SOS Ed Forum

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A Python-based Recipe for Weather and
Climate Reanalysis Visualization for the Science-on-a-Sphere

August 14, 2024

As announced at the workshop SOS Explorer is now free!

https://sos.noaa.gov/sos-explorer/sosx-download/

Reminder!

Presentations from the workshop are available here:

https://tinyurl.com/bdydzmju

Today!

A Python-based Recipe for Weather and Climate Reanalysis Visualization for the Science-on-a-Sphere

- Kevin Tyle, Ross Lazear, SUNY Albany

New dataset additions - SOS Team

PowerPoint Slide Show - SoSUAlbany - PowerPoint

A Python-based Recipe for Weather and Climate Reanalysis Visualization for the Science-on-a-Sphere

Kevin Tyle

Ross Lazear

Department of Atmospheric and Environmental Sciences
University at Albany
Albany, New York

Slide 1 of 23

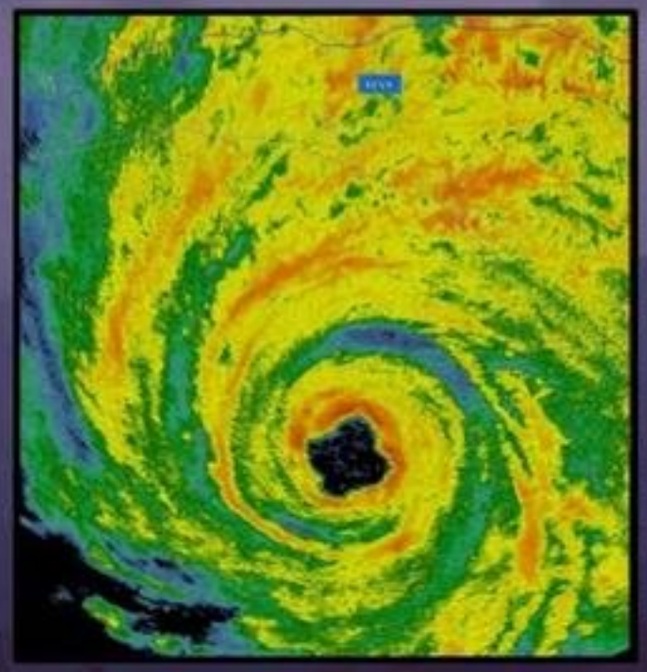
Outline

- Department of Atmospheric and Environmental Science programs
- ETEC building at the University at Albany
- Programming, data analysis and visualization courses at UAlbany
- Exploration of reanalysis datasets
- Jupyter notebook for global reanalysis data for SOS

Department of Atmospheric and Environmental Sciences

- Bachelor's Degrees in
  - -Atmospheric Science
  - -Environmental Science
  - -Climate Science
- Applied MS in Atmospheric Science
- MS in Atmospheric Science
- PhD in Atmospheric Science

Department of Atmospheric and Environmental Sciences

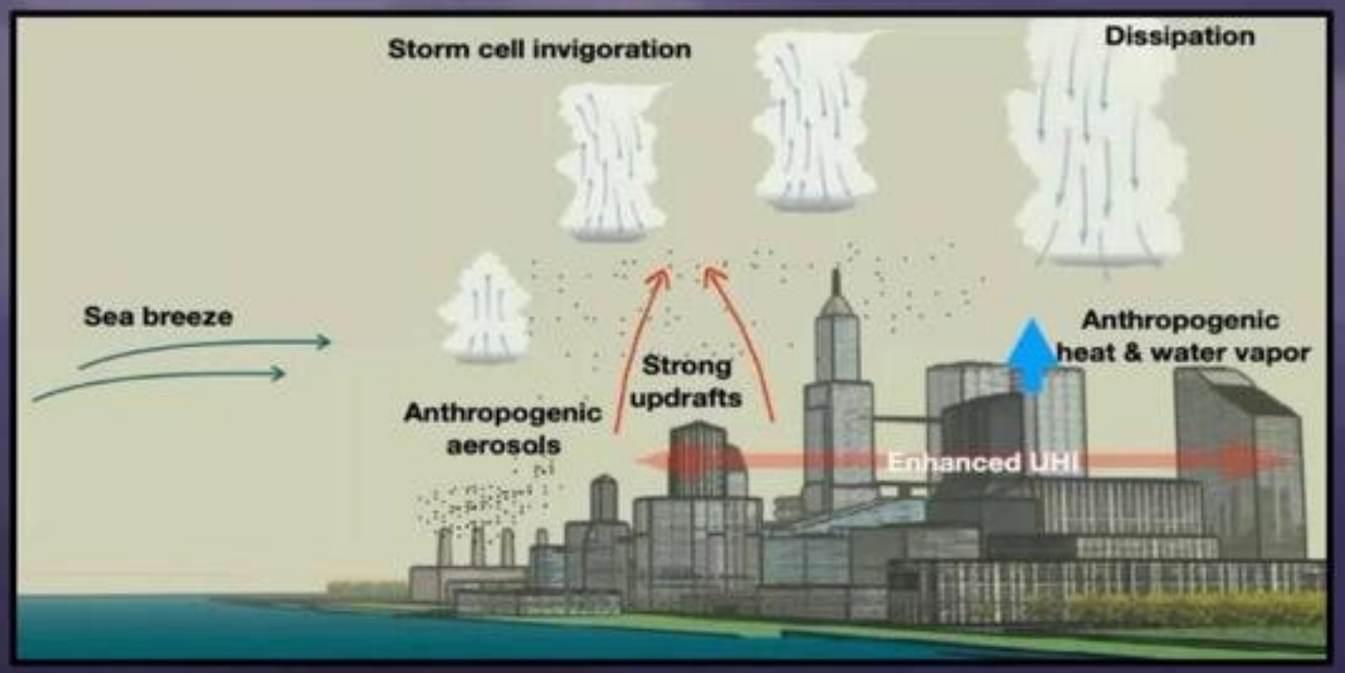


Synoptic meteorology
Tropical meteorology
Mesoscale meteorology

Department of Atmospheric and Environmental Sciences

Paleoclimatology
Climate change and variability
Climate modeling

Atmospheric Sciences Research Center



Atmospheric chemistry and air pollution
Boundary layer meteorology
Urban meteorology
Solar and wind energy

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ETEC Building - UAlbany

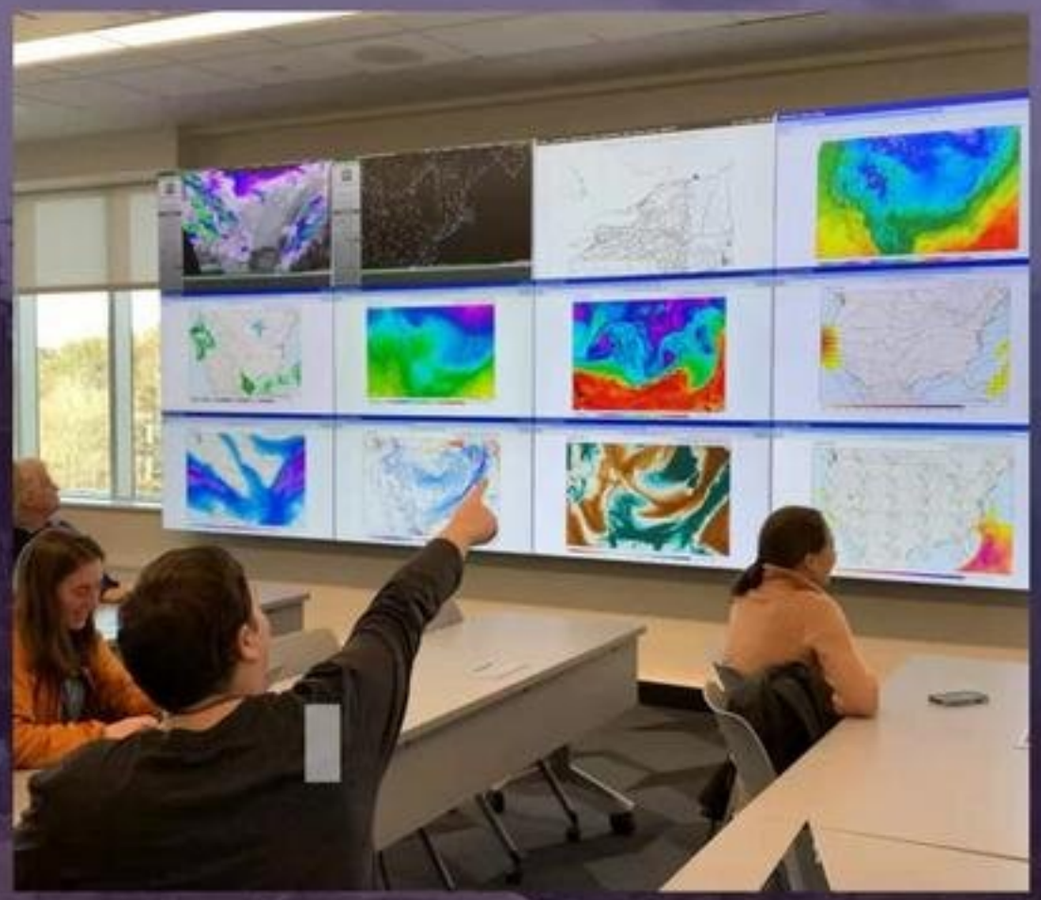
ETEC Building - UAlbany

- Department of Atmospheric and Environmental Sciences
- Atmospheric Sciences Research Center
- National Weather Service – Albany WFO
- New York State Mesonet
- State Weather Risk Communication Center

- College of Emergency Preparedness, Homeland Security, and Cybersecurity

- Materials Chemistry
- Environmental and Sustainable Engineering

ETEC Building - UAlbany



Weather Map Room

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ETEC Building - UAlbany

Weather observation deck

Views of the Catskills

ETEC Building - UAlbany

"Collaboratorium"

First-year students touring geothermal system

ETEC Building - UAlbany

Fluids Lab

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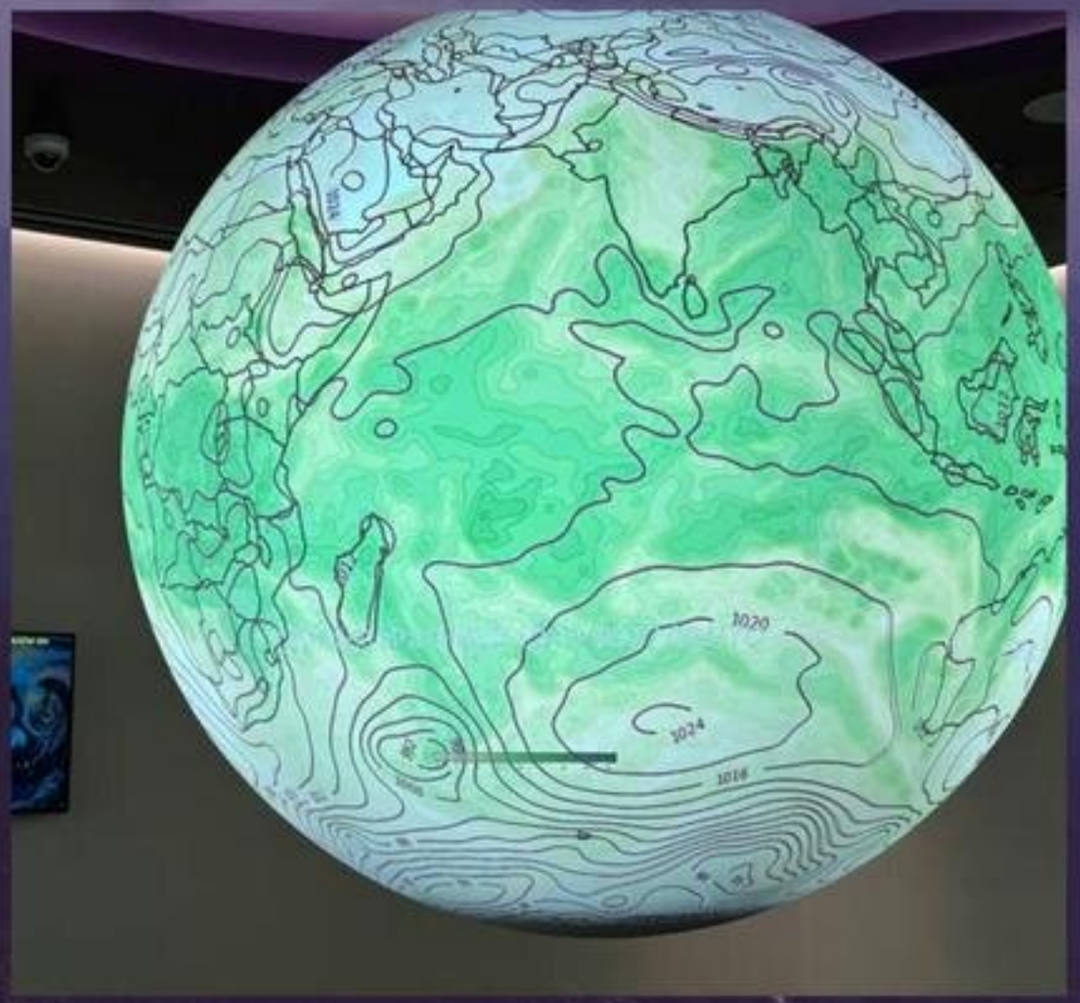
ETEC Building - UAlbany

ETEC Building - UAlbany

ETEC Building - UAlbany



Programming, Data Analysis and Visualization in DAES

- **Programming language: Python**

- **ATM 350: Meteorological Data Analysis and Visualization**
  -Junior-year atmospheric science majors

- **ATM 433/533: Advanced Geophysical Data Analysis and Visualization**
  -Senior-year atmospheric science majors and graduate students

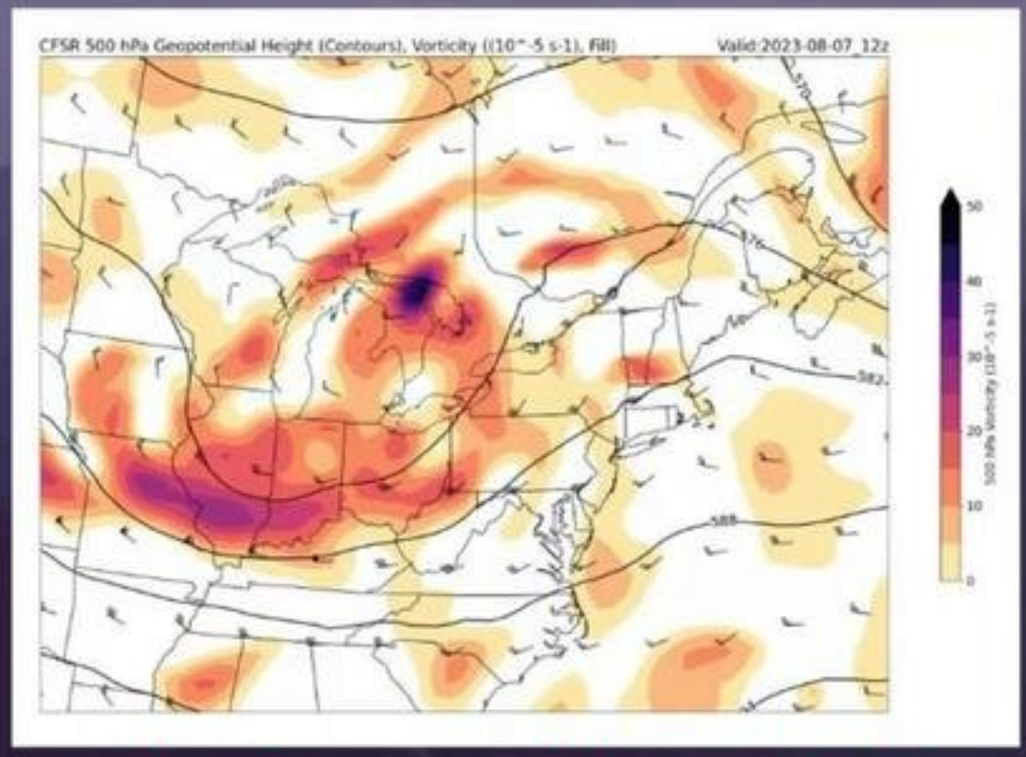
ATM 350 – Meteorological Data Analysis and Visualization

- Linux command line and bash shell scripting
- Python using Jupyterlab
- Pangeo software ecosystem
- Final project:
  - -Weather event case study
  - -Reanalysis datasets: CFSR, ERA5

ATM 350 – Meteorological Data Analysis and Visualization

- **Reanalysis dataset exploration**

- Xarray
- Matplotlib
- Cartopy
- MetPy



Alex Kramer, Class of 2025

Jupyter Notebook "Recipe" for Science on a Sphere

- Data access
- Prototype for a single time
- Test visualization on Cartopy plot and *maptoglobe.com*
- Create SoS target directory structure
- Loop over times and create the visualizations
- Load on SoS, suggest improvements, re-generate
- Run playlist on UAlbany's "Showcase Day"

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Let's run through our Jupyter notebook!

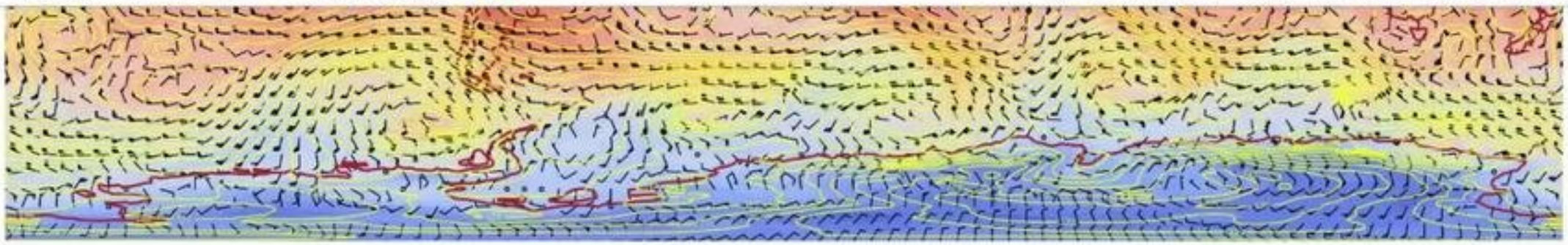
ktyle/SoS-Python-Recipes | SOS_CFSR.ipynb - JupyterLab

turing.atmos.albany.edu:8000/user/ktyle/lab/tree/0notebooks/atm350/sos/SOS_CFSR.ipynb

File Edit View Run Kernel Tabs Settings Help

Launcher | SOS_CFSR.ipynb

Markdown | Notebook | Python 3 Jan. 2024 Environment



If you'd like, go to http://maptoglobe.com and view how your graphic might look on the sphere.

Note: If you get an error message from the *maptoglobe.com* site, try reloading. Usually it will load correctly on the 2nd try.
If it still fails, try **http://maptoglobe.com**

Follow these steps:

1. Download the `test_CFSR_SOS.png` file to your local computer

Simple | 0 | 2 | Python 3 Jan. 2024 Environment | Idle | Mode: Command | Ln 1, Col 1 | SOS_CFSR.ipynb | 0

PowerPoint Slide Show - SoSUAlbany - PowerPoint

Selena Ramos, Class of 2025

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Future work

- Transition from in-house CFSR to cloud-served ERA5
- Use recipe for real-time global NWP output
  - Prototype for integrated vapor transport
- GitHub repository: https://github.com/ktyle/SoS-Python-Recipes


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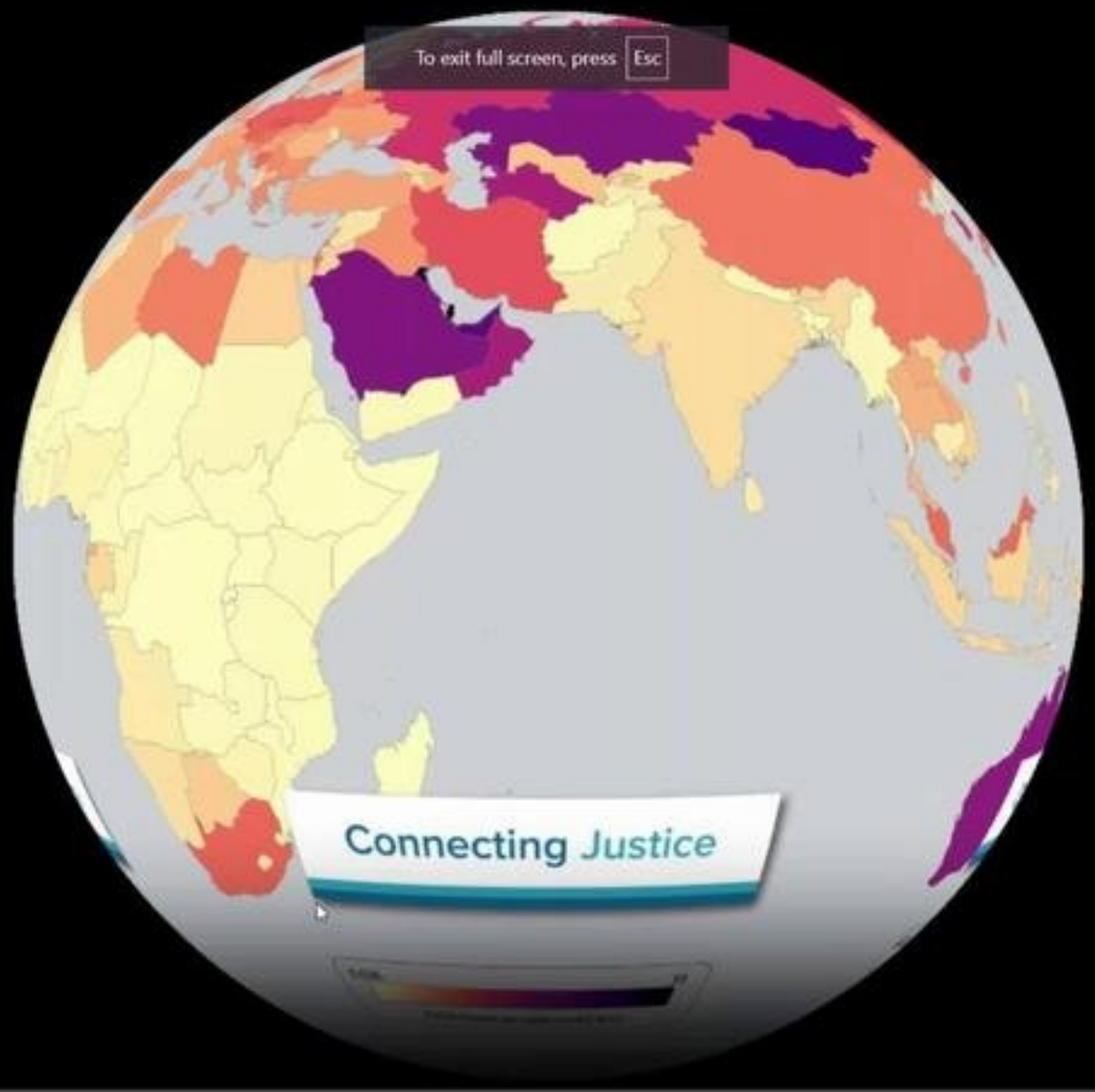
8/14/2024



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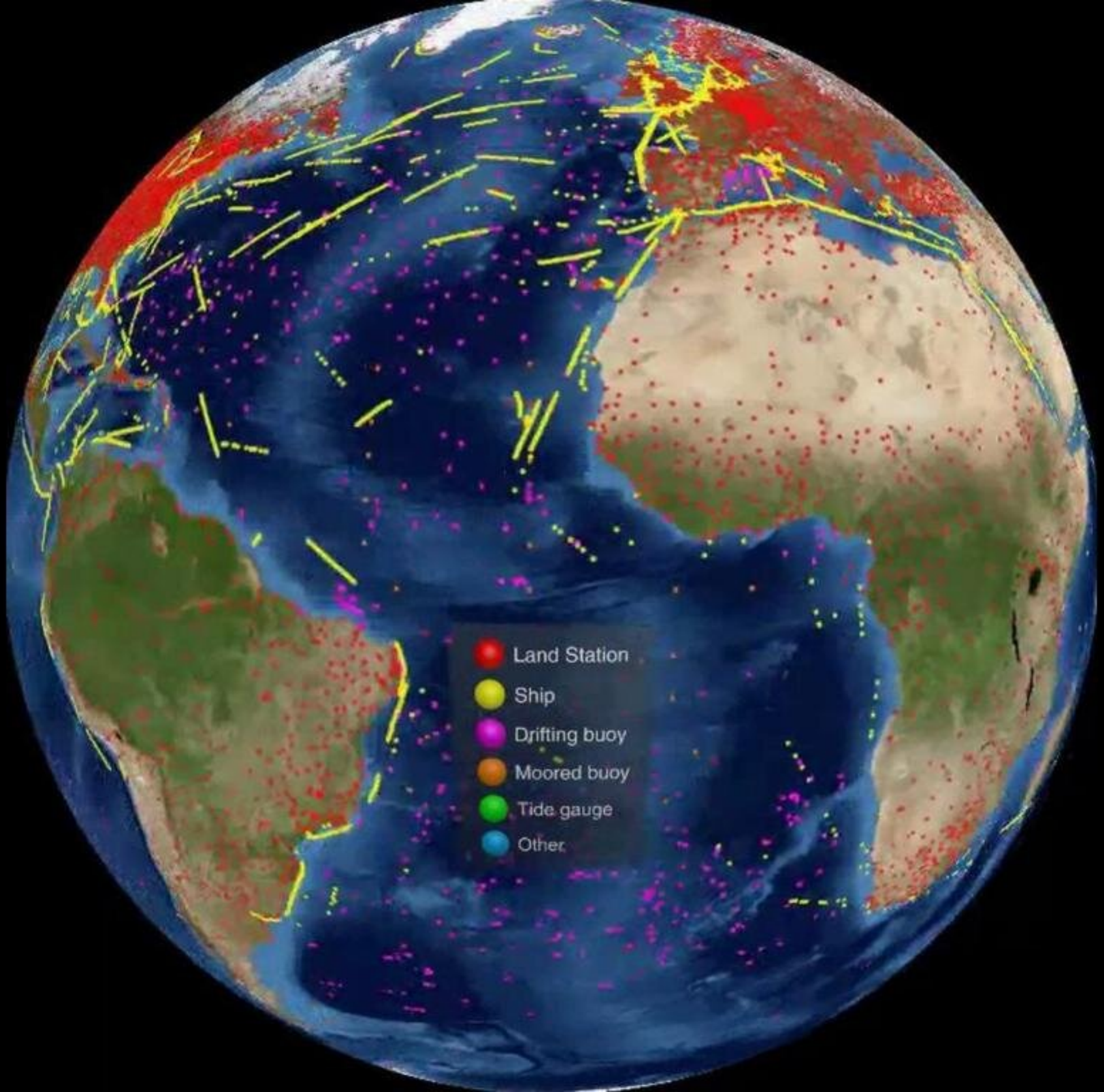
Land Station
Ship
Drifting buoy
Moored buoy
Tide gauge
Other

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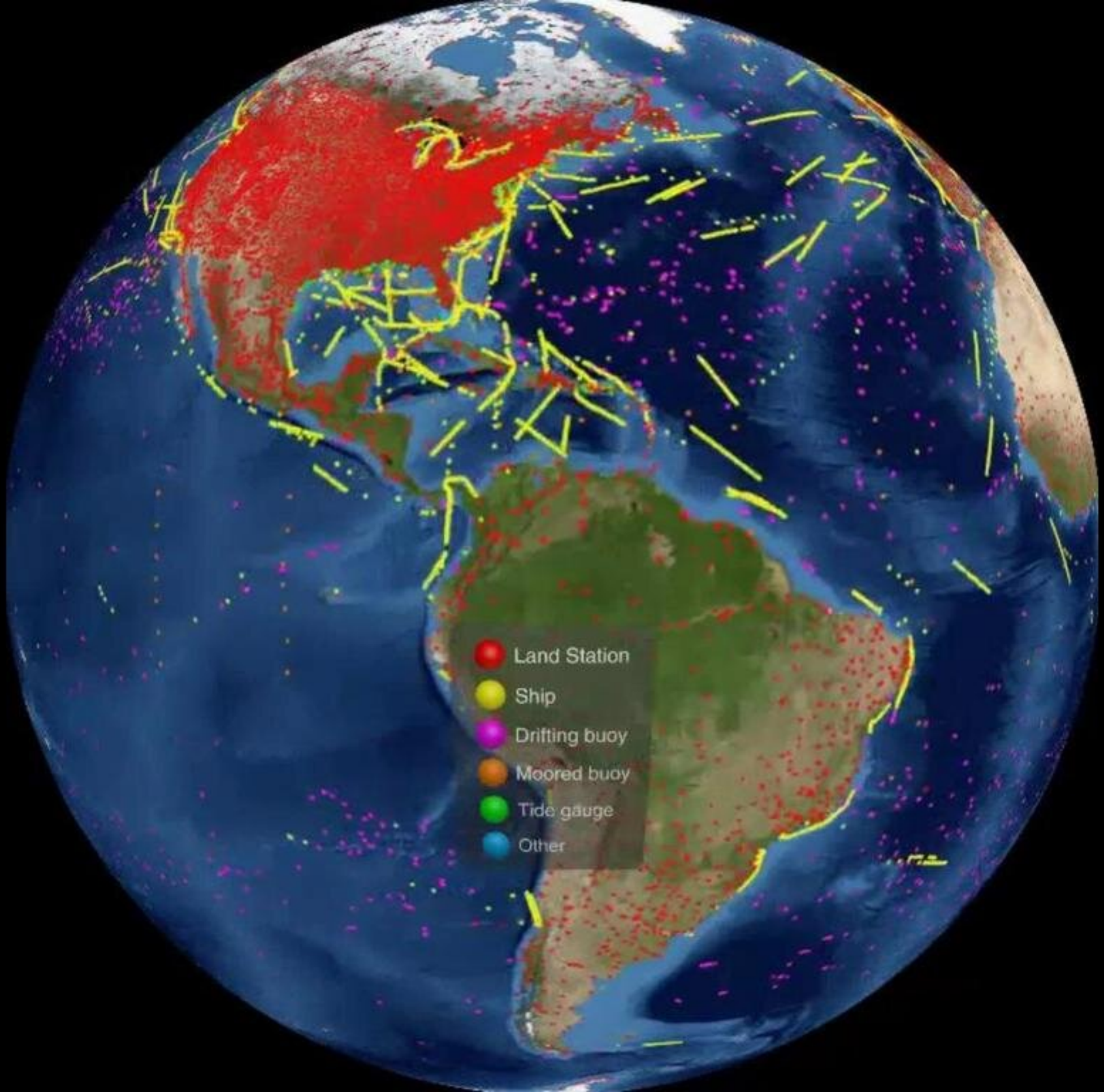
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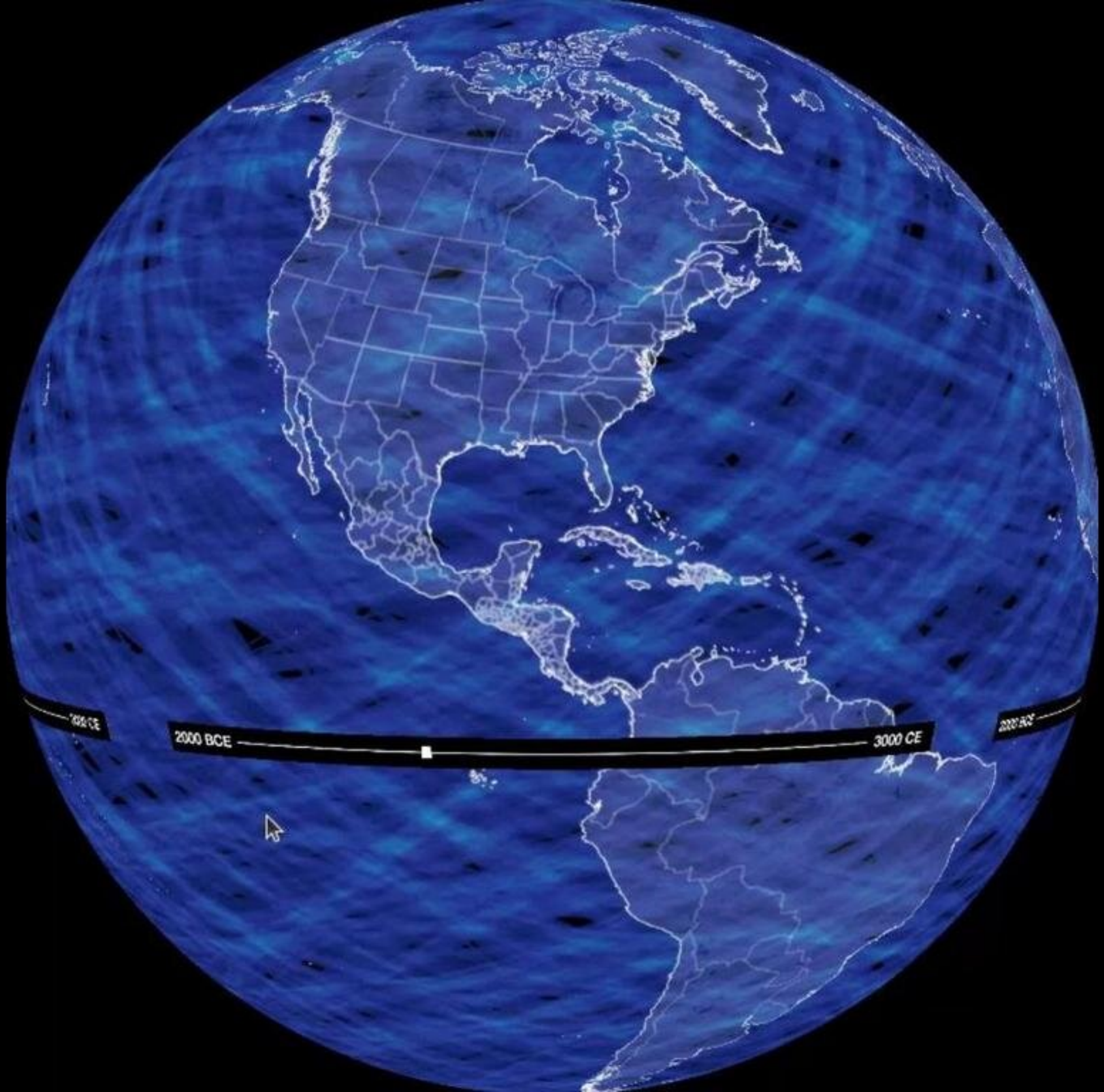
2000 BCE
3000 CE