GHRC
Global Hydrometeorology Resource Center

Field Campaign eXplorer (FCX): Empowering Scientific Advancements through Cloud-Based Data Visualization and Analysis

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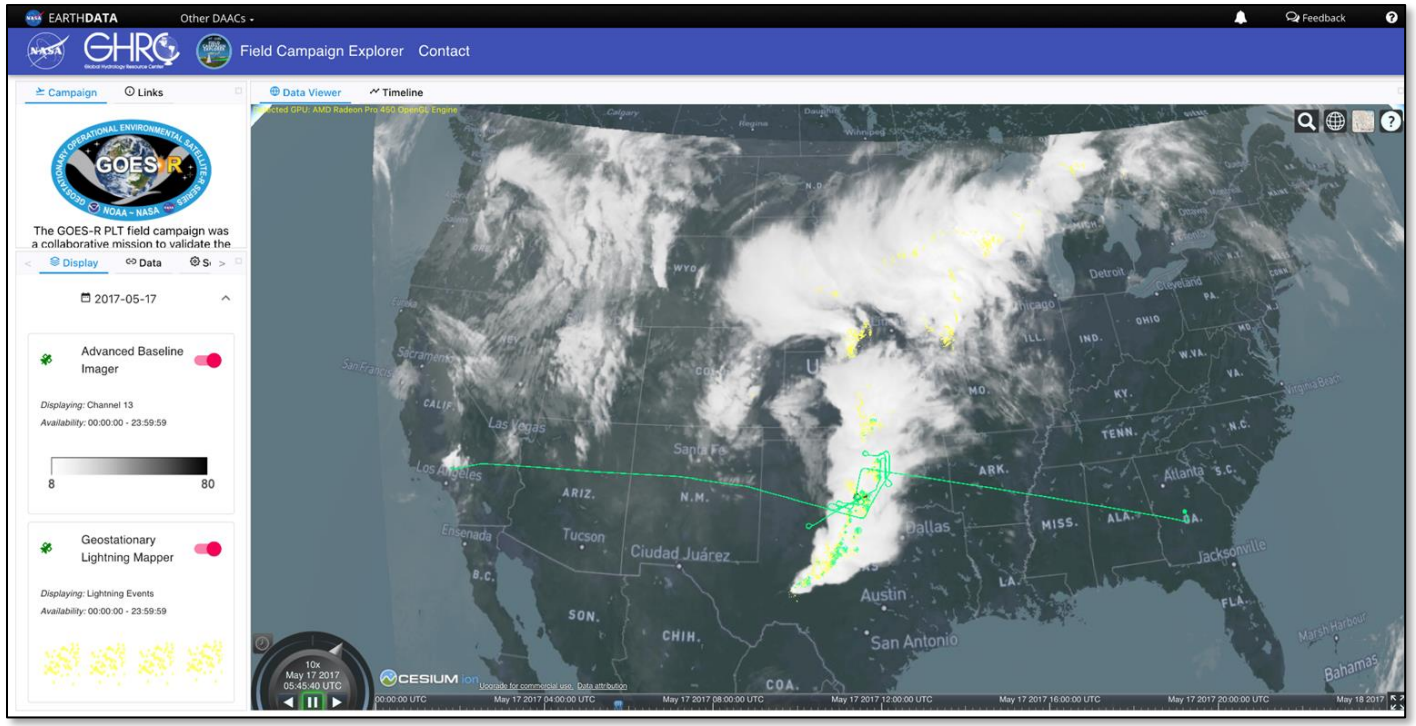
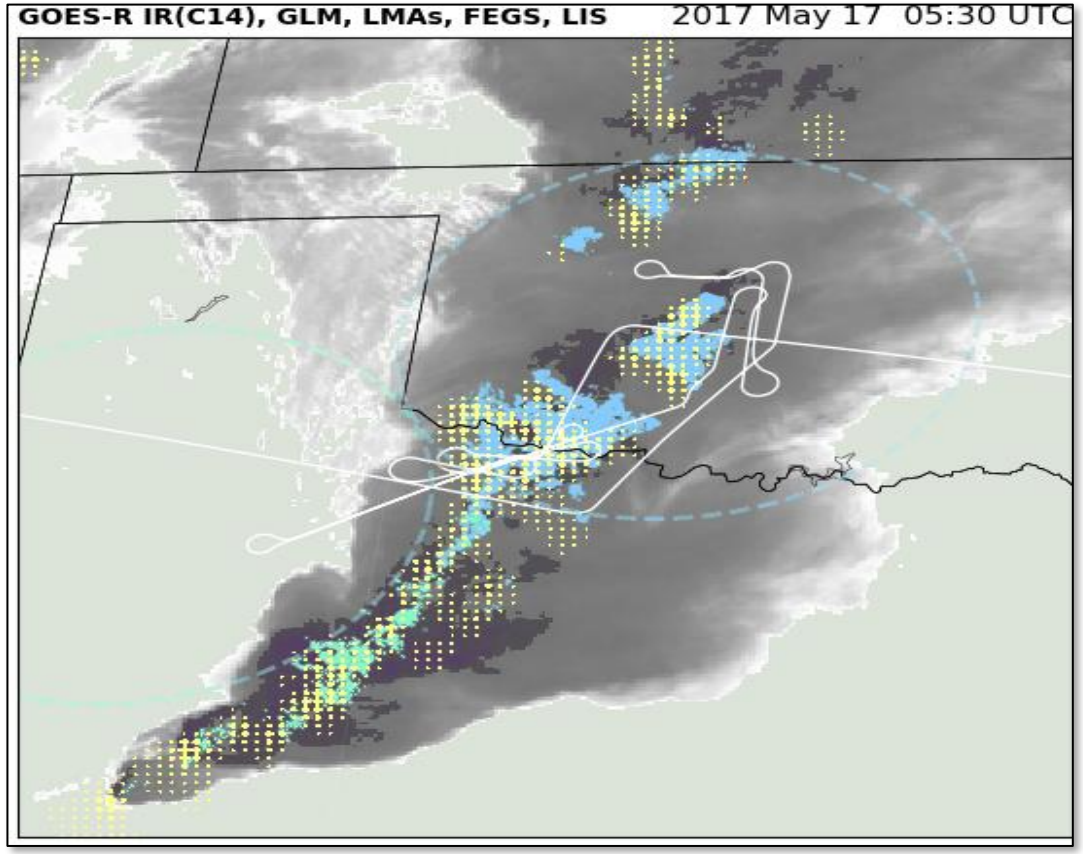
What is Field Campaign Explorer (FCX)?

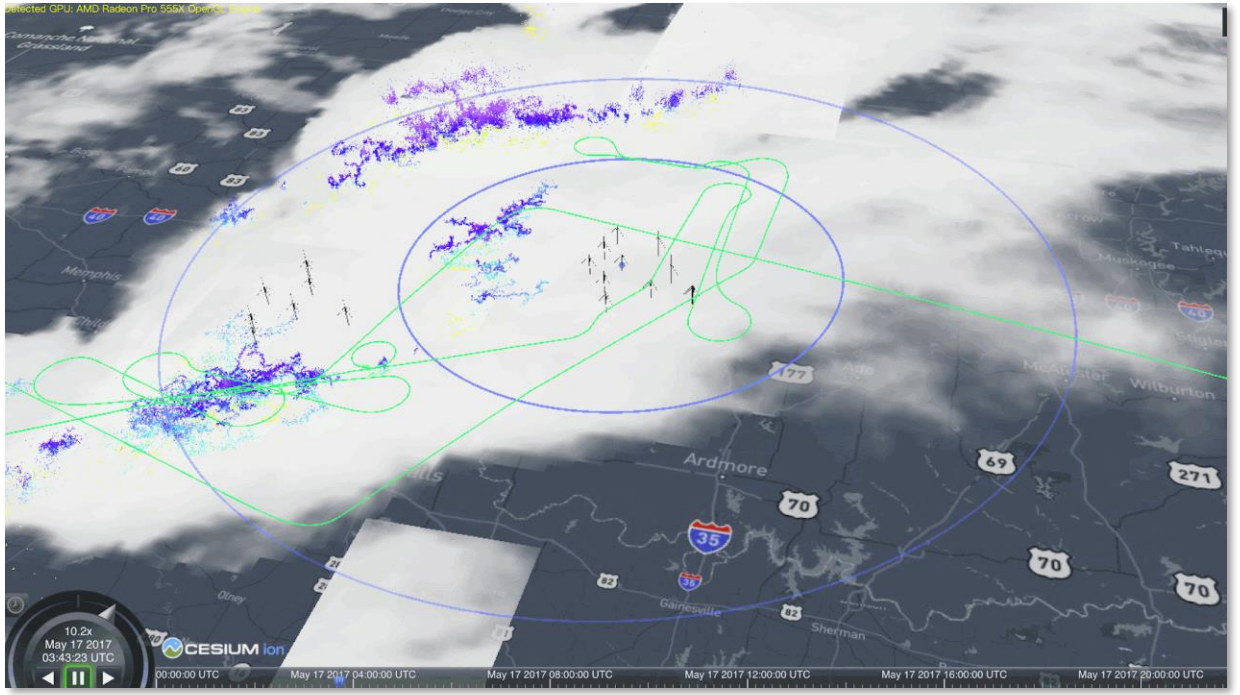
- **FCX is a 3-D data exploration tool to provide visualization and analytic capabilities for diverse coincident datasets, with a focus on airborne field campaigns**
  - Developed using CesiumJS and React for the frontend, Python, and AWS for the backend



2D and 3D Comparison

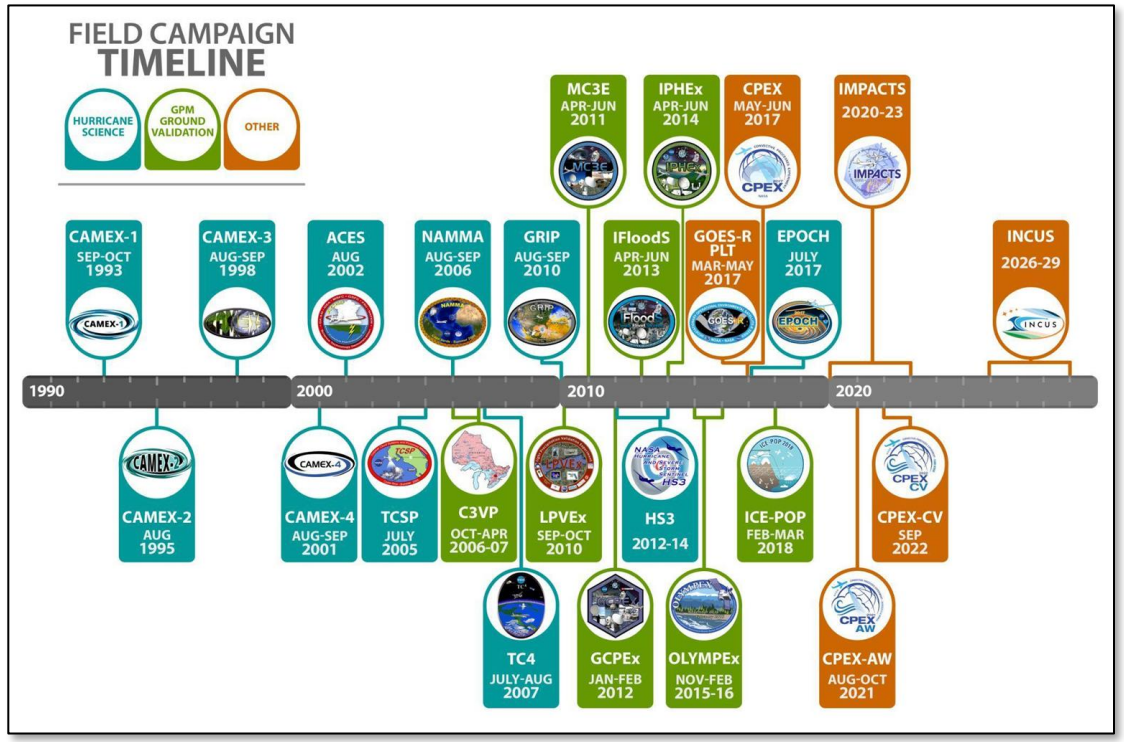


2D non-interactive animation of lightning observed from various coinciding measurements



Same 3D interactive animation/exploration from FCX running in the cloud

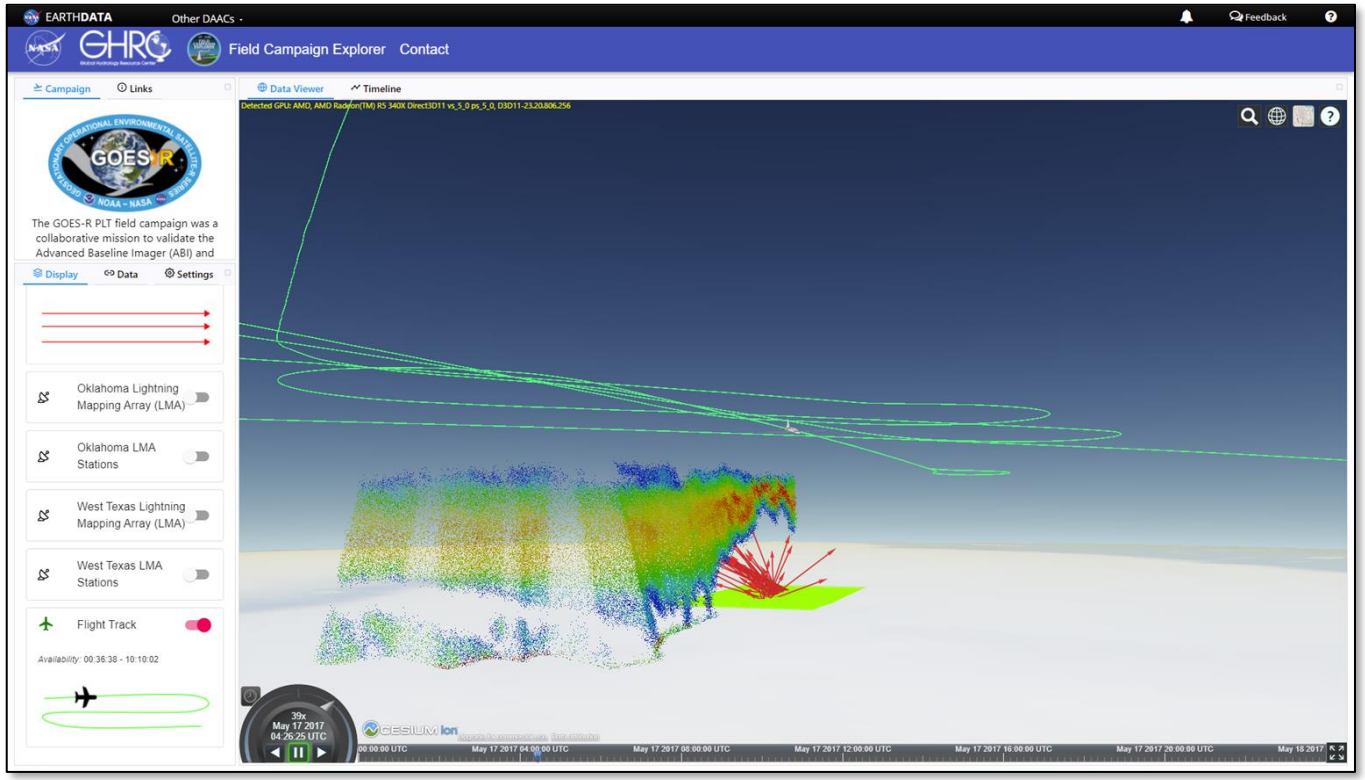
Available on FCX



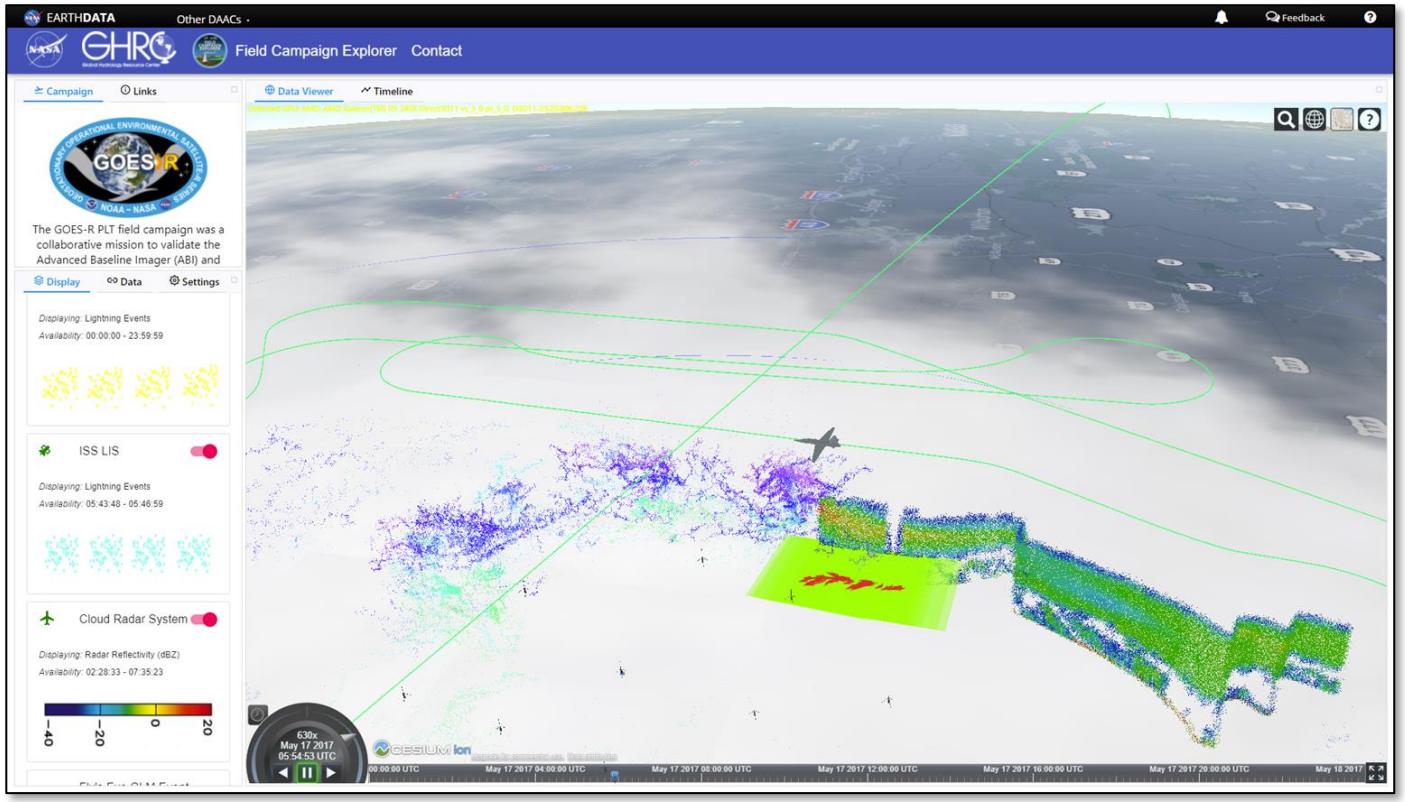
- **Field Campaigns in FCX**
  - Geostationary Operational Environmental Satellite-R Post Launch Test (GOES-R-PLT)
  - Olympic Mountains Ground Validation Experiment (OLYMPEx)
  - Convective Processes Experiment – Aerosols & Winds (CPEX-AW)
  - Hurricane and Severe Storm Sentinel (HS3)
  - Investigation of Microphysics and Precipitation for Atlantic Coast-Threatening Snowstorms (IMPACTS)
  - The Tropical Cloud Systems and Processes (TCSP)
    - In progress

FCX Playground

- **What's a playground?**
  - A playground in the context of a software application typically refers to a safe and isolated environment where developers can experiment, prototype, and test code without affecting the production environment or the actual users.
  - Playgrounds are especially valuable for learning, debugging, and exploring new technologies.
    - https://ghrc.earthdata.nasa.gov/fcx-playground
- **Easier to collaborate and understand the core structure**
  - https://github.com/ghrcdaac/fcx-playground-frontend
  - https://github.com/ghrcdaac/fcx-playground-backend

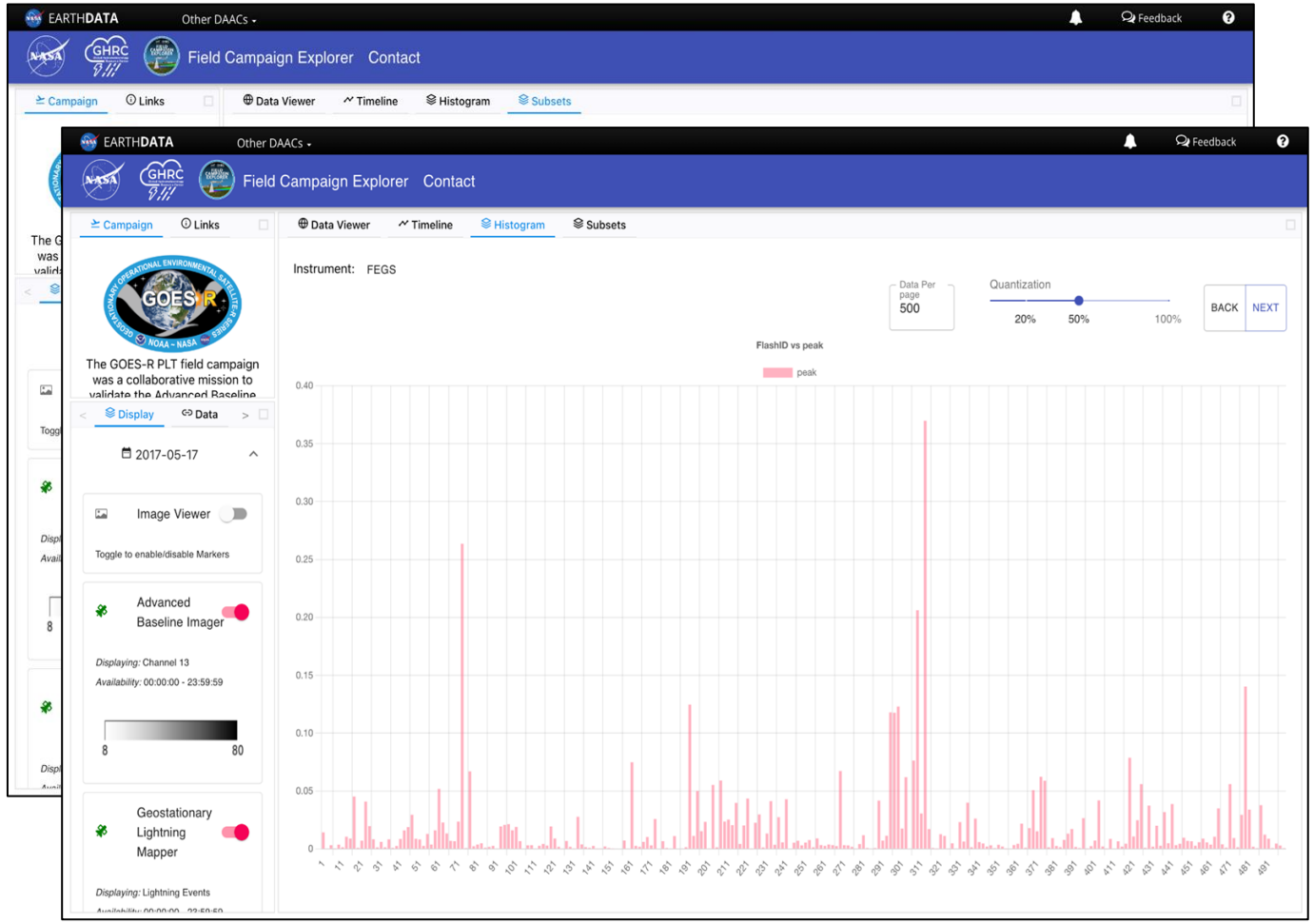


PyPI Packaging



- **Published GHRC's Services Applications (Like FCX and Lightning Dashboard) to the Python Package Index (PyPI)**
  - Part of open source and ease of distribution
  - Checkout GHRC PyPI
    - https://pypi.org/user/ghrc/
    - https://github.com/ghrcdaac/ghrc-playground

FCX Utilities



- **Histogram and subsetting tools**
  - Dockerized, as a service, APIs
  - Separate service (abstract) class for each flight instruments
  - Can be hosted in Lambda/ECR
  - Using WebSocket communication protocol which provides full-duplex communication (Bi-directional)
  - Compatible with NGAP deployment architecture. (CloudFront Distribution)
  - Experimental, only available in Goes-R PLT. Supports other formats than NC and HDF
- **In the future, we plan to integrate it with the OPeNDAP services**
- **GraphQL API integration to serve FCX metadata, filters, etc.**
- **Can be integrated with JupyterHub Notebooks**
- **We integrated the LMA and GLM tools by Dr. Eric Bruning**
- **This integration facilitates the generation of netCDF files for the NALMA dataset and the production of COG images as the final output**

Upcoming Activities

- **Future Work**
  - More services to be published in PyPI
  - Generalized workflow for adding external datasets
  - Harmony Integration
  - Can use GPUs to generate better visualization for high-resource systems and normalized visualization for lower-end systems
- **Try it out!**
  - https://ghrc.earthdata.nasa.gov/fcx

THANK YOU!

https://ghrc.earthdata.nasa.gov/fcx

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