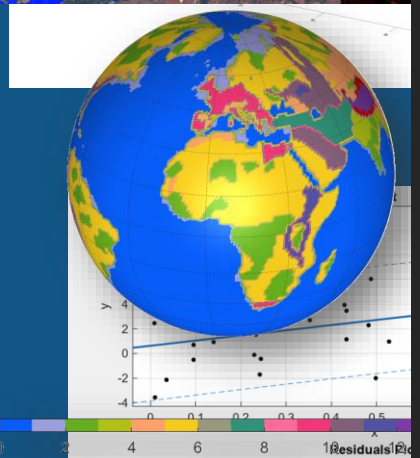
- 10:00 – 10:45am — Mapping and Geospatial Data pt.1
- 10:45 – 11:00am — Break
- 11:00 – 12:00pm — Mapping and Geospatial Data pt. 2
- 12:00 – 12:15pm — Start lunch
- 12:15 – 1:00pm — Increasing Your Research Impact
- 1:00pm + — Q&A and 1-on-1 meetings

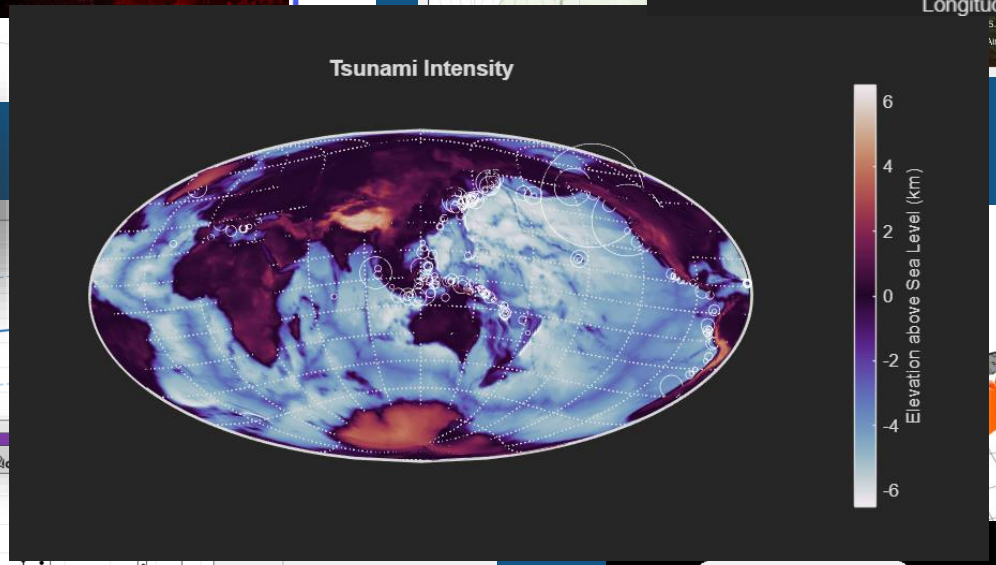
Agenda

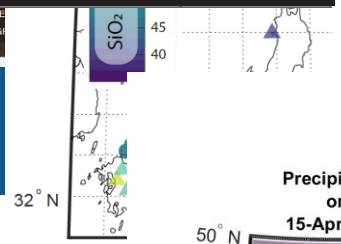
- Workshop file access/setup
- Introduction
- All hands on deck!
  - Maps and tools
  - Importing files
  - Community tools

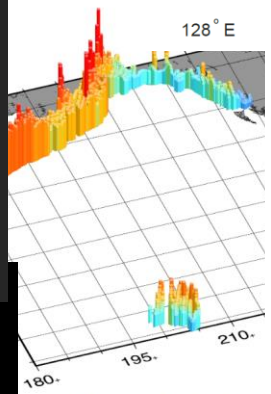


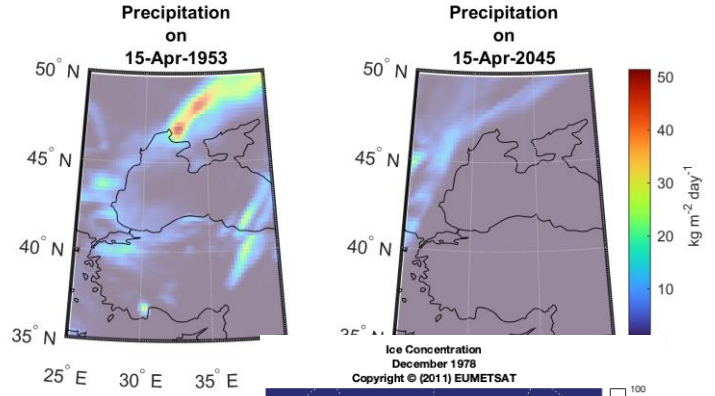


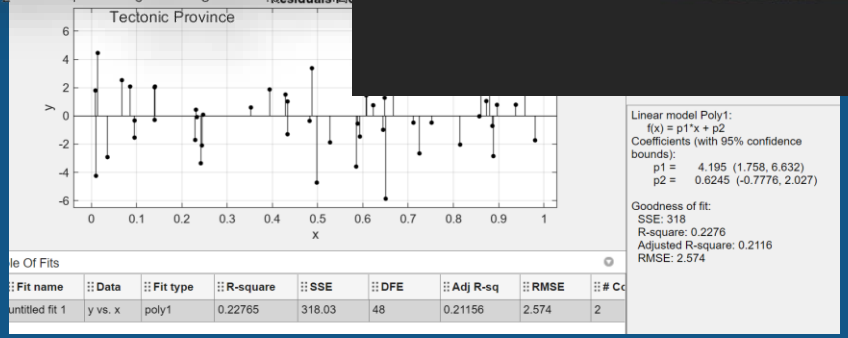




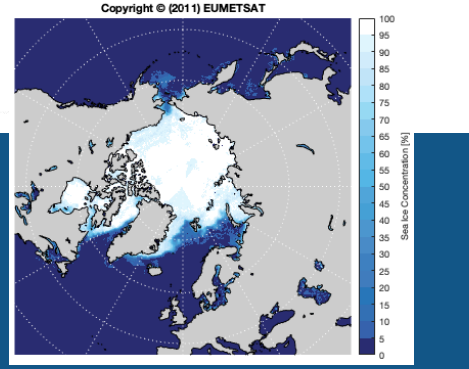




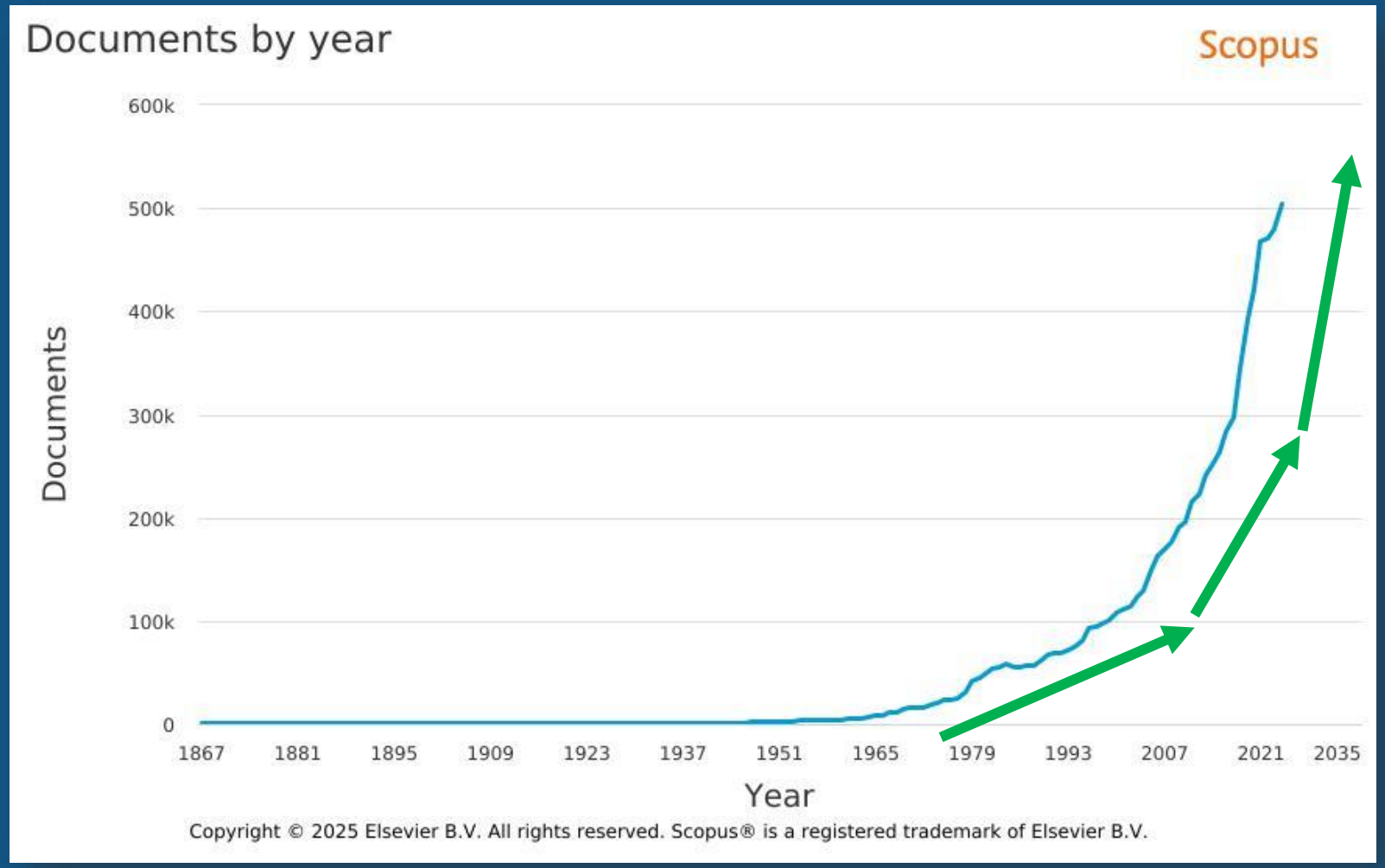




e exceedance amplitudes for the five western states.



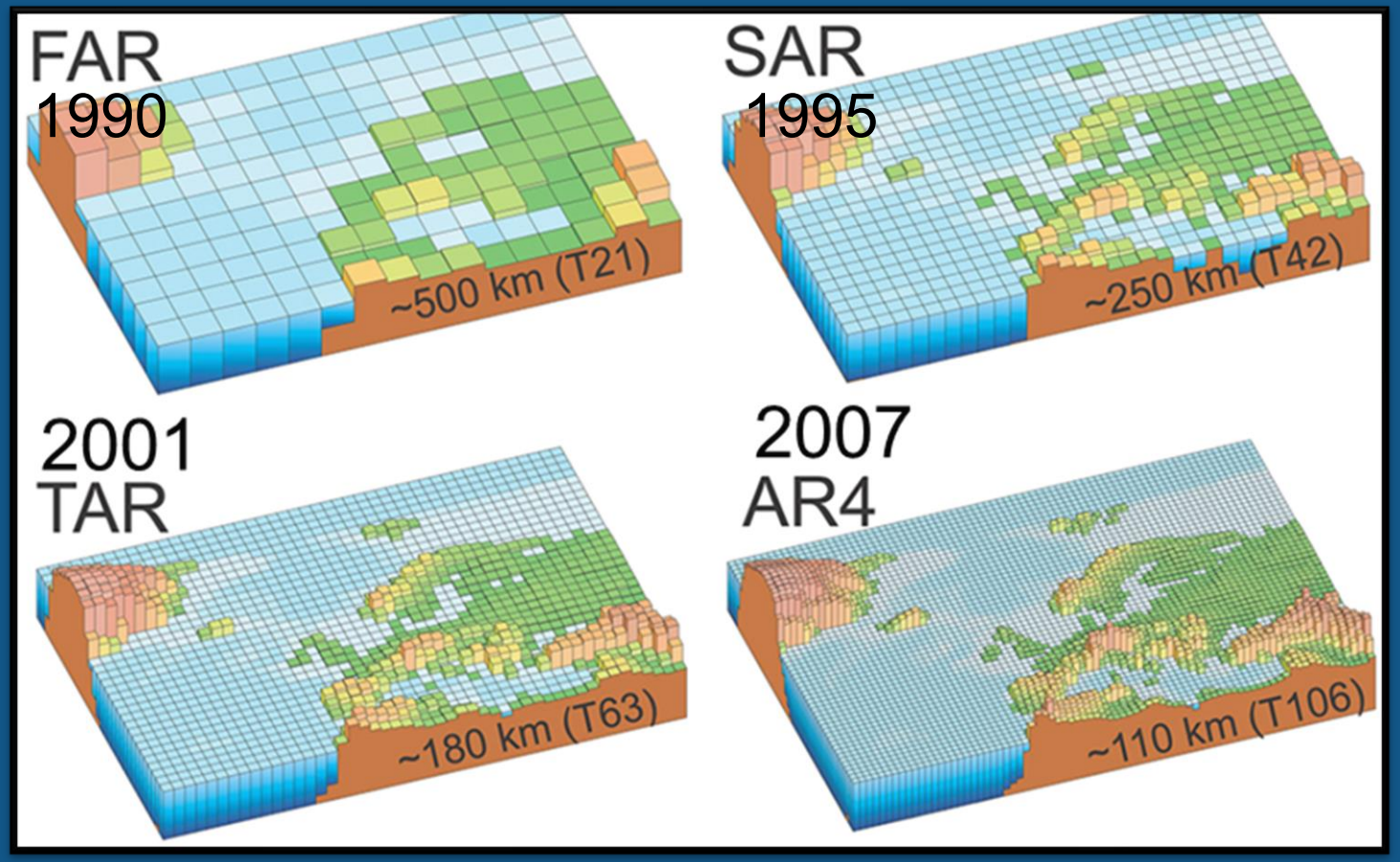
Publications in Earth, Planetary & Environmental Sciences



- More Papers
- More Data
- More Tools & Methods
- More Collaborations

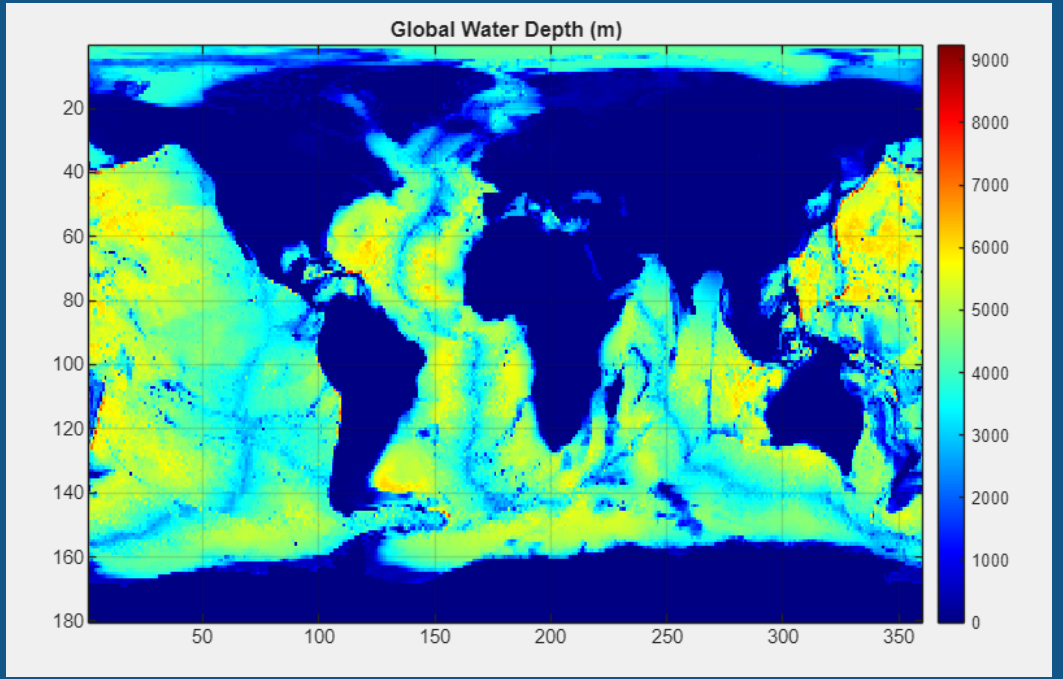
Source: Scopus

Data Growth


FAR
1990
~500 km (T21)
SAR
1995
~250 km (T42)
2001
TAR
~180 km (T63)
2007
AR4
~110 km (T106)

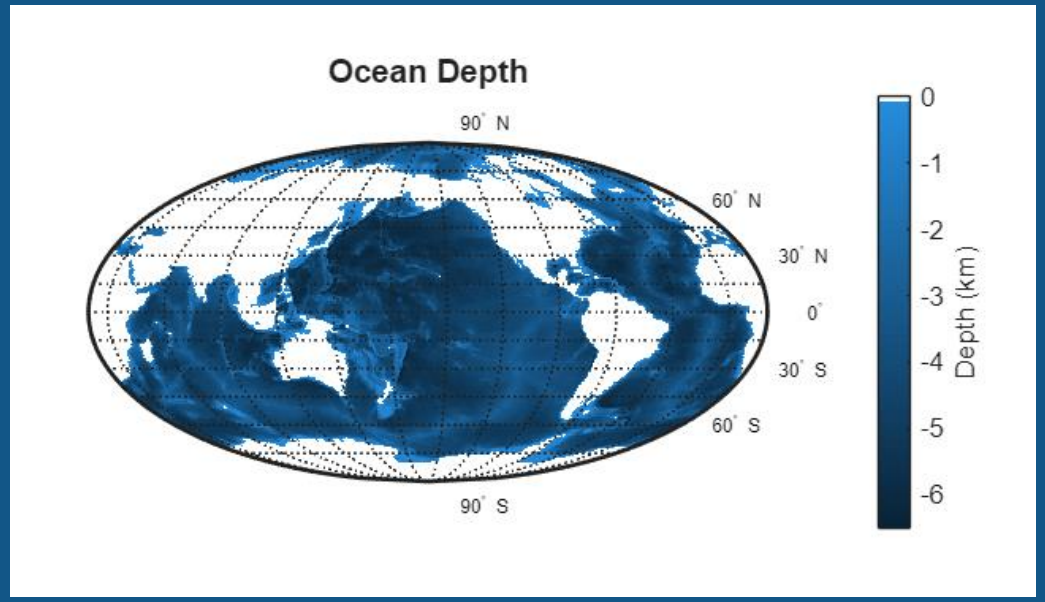
The importance of figures

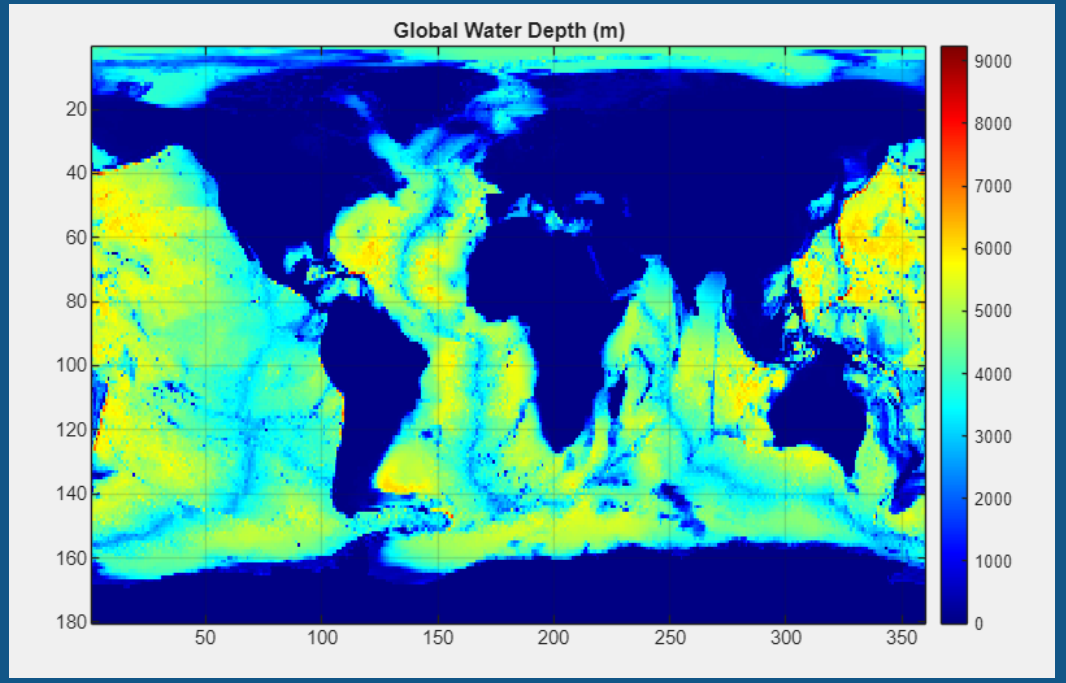
"The average ocean depth appears to be about 5000 meters, though this average does not necessarily represent the most common depths. Near mid ocean ridges and at continental margins, the average depth is much shallower, often only reaching depths of 1000 – 3000 meters. The deepest areas appear as trenches at convergent plate boundaries, especially in the Pacific. Many islands dot the Pacific, and…"



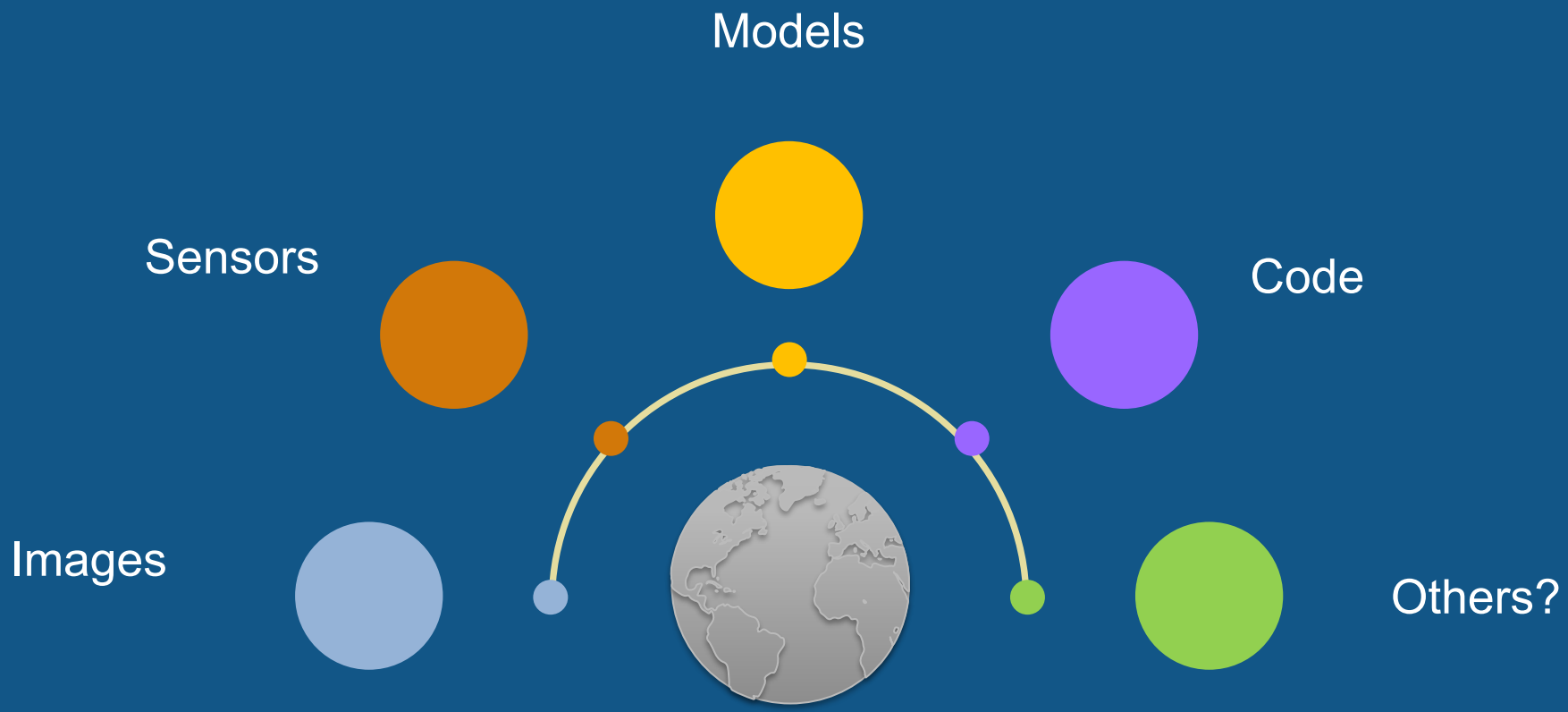
The importance of figures

clear, informative, scaled

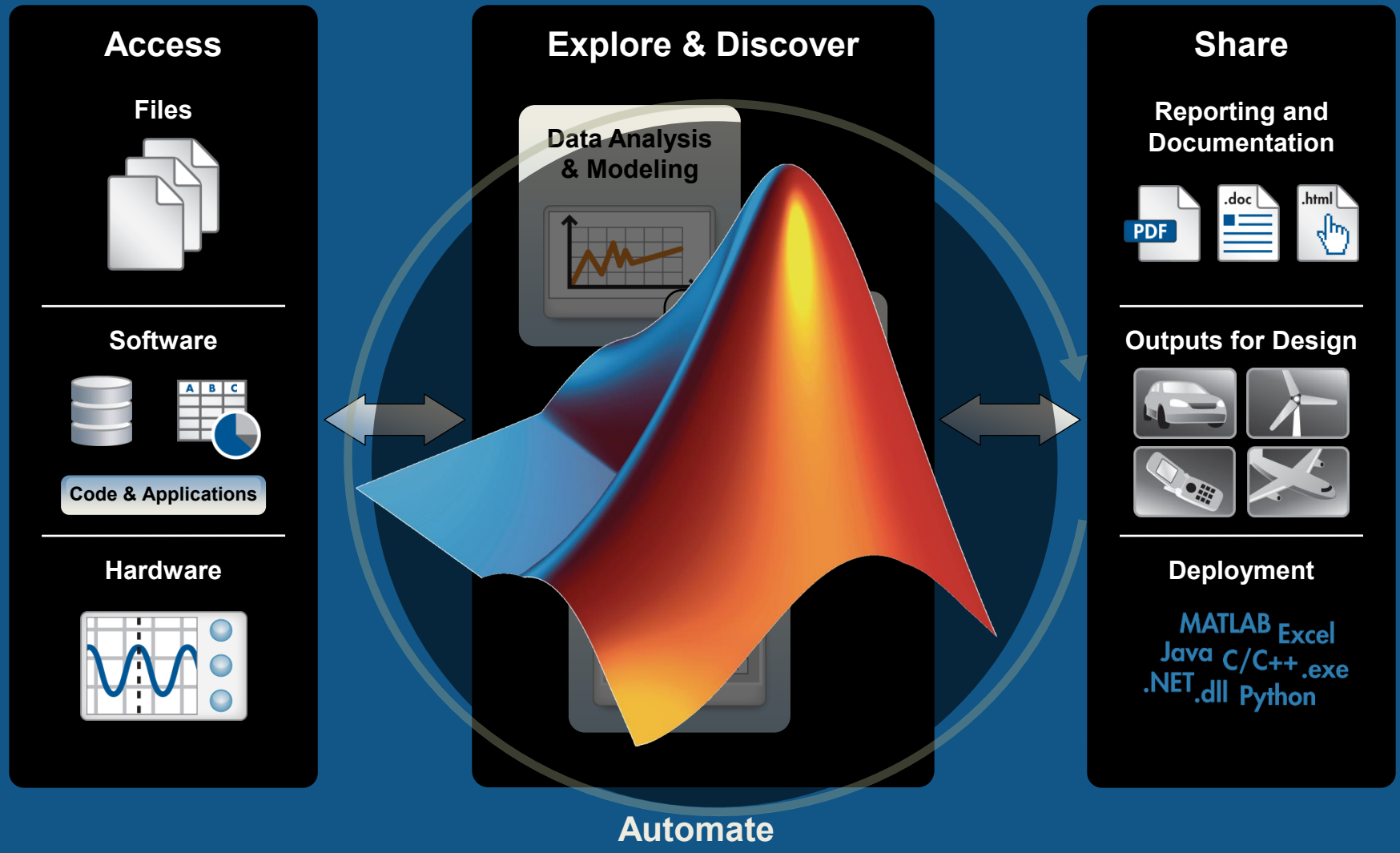




Where does geospatial data come from?



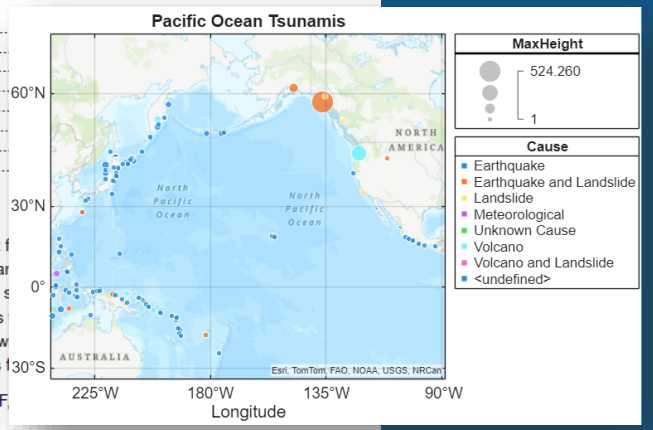
Data Analysis Workflow



Today's Results

Notebook1: Roadmap for Geospatial Mapping

Table of Contents



Introduction

Accessing and visualizing disparate data is a critical requirement f
tsunamis or hurricanes. However, sometimes just connecting to ar
visualization and analysis can be result in large hurdles and time s
working with and visualizing date, including multiple new features
data easier and requiring less coding. During this workshop, we w
and impact of tsunamis on coastal communities. The worksheets

- Access geospatial data, such as GIS shape files, netCDF
- Visualize data with different maps and figures
- Customize maps with relevant features
- Automate your data import, analysis, and mapping workflows
- Manage large datasets and best MATLAB coding practices for speeding up your code
- Find further mapping and geospatial resources

1

1. Import Excel Data

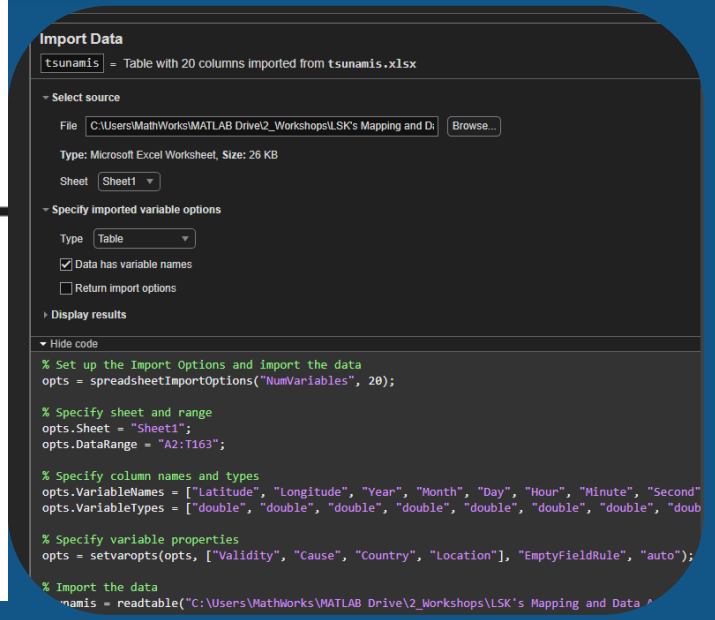
MATLAB has multiple different ways to access data. You can use the `Import Data` tool, double click on files in the File Browser, or use any number of direct 'read' functions.

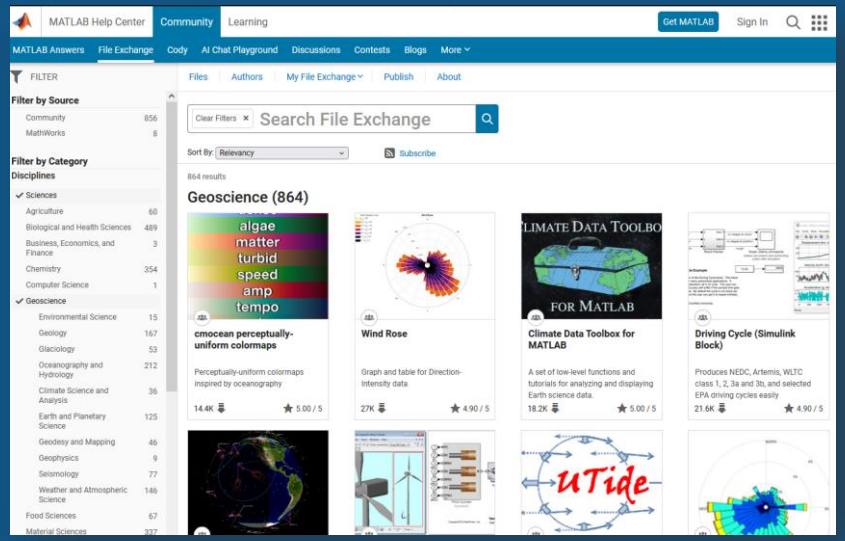
Q:What is one function you can use to access Excel or CSV files?

Alternatively, live scripts include the option of adding live controls and live tasks to easily set up an interactive GUI in your code. Use the live task below to browse for and import your data.

```
% Set up the Import Options and import the data
opts = spreadsheetImportOptions("NumVariables", 20);

% Specify sheet and range
opts.Sheet = "Sheet1";
```





Open in MATLAB Online

SUMMARY

Automate

Solve the problem once, use the solution every time

File Types

.shp, .xml, geotiff, netcdf, and more

Maps

Map axes, projections, geo basemaps

Resources

MathWorks Central → Answers, help, user community, more

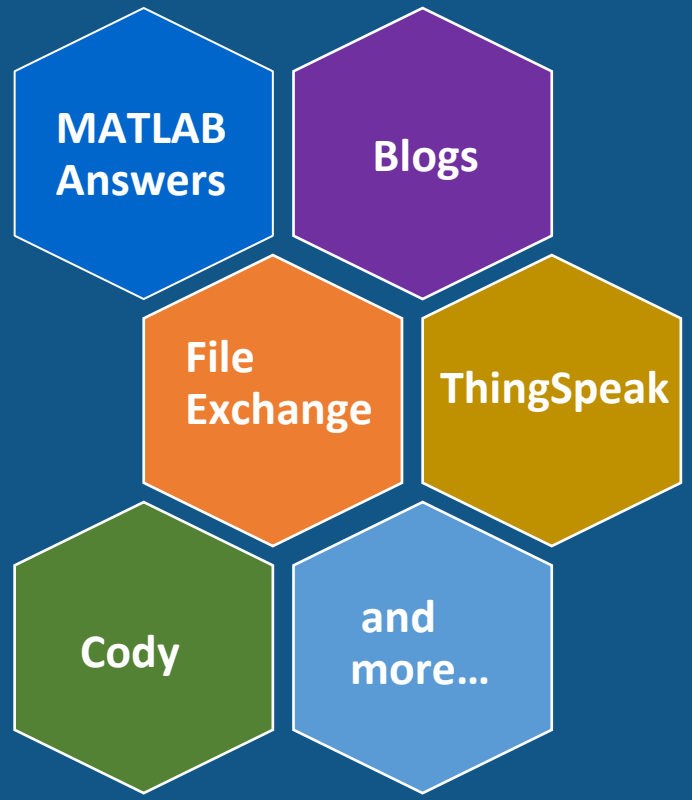
More Resources

- MATLAB Documentation
  - Mapping Toolbox
- File Exchange Courseware
  - https://www.mathworks.com/academia/courseware/search.html?q=&fq%5B%5D=courseware_discipline:earth_ocean_and_atmospheric_sciences&page=1
- Geoscience Resources
  - https://www.mathworks.com/solutions/earth-ocean-atmospheric-sciences.html

MATLAB Central Community

MATLAB Central

Learn | Contribute | Connect



MATLAB Answers: Q&A forum; most questions answered in < **1 hour**

File Exchange: Download code from a huge repository of free code including **tens of thousands** of open source community files

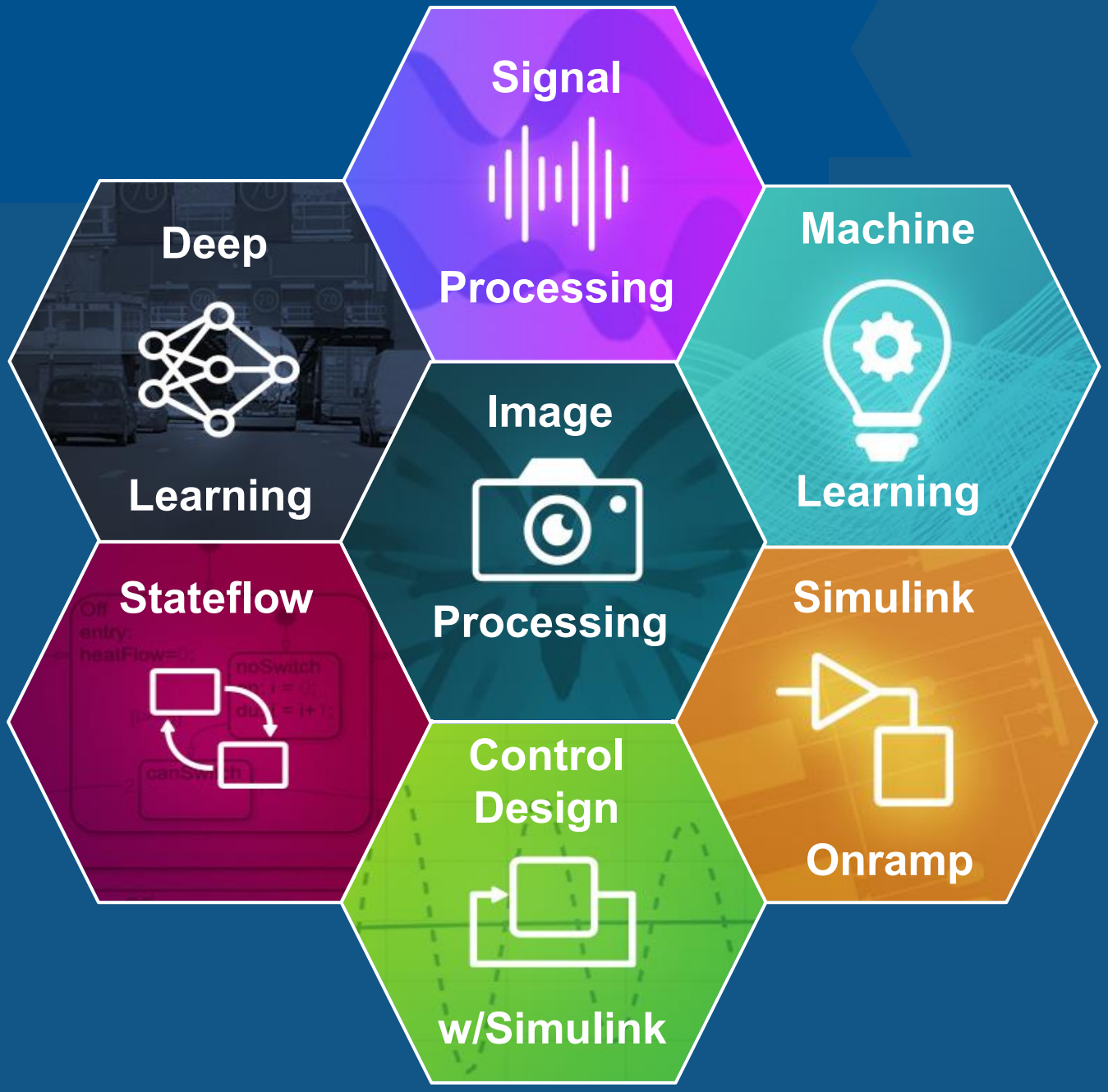
Cody: Sharpen programming skills while having fun

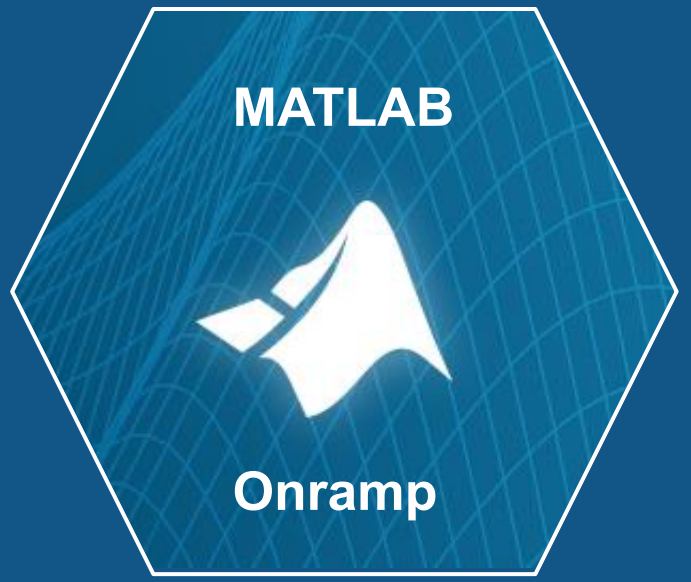
Blogs: Get the inside view from Engineers who build and support MATLAB & Simulink

ThingSpeak: Explore LoT Data

And more for you to explore…

Sel-Paced Courses





Geoscience Learning Path

Data Analysis in MATLAB

LEARNING PATH

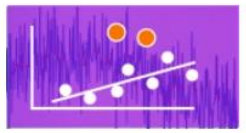
Data Analysis in MATLAB

Share Learning Path | Digital Credential & Certificate

Tables

2 hours | Languages

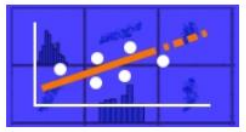
Import, manage, and manipulate tabular data.



Clean and Prepare Data for Analysis

1.5 hours | Languages

Perform common data cleaning techniques.



Common Data Analysis Techniques

1 hour | Languages

Analyze relationships between variables and model patterns in d

Find and Extract Subsets of Data

1 hour | Languages

Use logical indexing to filter data and count elements.

Calculations on Grouped Data

1 hour | Languages

Perform calculations on groups of data.

Visualization in MATLAB

LEARNING PATH

Visualization in MATLAB

Share Learning Path | Digital Credential & Certificat

Explore Data with MATLAB Plots

1.5 hours | Languages

Customize, annotate, and export a variety of visualizations.

Plot Beyond the Second Dimension

1.5 hours | Languages

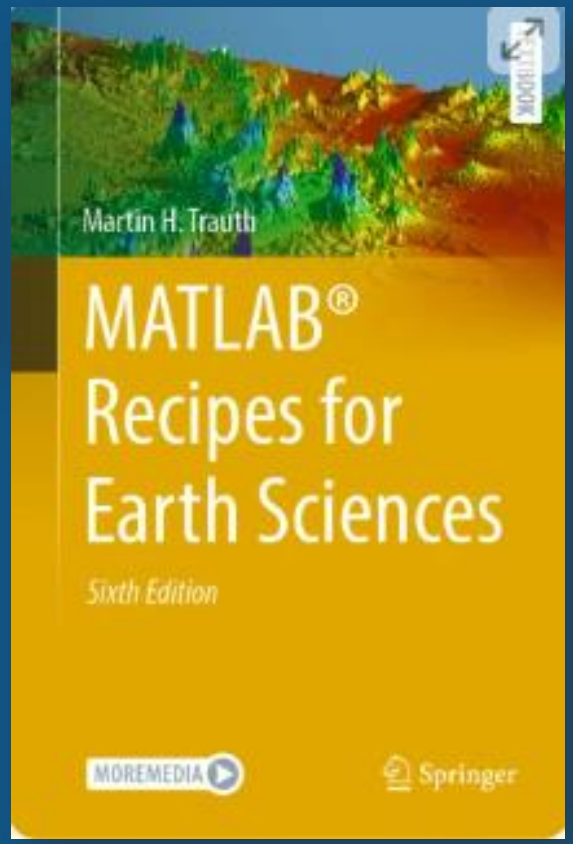
Visualize three-dimensional data using surface plots and images.

How MATLAB Graphics Work

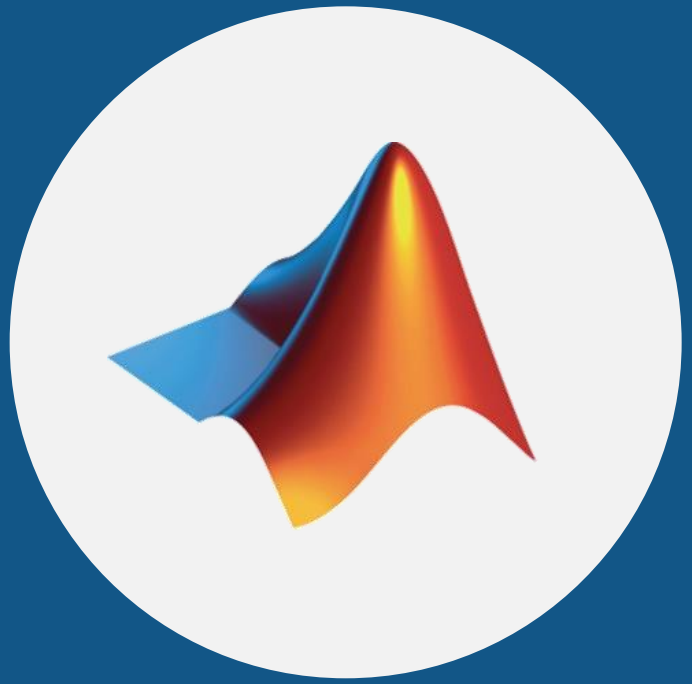
1 hour | Languages

Use the graphics hierarchy to gain fine control over graphics.

MATLAB® Recipes for Earth Sciences | SpringerLink 2025



Contact Information



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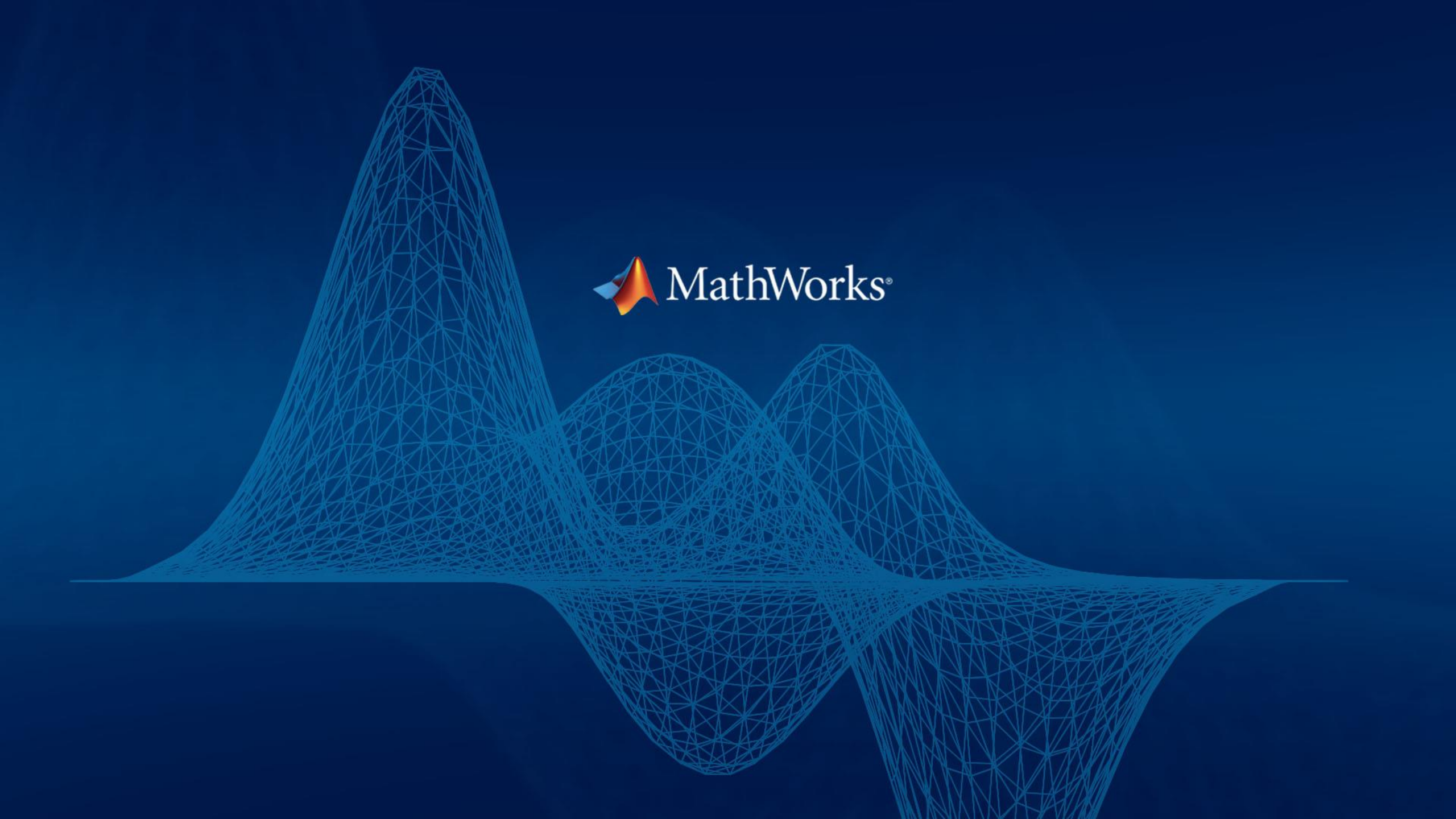

MathWorks®

MathWorks Call for Research Proposals

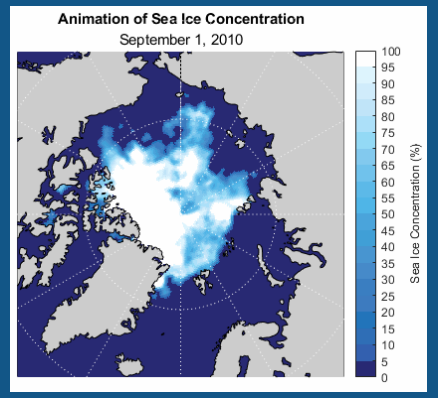
Notify Me when Proposals are Open

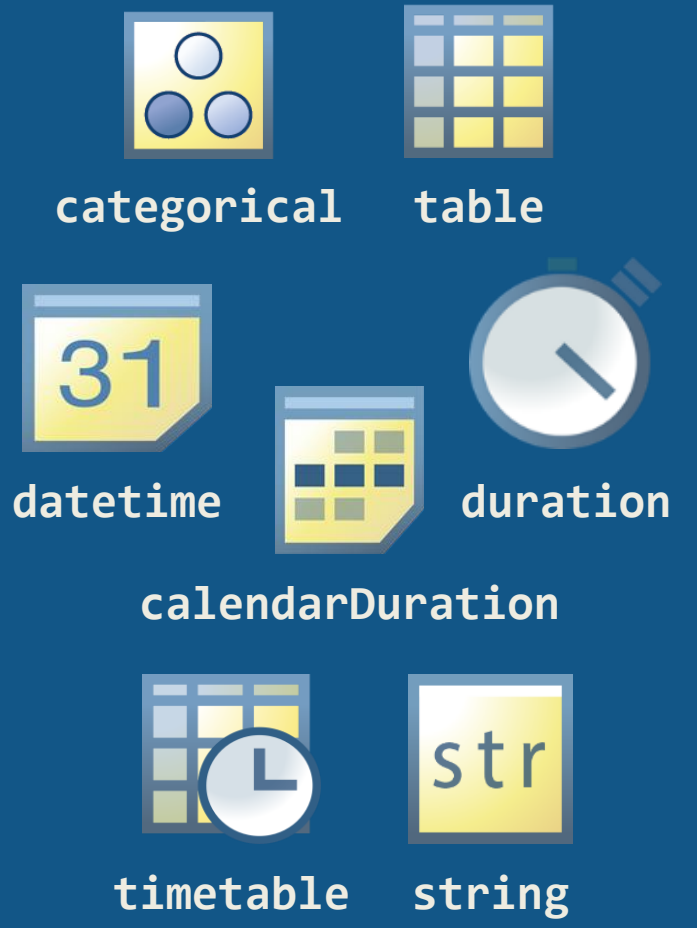
- PI applicant must be current full-time faculty at an accredited academic institution that awards research degrees to Ph.D. students
- use of MATLAB and Simulink products in conducting the proposed work

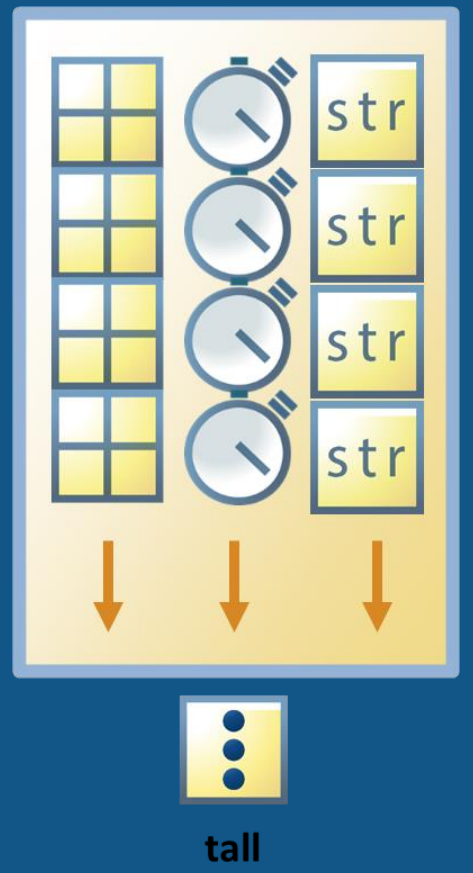
Award recipients are expected to have identified a commercial (or government) partner that is willing to collaborate on the proposed project. The commercial partner can be an organization, company, or entity that operates within the relevant industry or market. A letter of intent from the commercial partner indicating its commitment to collaborate on the project should be provided with the proposal.

Supported data formats and types in MATLAB

- ***Raster file formats***: GeoTIFF, USGS DEM, DEM, DTED, Arc ASCII Grid, GTOPO30, ETOPO, and worldfile
- ***Vector file formats***: ESRI shapefiles, KML, GPX, VMAP0, and GSHHS
- ***Image file formats***: TIFF, JPEG, PNG, JPEG2000, LandSat, NITF and HDR
- ***Scientific data***: NetCDF, HDF5, GRIB, CDF, FITS, and multiband files (BIP, BIL, BSQ)
- Community Tools to work with miniSEED, SAC and SEG-Y







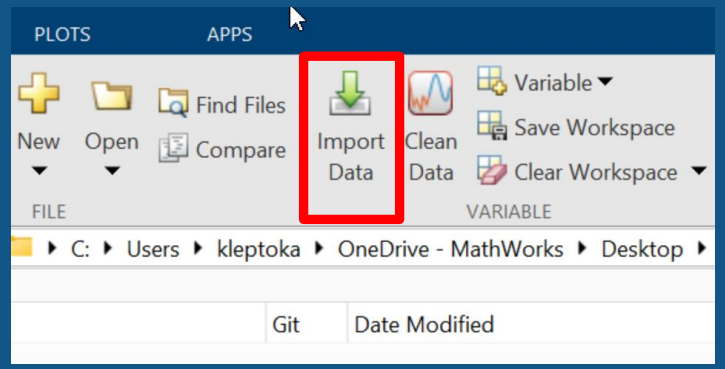
Data Formats >>

Data Format Functions >>

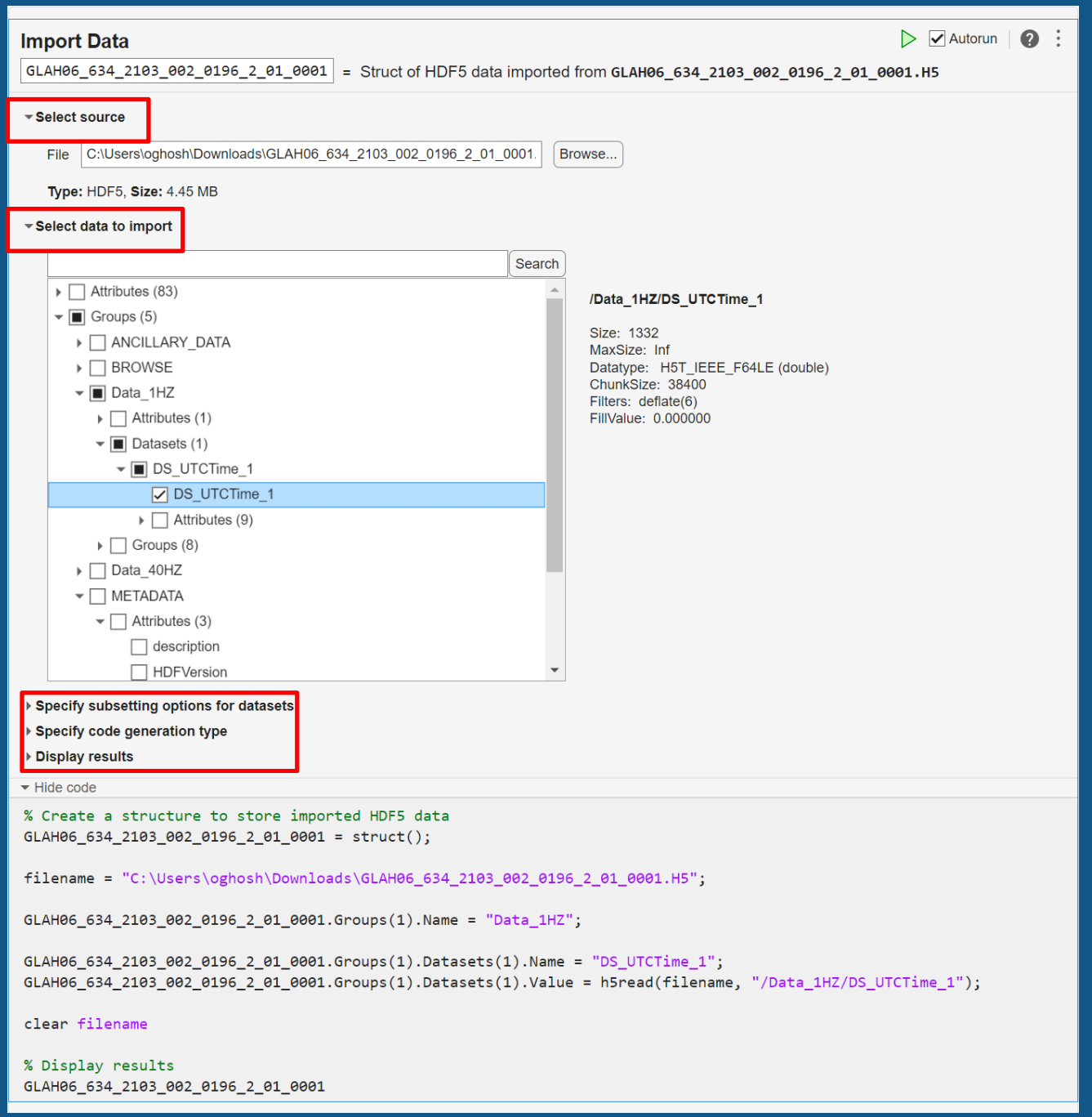
Tall Arrays >>

Data Handling in MATLAB: Import Data Live Task now supports:

- ***NetCDF (R2023b)***
- ***HDF5 (R2024a)***
- ***GRIB (R2024b)***

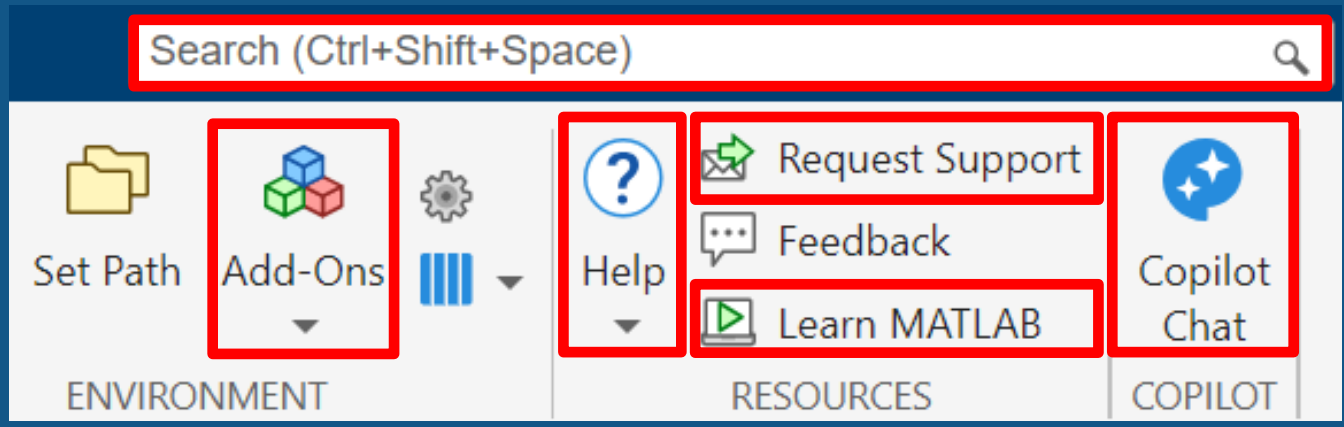


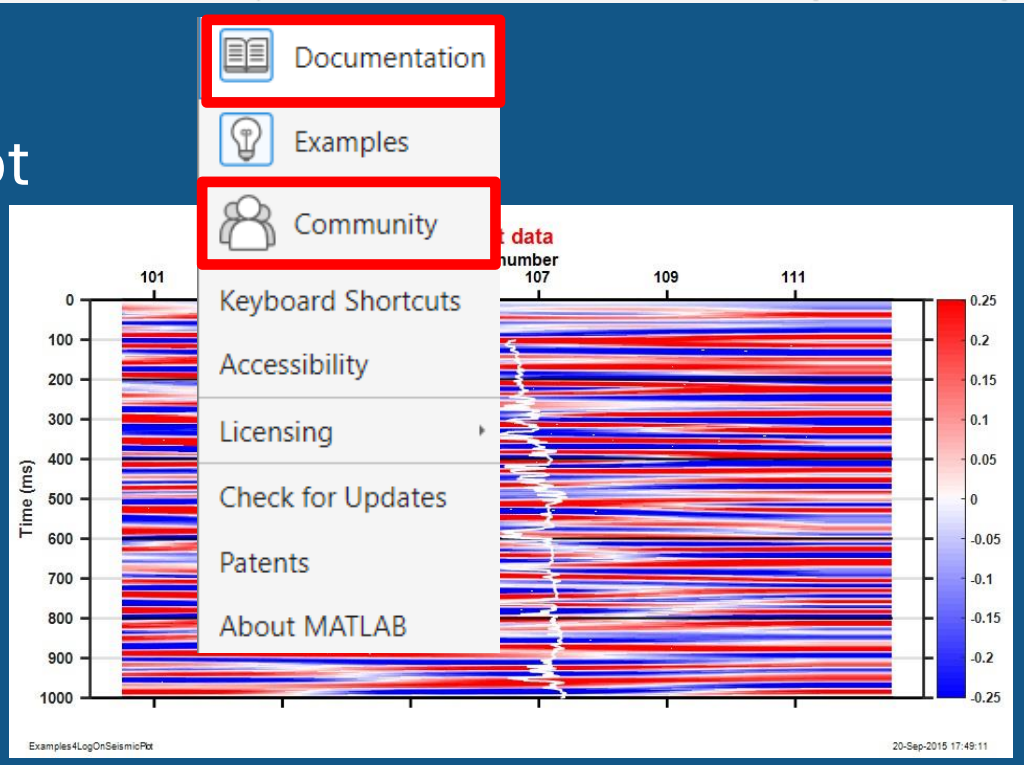
Code Generated



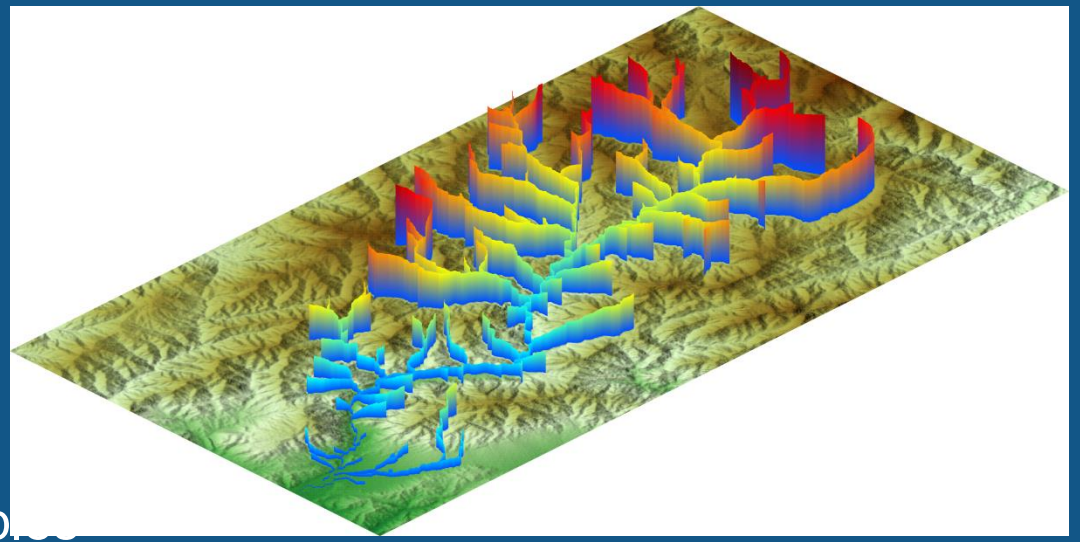
Self-Explore Resources

- Desktop Search!
- MATLAB documentation
- MATLAB answers
- AI chat playground, MATLAB GPT and copilot
- MATLAB Community Toolboxes
- MATLAB self-paced courses
- Request Support
- Google “MATLAB” + *keyword/phrase*

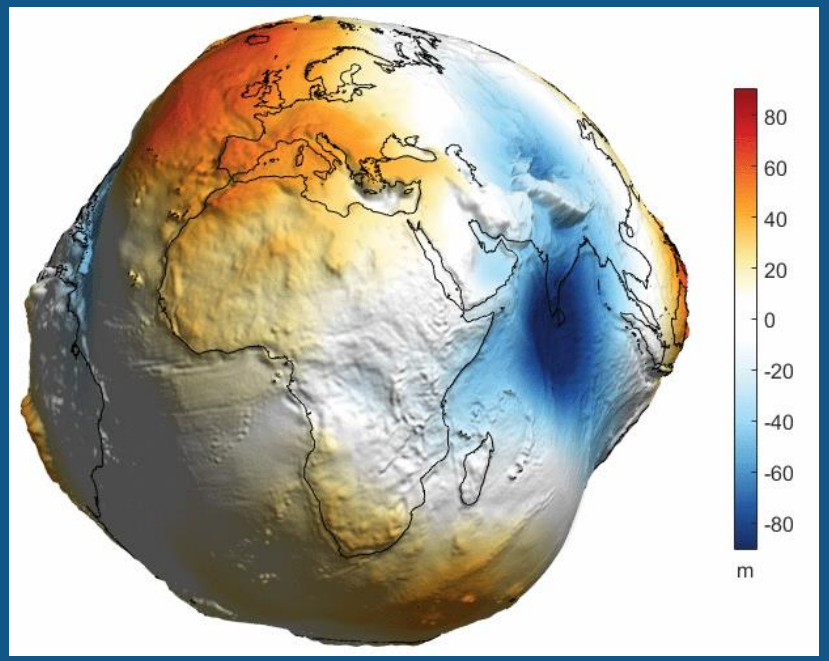


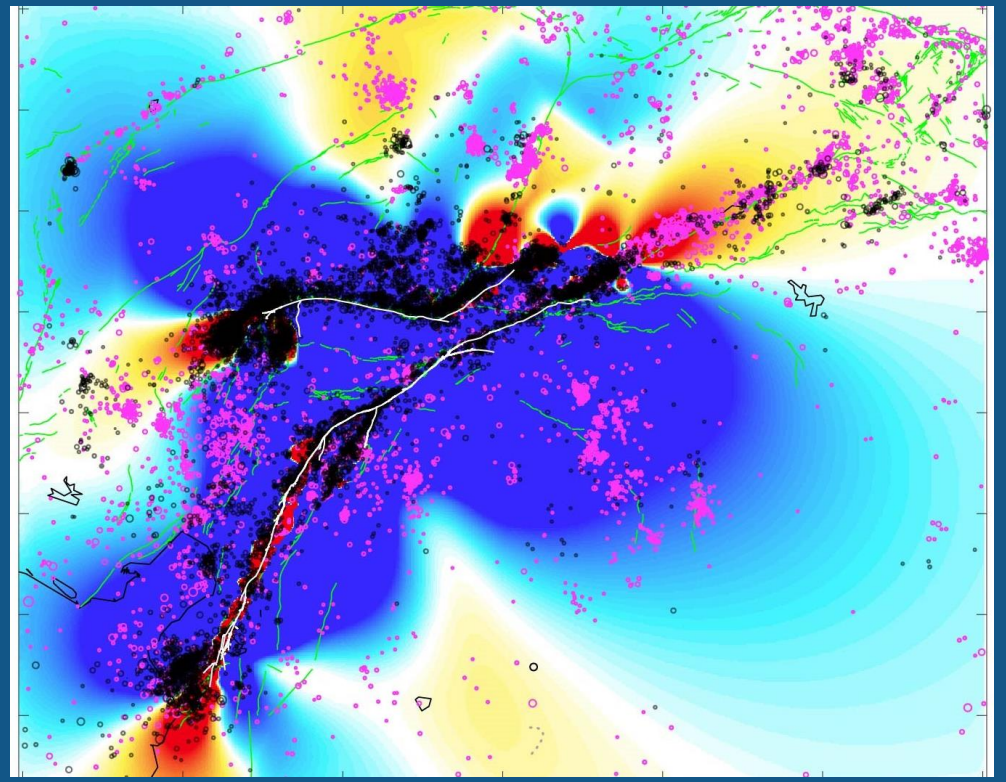


Visualization and Mapping with MATLAB



- Data Import and Analysis – set of courses
- Explore Data with MATLAB Plots - course
- MATLAB Plot Gallery – documentation & examp
- Mapping Toolbox - documentation & examples



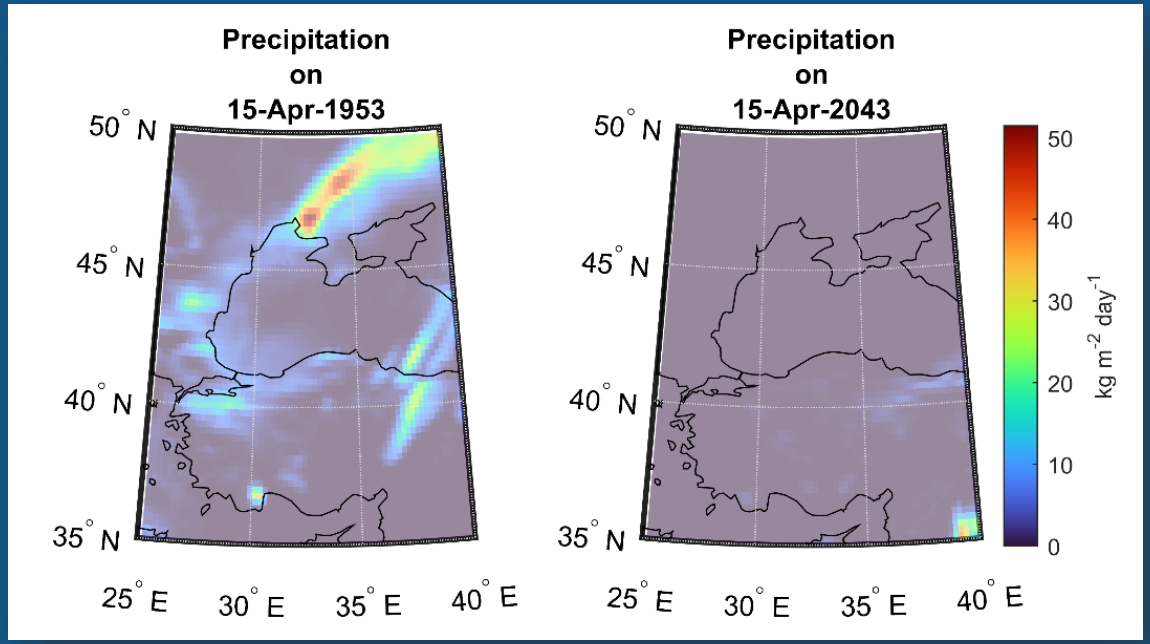


Code example: Import, analyze and visualize web netCDF (CMIP6)

Code and access to data available at:

- GitHub
- File Exchange
- Reproducible Capsule in Code Ocean with DOI

Code in **.m** file, live script (**.mlx**) and jupyter notebook (**.ipynb**)



Official MathWorks MATLAB kernel for Jupyter released (The MATLAB Blog)