



The Field Campaign Explorer

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NASA's Earth Science DAACs

Distributed Active Archive Center (DAAC):

- NASA's Earth Observing System Data and Information System (EOSDIS)

Role:

- Process, archive, document, and distribute data
- Use NASA's past and current Earth-observing satellites and field measurement programs

GHRC:

- 1 of 12 NASA DAACs
- Collaboration between **NASA MSFC** and the **University of Alabama in Huntsville**
- Emphasis on lightning, hurricanes, storm hazards, and field campaigns

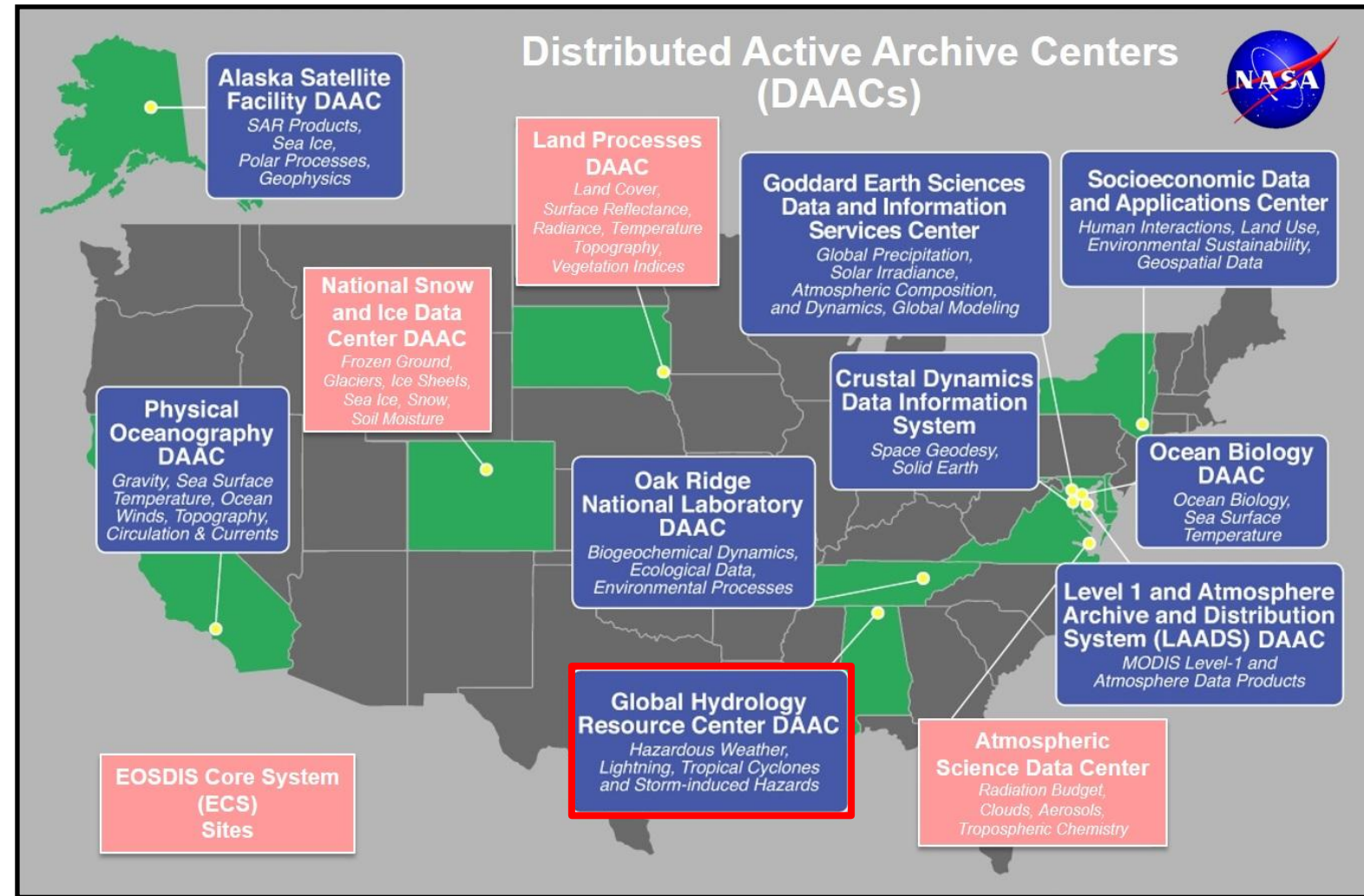
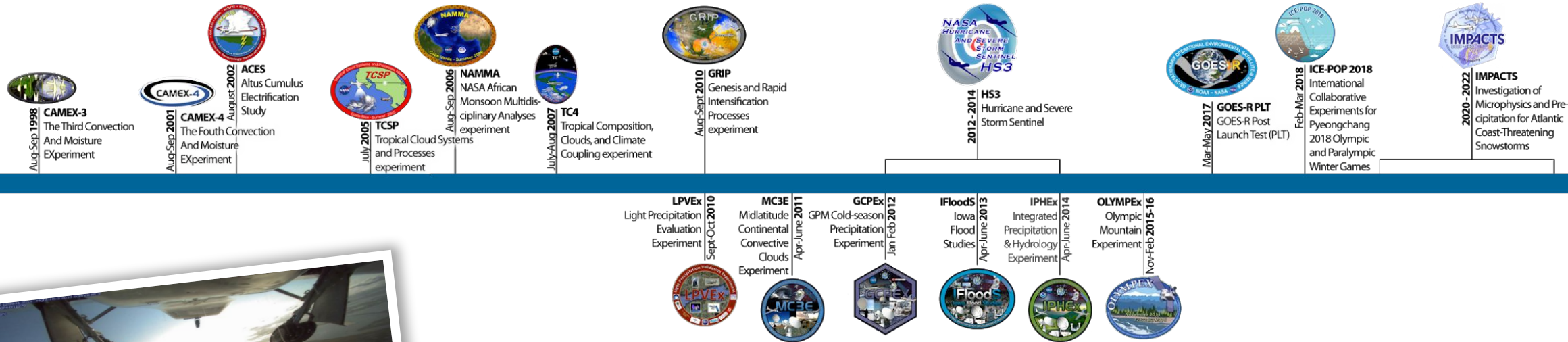


Image courtesy NASA EOSDIS

GHRC Field Campaign Data



GHRC DAAC Specializes in Field Campaign Data

- Three basic categories of observational platforms
 - Ground-based
 - Airborne
 - Satellite-based
- Each category has wide variety of observations
 - In-situ and remotely sensed
 - Mobile versus stationary
 - Numerous specializations



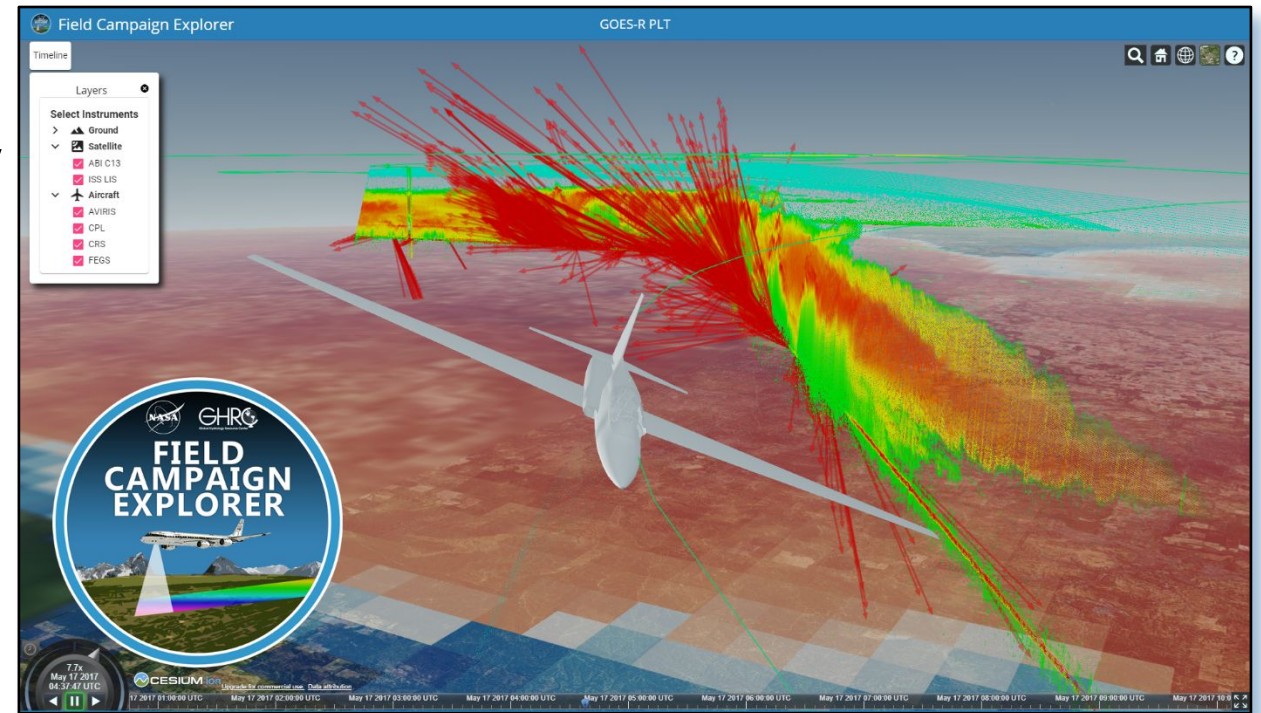
Characteristics of Field Campaign Data

Advantages

- Multiple datasets of varied physical characteristics
- In-depth, co-located datasets
- Thorough observation of event evolution
- Specialized data often beyond what is normally available
 - Airborne datasets
 - Targeted, in-situ observations

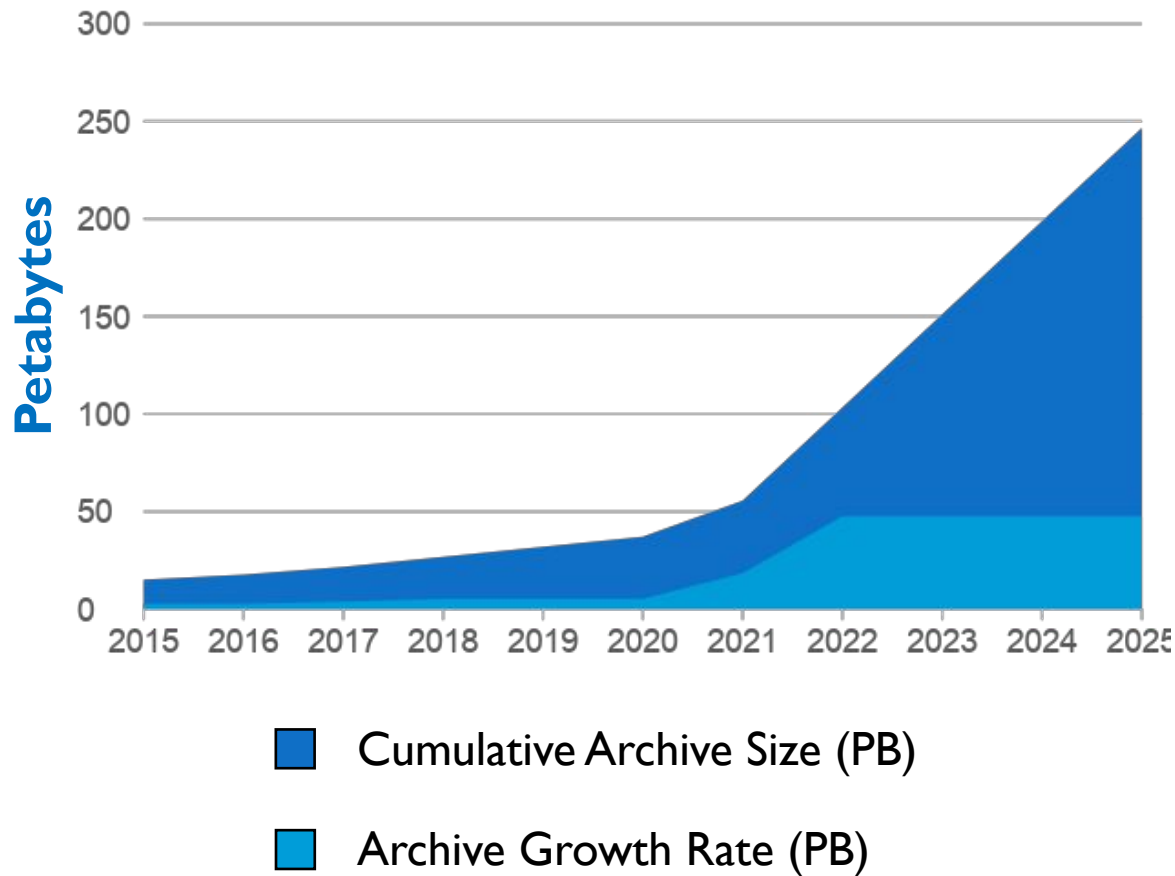
Disadvantages

- Wide variety of datasets difficult to coordinate visualization / analysis
- Airborne data particularly difficult
 - High resolution, fine footprint, large data volume
 - Temporal details very important



Opportunity with the Cloud

Annual Archive Growth



Challenge

- DAAC data volume growing exponentially
 - New missions to add 48 PB per year
- DAACs shifting to data archival in the cloud

Opportunity

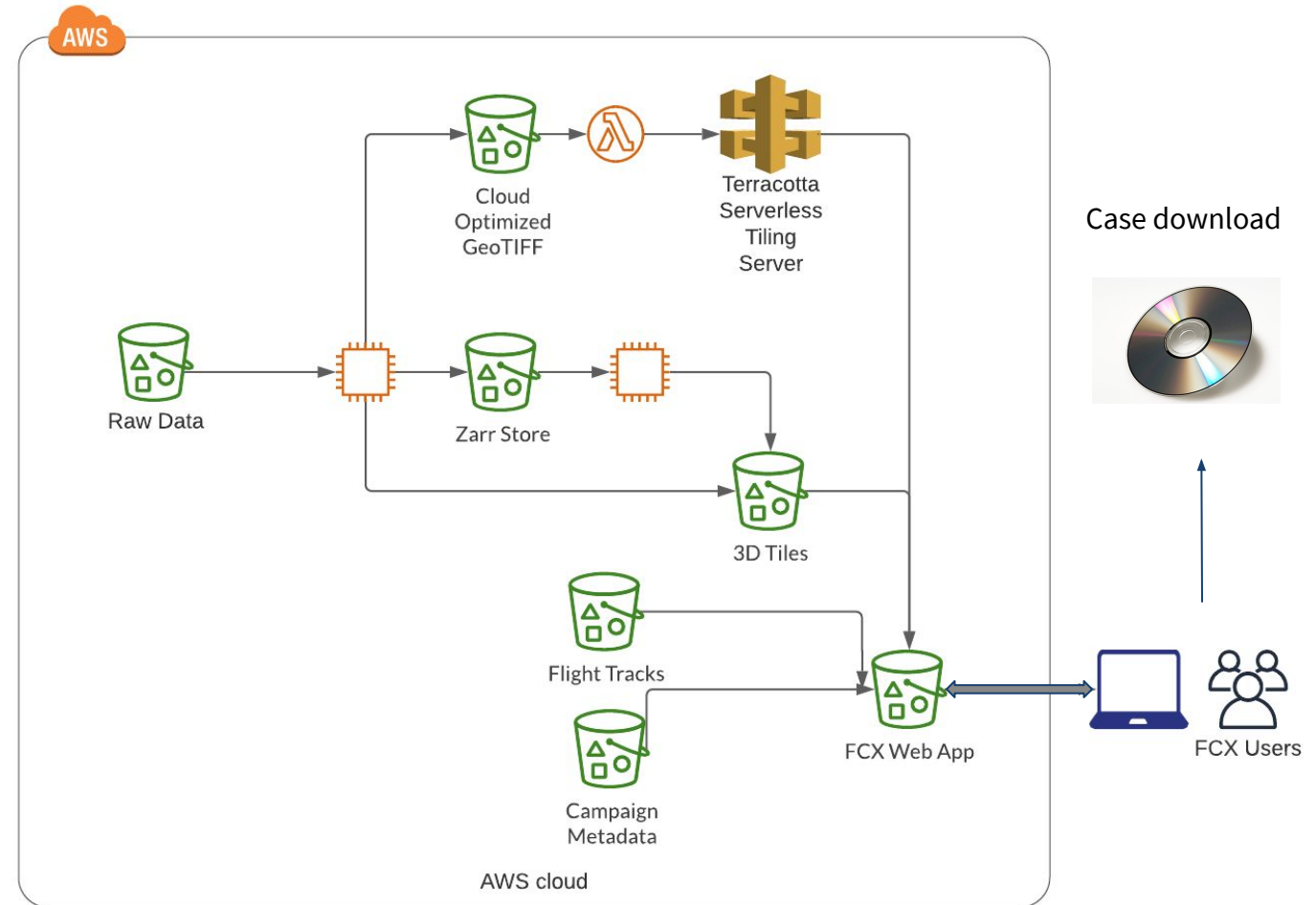
- Cloud accessible data offers:
 - Greater accessibility
 - Pull data from multiple DAACs
 - Improve data analysis
 - Can analyze data in cloud
 - No need to download the data
- Field Campaign eXplorer (FCX) will leverage this

What is the Field Campaign eXplorer (FCX)?

- Cloud-native tool to:
 - Explore
 - Visualize
 - Analyze
 - Diverse, coincident data in a common framework
- 3 dimensional, evolutionary display
- Incorporated airborne measurements with satellite and ground-based observations
- Coupled viewer/map to show flight overview or along flight track
- Interactive App-User experiences
 - User-controlled exploration
 - 3D time-evolution display



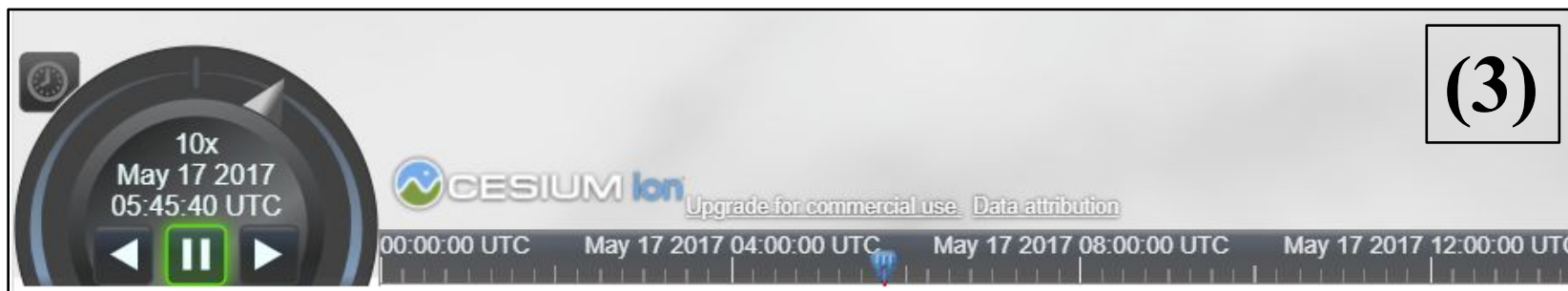
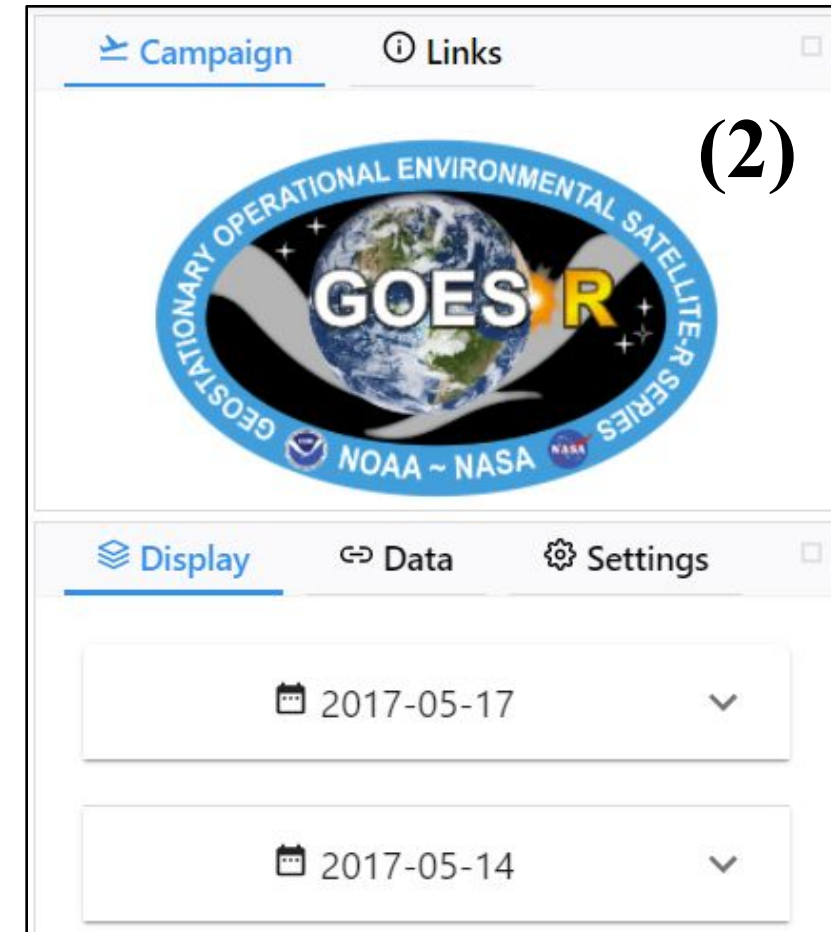
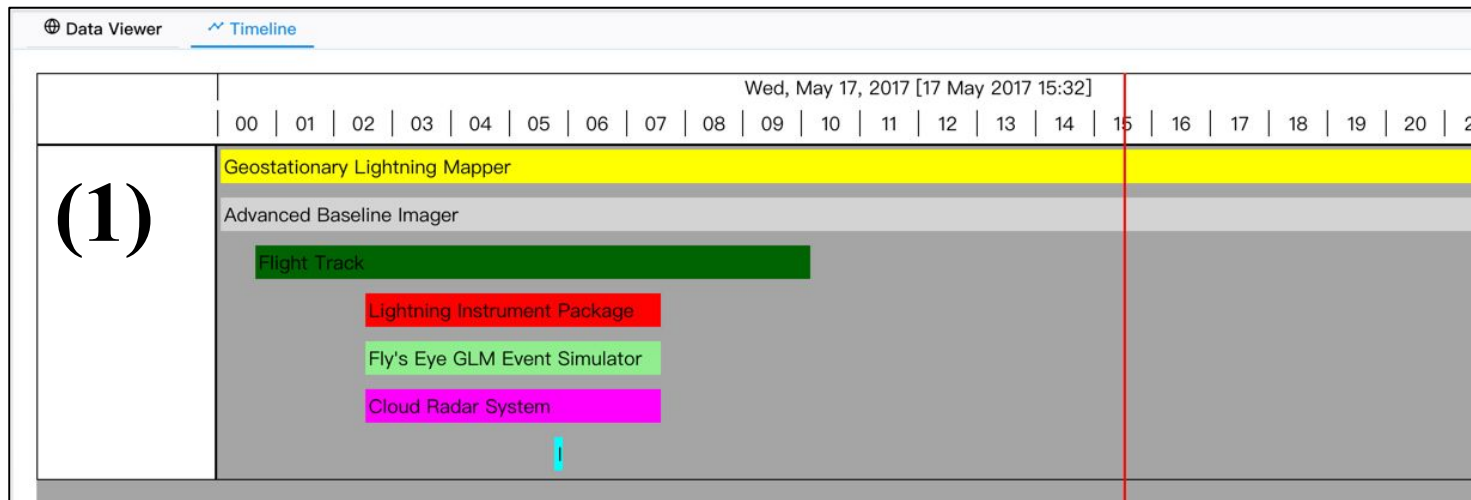
- Front end - React application
- Backend - Python
- Visualization - Cesium, Terracotta
- Raw data stored as compressed N-dimensional array
- Raw data mapped to its metadata
- Processed data available on-demand
 - Front end using Amazon Web Services
- Terracotta tiling: dynamic imagery visualization
- Cesium: dynamic object visualization
- App - User interaction



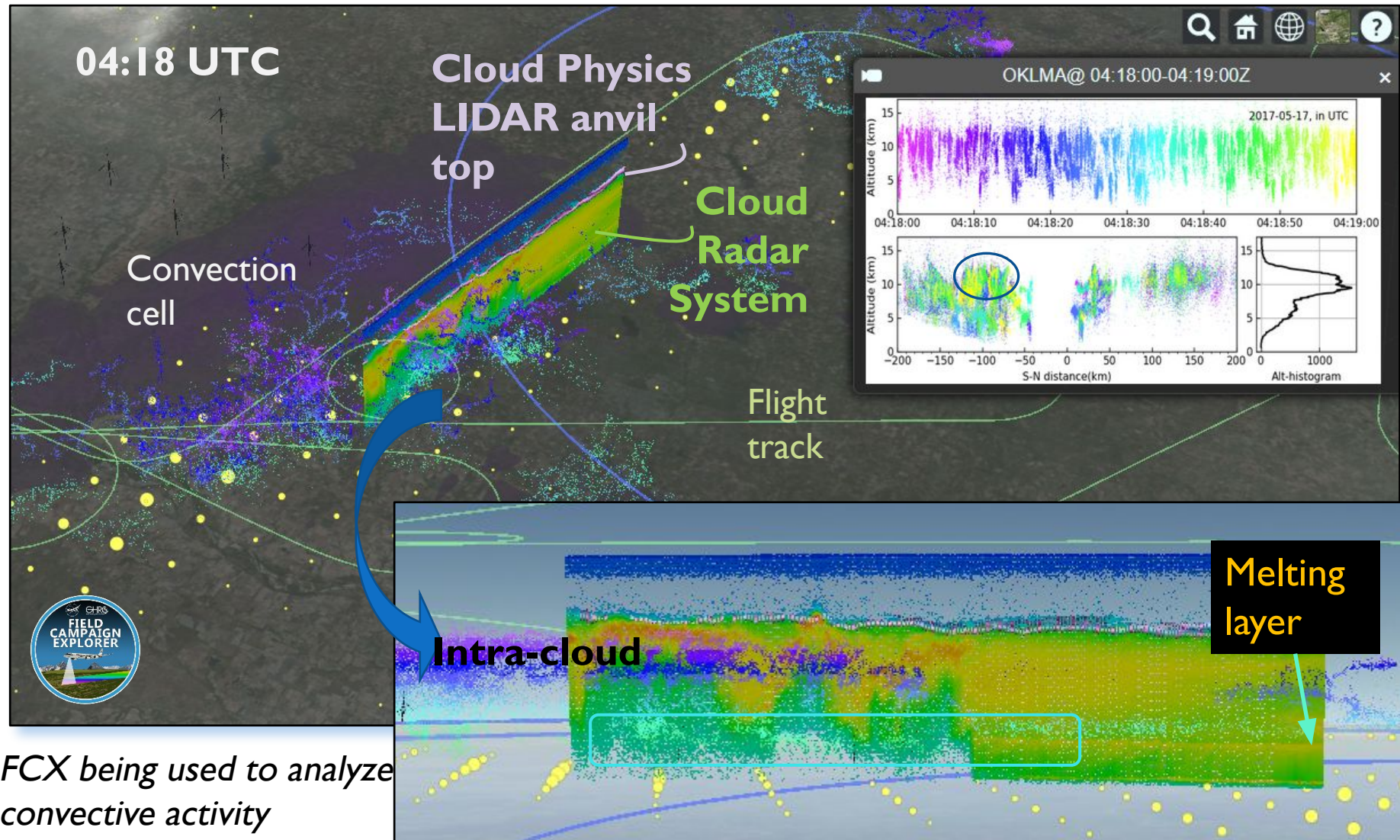
Publicly available in the cloud: <https://ghrc.earthdata.nasa.gov/fcx/index.html>

FCX Functions and Tools

- Case/Flight data timeline summary
- Case/Flight selector / data downloader
- Visualization
- Web-based browsing and sharing



Field Campaign Explorer: Significance



Ongoing Development

- Compliment NASA Worldview
- Preparing to make open source
- Support community development
- Cross-DAAC data analysis

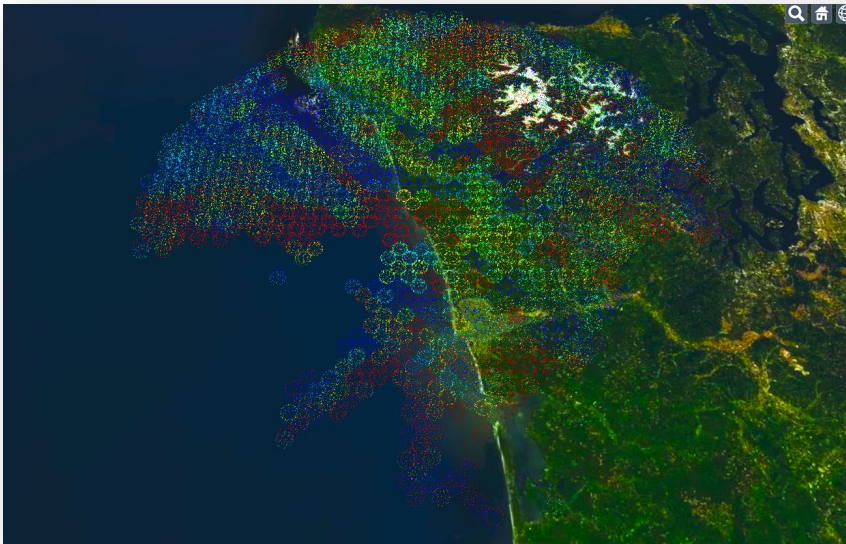
Example Use – Cross-validation of GLM

Types	Instrument	Measurement	Displayed Parameter
Satellite	GOES-R ABI (advanced baseline imager)	Reflectance	Ch14 (11.2 μ m) T _B
	GOES-R GLM (geostationary lightning mapper)	Optical energy	Intensity (energy)
			Activity (counts)
	ISS LIS (lightning imaging sensor)	Optical energy	Intensity (energy)
Ground network	LMA (lightning mapping array)	60 MHz RF radiation	Lightning source
Aircraft (ER-2)	CRS (cloud radar system, w-band)	Reflectivity	Reflectivity
		Doppler velocity	Doppler velocity
	CPL (cloud physics lidar)	Attenuated total backscattering	Attenuated total backscattering
	FEGS (Fly's eye GLM simulator)	Optical energy	Detected lightning FOV
	LIP (lightning instrument package)	Electric field	Electric vector

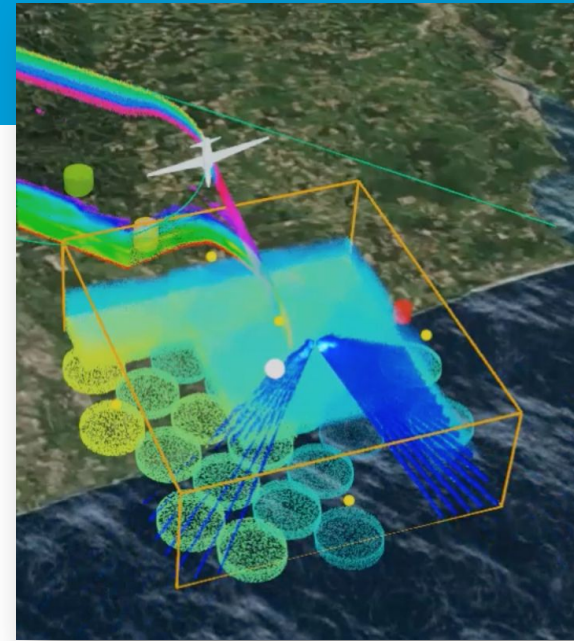
Upcoming Efforts

- Establish FCX as Open Source
 - Enable users to develop their own data exploration tools
- Incorporate data analysis tools
- Expand functionality to more datasets

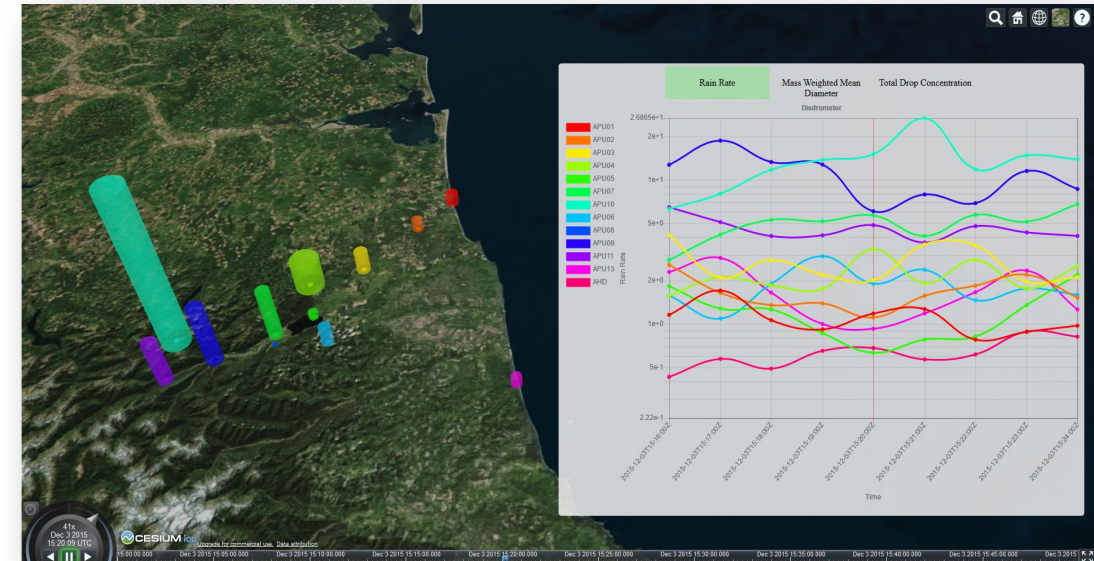
Comparison across different data fields



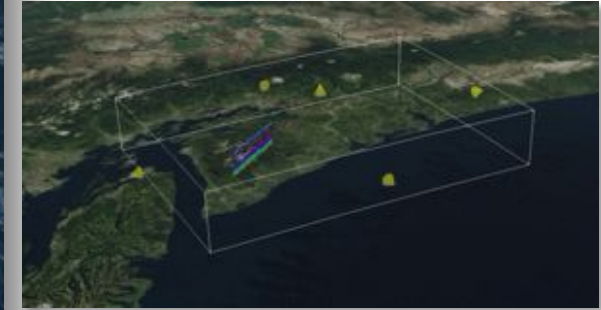
Dynamically generated map showing differences between ground radar reflectance and GPM radar reflectance



Data analysis



3D subsetting





THANK YOU!

Questions?

