Cloud-based User Services for Lightning Data at GHRC DAAC

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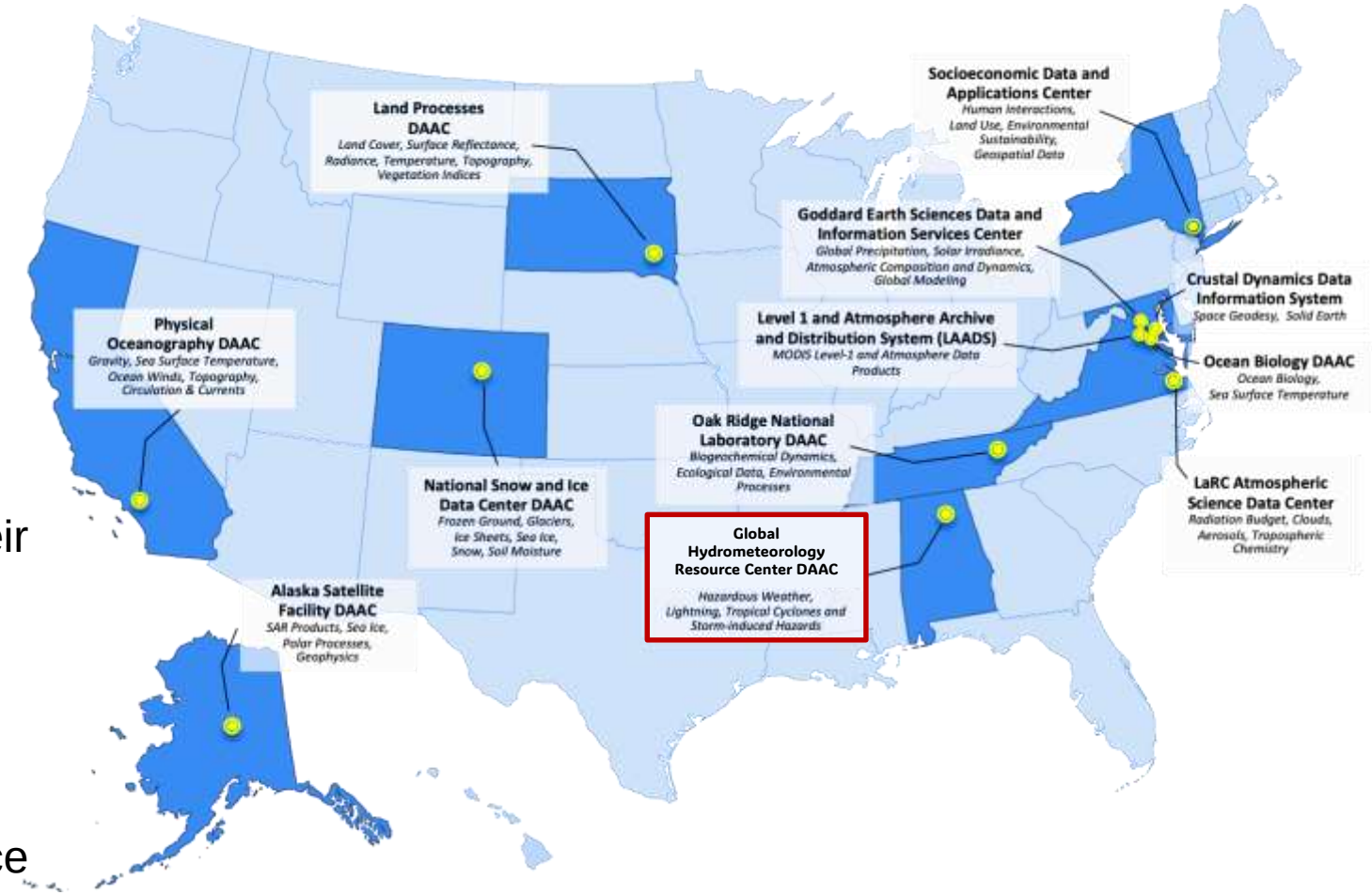
NASA's Earth Science DAACs and GHRC

- **Distributed Active Archive Centers (DAAC)**
  - NASA's Earth Observing System Data and Information System (EOSDIS)
- **Role**
  - Process, archive, document, and freely distribute Earth Science data
  - Enable the use of these data by users in their research
- **GHRC**
  - Global Hydrometeorology Resource Center
  - 1 of 12 NASA DAACs
  - Collaboration between NASA Marshall Space Flight Center and the University of Alabama in Huntsville



NASA's Distributed Active Archive Centers

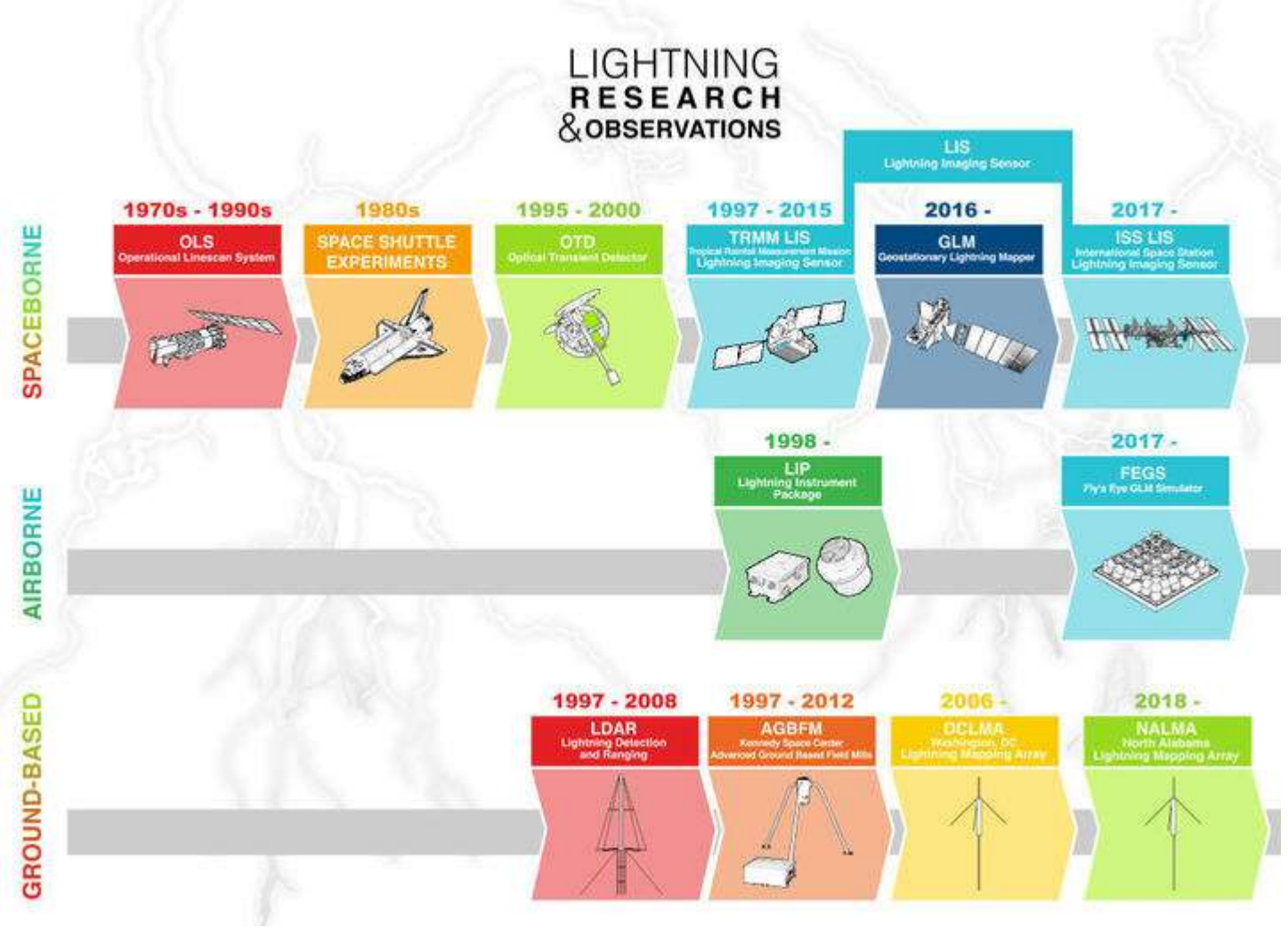
GHRC's Activities

- **Earth Science Data**
  - Lightning, storm hazards, field campaigns
- **Cloud-based Archive**
  - All datasets are in the cloud
  - Datasets have digital object identifiers (DOIs)
  - Campaigns receive a DOI
  - Data ingest in the cloud through Earthdata Pub
- **User Services**
  - Support dataset ingest and archival
  - Documentation (user guides, micro articles)
  - Science enabling with jupyter notebooks and dataset analysis and visualization

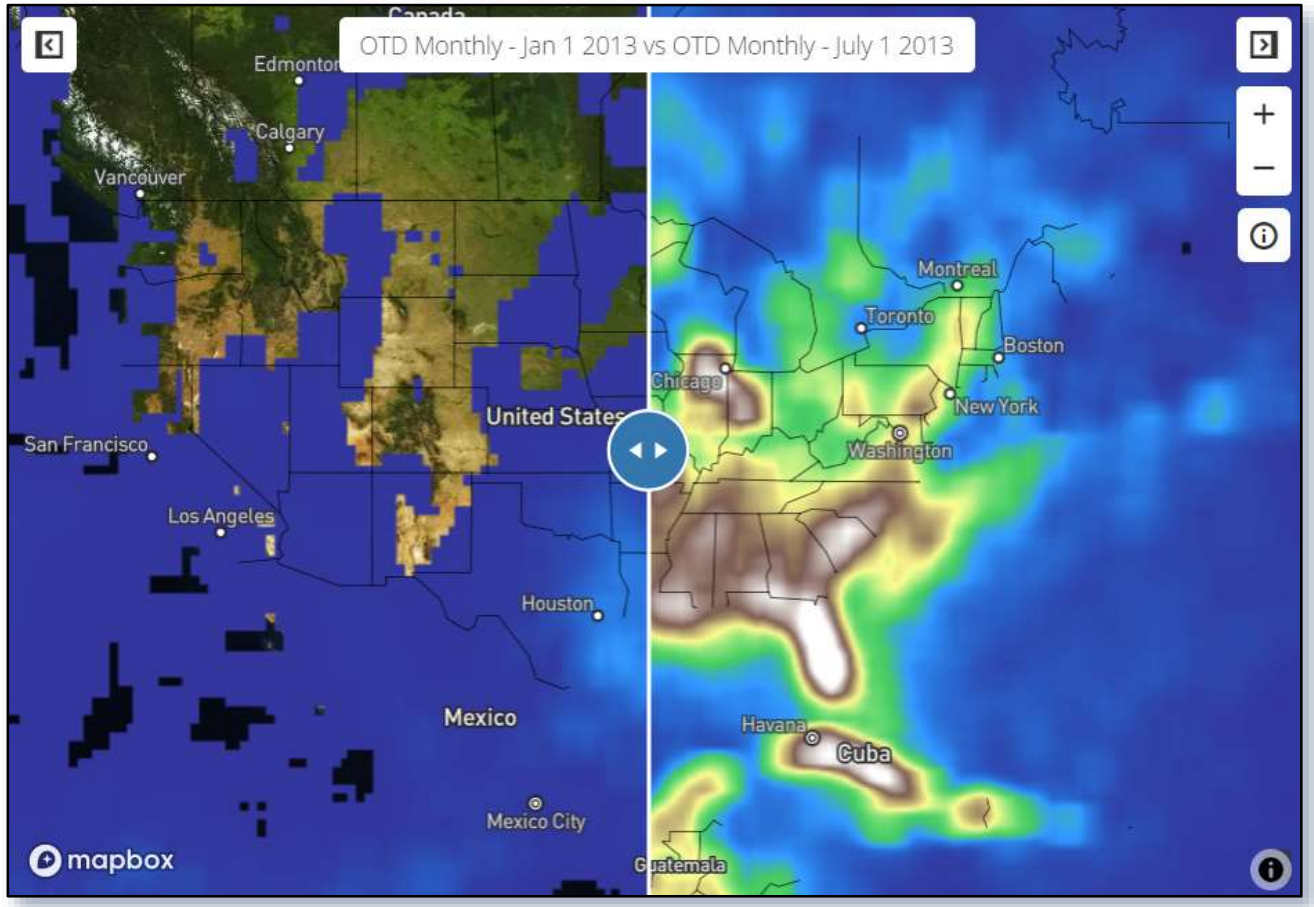
GHRC provides a comprehensive archive of datasets for the analysis of dynamical and physical processes of storm hazards, lightning, precipitation, convective and tropical systems, and field campaigns. GHRC emphasizes cloud-based tools, science expertise, and open science enabling users to more fully access, analyze, and visualize GHRC's unique holdings.

GHRC Is NASA's Lightning DAAC

- **Available Data**
  - Variety of datasets available
    - Ground-, airborne, and space-based
  - GHRC has worked with several from ALOFT
- **Anticipated Data**
  - Waiting for NASA approval on ALOFT
  - WMO global, gridded lightning
  - GLM Cluster Integrity Exception Resolution and Reclustering Algorithm (CIERRA)
  - Lightning beyond the troposphere
- **User Services**
  - Field Campaign Explorer and Lightning Dashboard



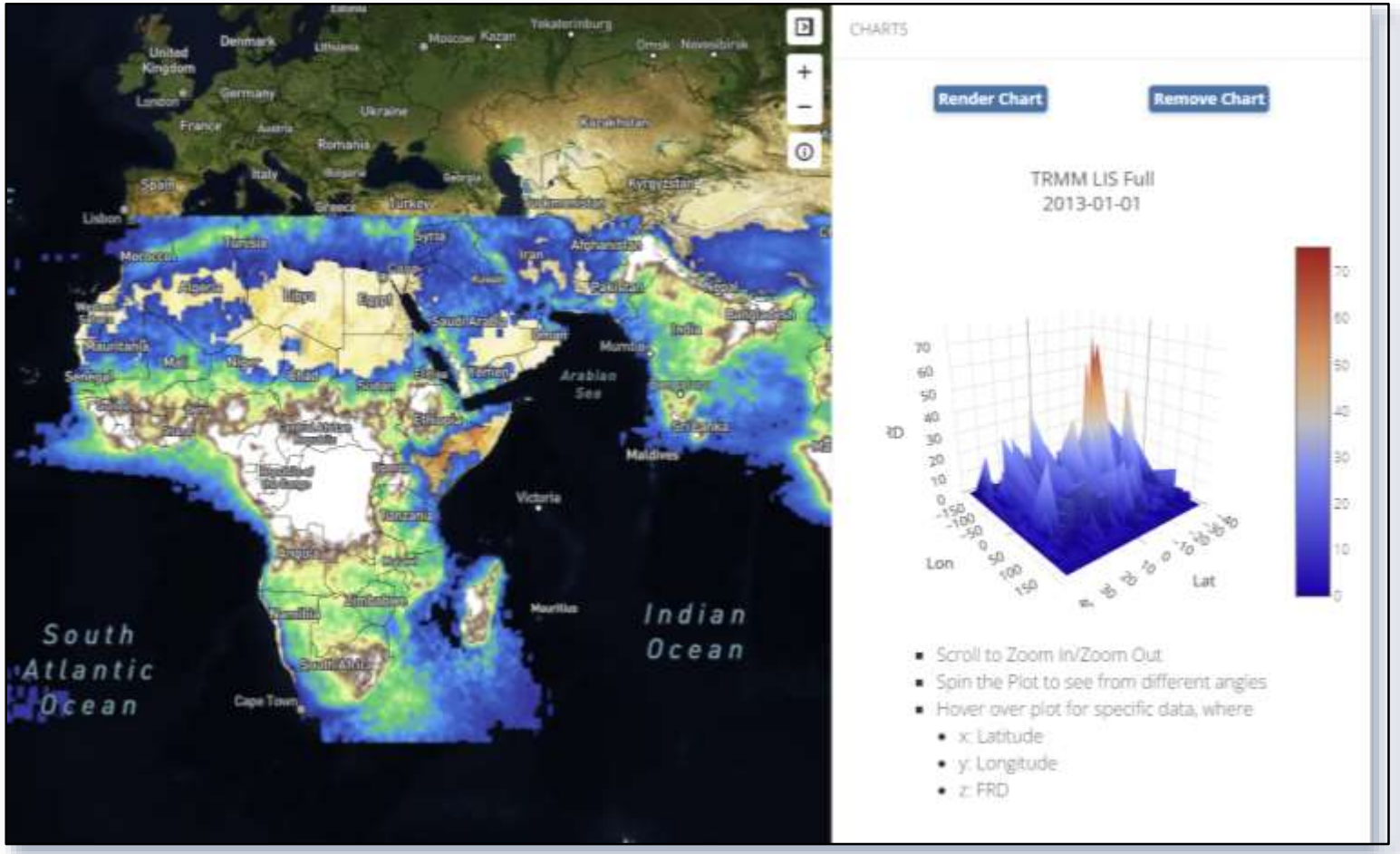
Lightning Dashboard



Sample Dashboard: OTD January (left) and July (right)

- **Use cloud expertise / open science**
  - Use NASA's Covid-19 dashboard as foundation
  - Entirely cloud-based (no downloads)
- **Capabilities**
  - Basic flash rate densities
  - Slider comparison feature
  - Histograms
  - Data analysis
  - Recently integrated Dr. Bruning's GLM and LMA tools in the cloud

CONTENT



Lightning Dashboard: https://ghrc.earthdata.nasa.gov/lightdash/index.html

- **Expand abilities**
  - More lightning datasets
  - Additional analysis tools
  - Improve visualizations
  - Move code to open source
- **Opportunity**
  - Basic features available
  - GHRC wants to hear from users on what should come next!

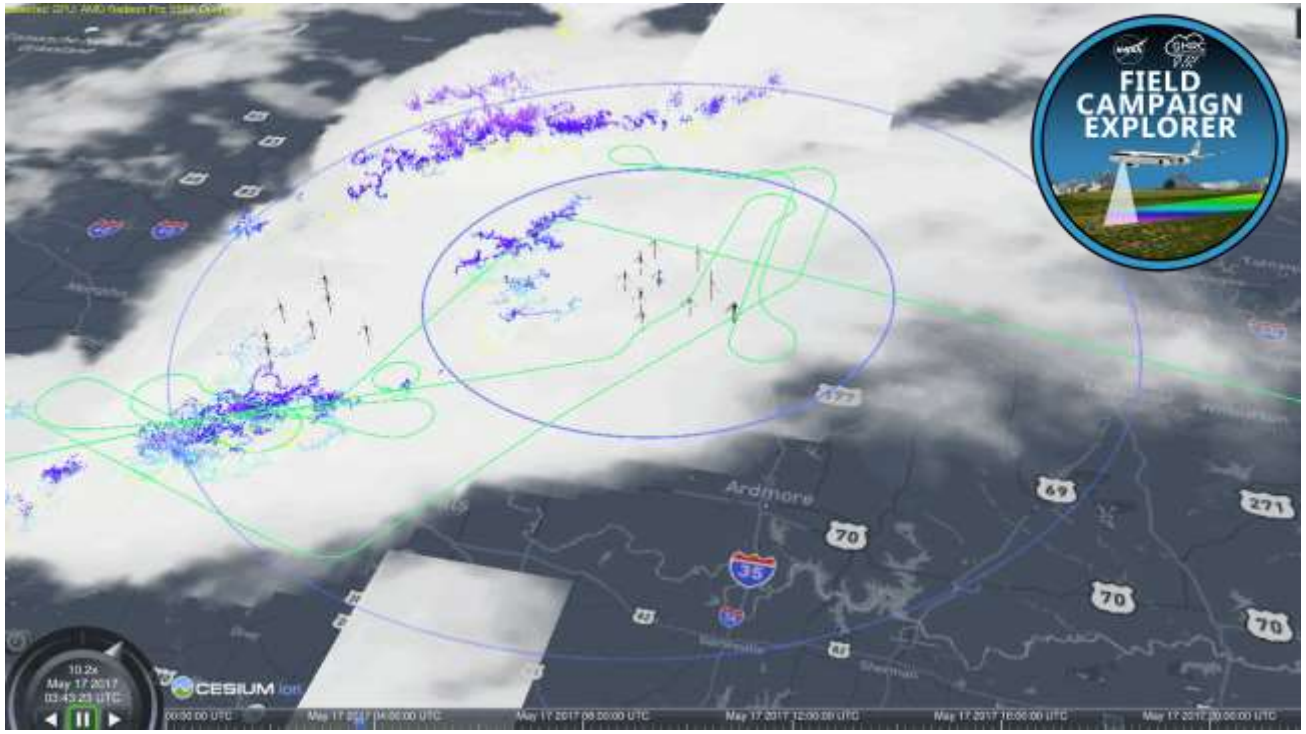
Why Create FCX?

- **Field Campaign Challenges**
  - Multiple data platforms
    - Ground-, airborne, and satellite-based
  - Variety of variable fields and dimensions
    - Point observations
    - Two-dimensional (horizontal and vertical)
    - Three-dimensional
  - Multiple data formats
    - Raw observations
    - Derived datasets
    - Model output

Cloud Radar System, Southern Ontario LMA, and ER-2 flight track from GOES-R PLT

Field Campaign Explorer (FCX)?

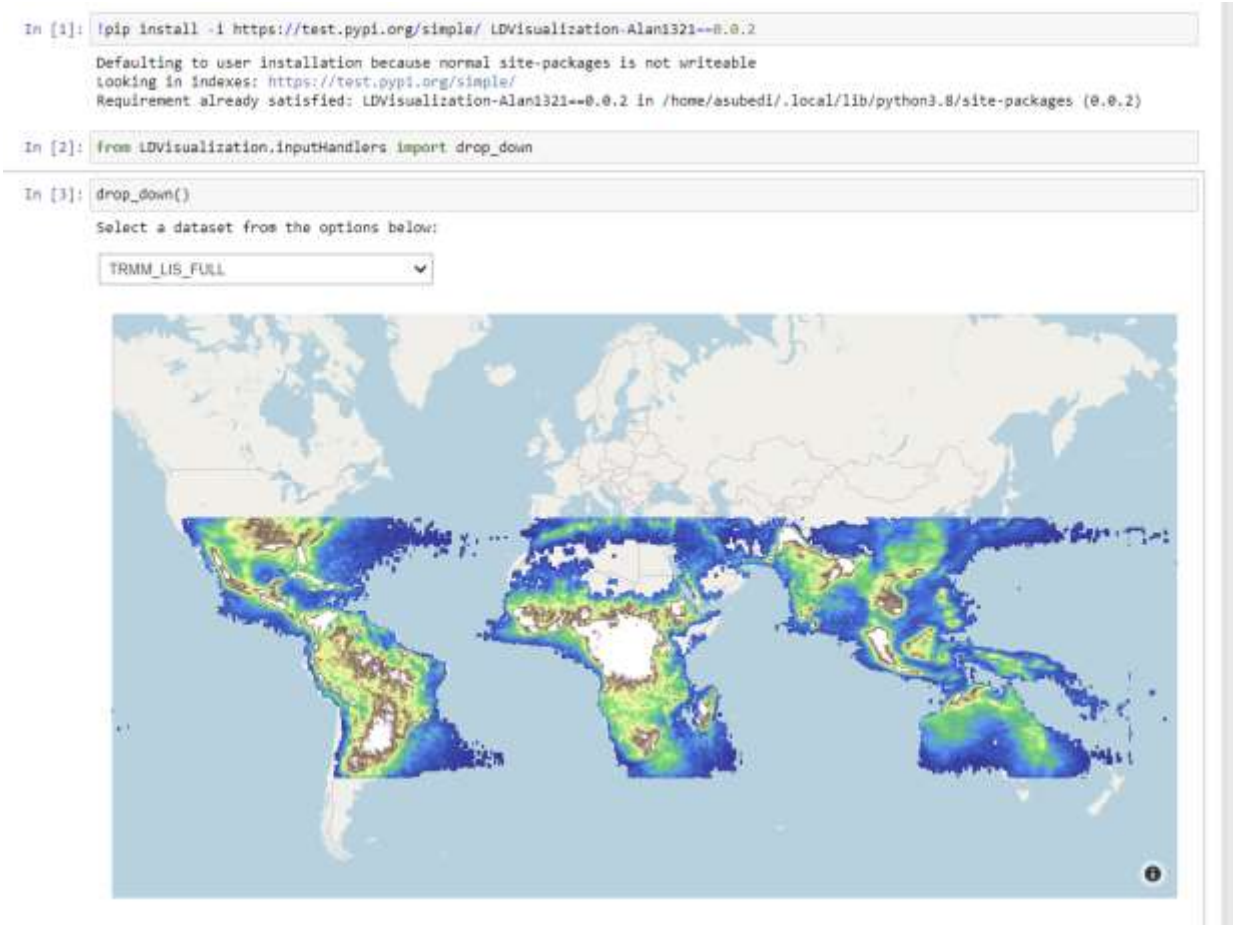
- **Design**
  - Cloud-based, open source
  - Three-dimensional data exploration
    - Visualization
    - Analysis
  - Coincident display of multiple datasets



FCX Link:
https://ghrc.earthdata.nasa.gov/fcx/index.html

Jupyter Notebooks

- **Visualizations available in FCX and Lightning Dashboard**
  - Provide accessibility to users
  - Collaborating with NASA Openscapes
    - Jupyter notebooks need python libraries
    - Openscapes offers community libraries
    - No need for users to install
  - Developing multiple notebooks
    - Updating for public release
    - Can collaborate with users on other notebooks



TRMM LIS display from jupyter notebook

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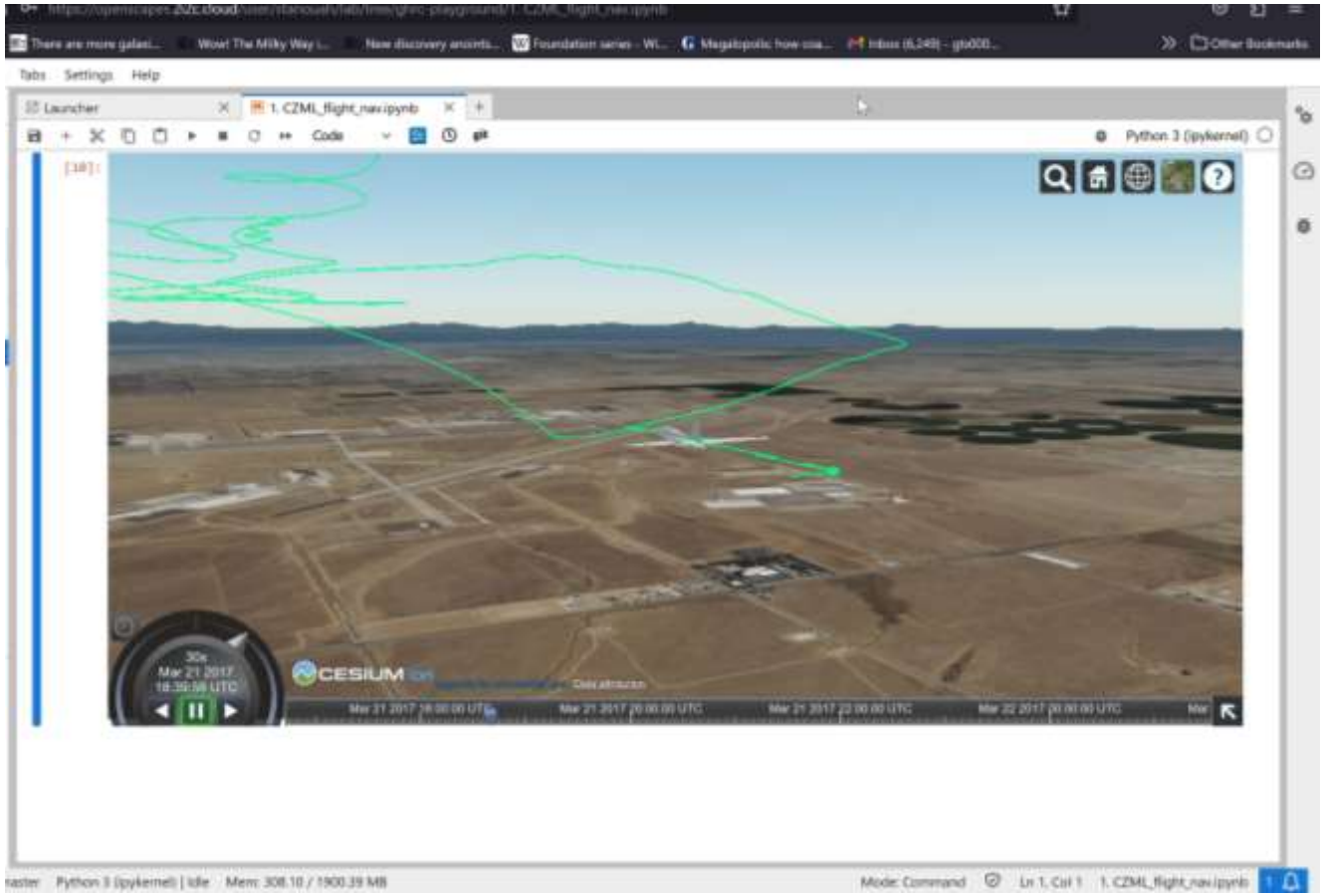
ER-2 flight track from jupyter notebook



Looking Ahead

- **Opportunity for Collaboration**
  - FCX playground and github repositories
  - Playground: https://ghrc.earthdata.nasa.gov/fcx-playground
  - GitHub
    - https://github.com/ghrcdaac/fcx-playground-frontend
    - https://github.com/ghrcdaac/fcx-playground-backend
  - Python Package Index (PyPI)
    - https://pypi.org/user/ghrc/
  - ArcGIS collaborations with TRMM LIS
  - NASA EGIS Portal
  - GHRC wants to hear from the community on capabilities you want!

GHRC
Global Hydrometeorology Resource Center

THANK YOU!

QUESTIONS?

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