



Field Campaign Explorer: Simultaneous Data Exploration, Discovery, and Visualization

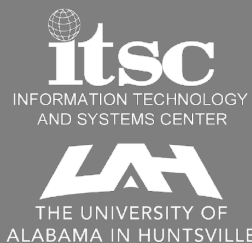
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ITSC, University of Alabama in Huntsville¹

NASA MSFC²

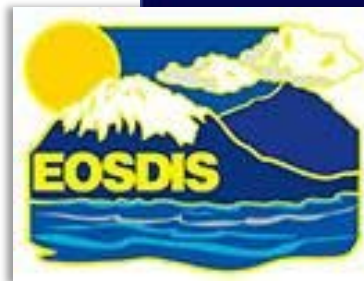
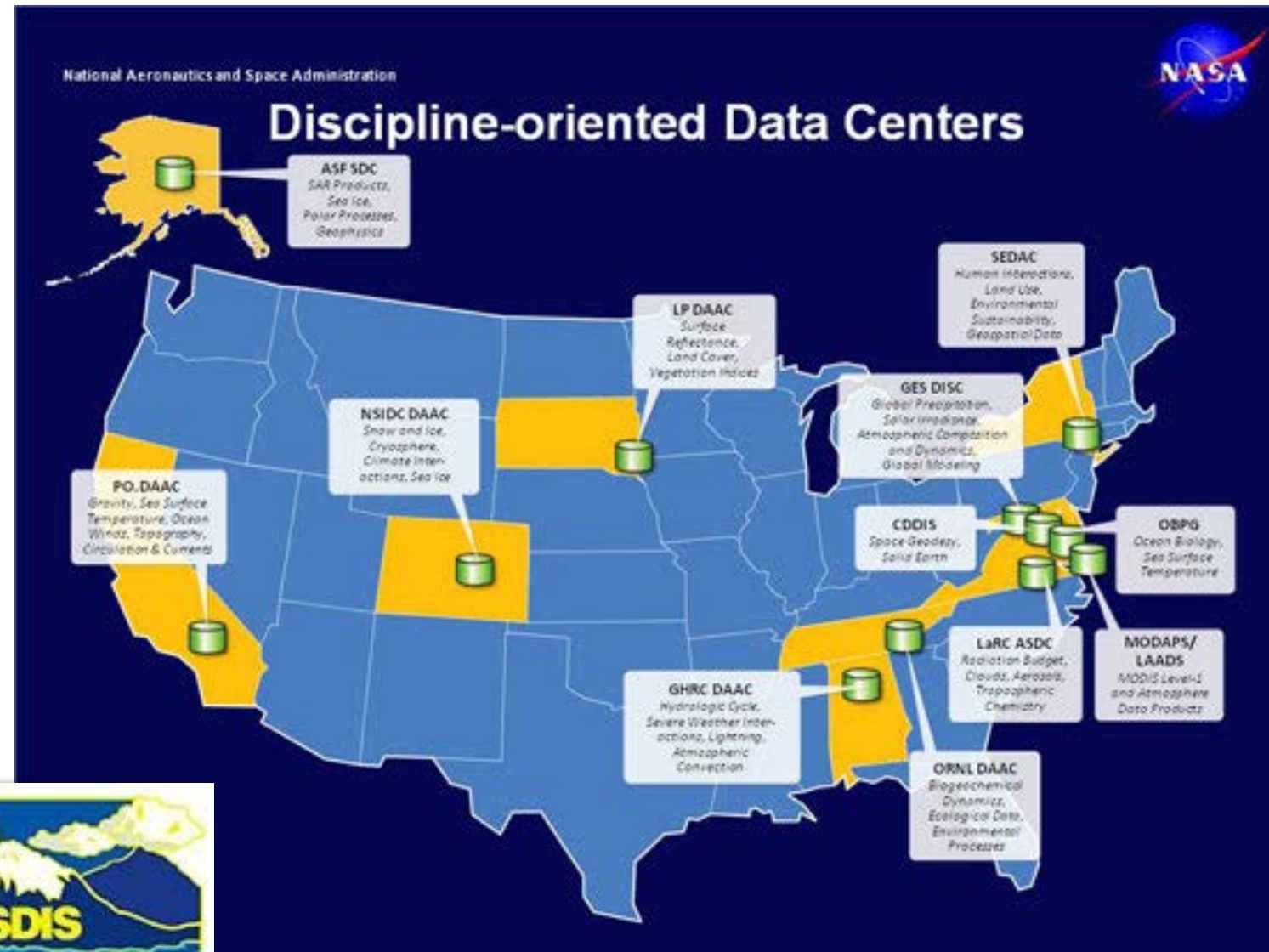
American Geophysical Union Fall Meeting IN53E

San Francisco, CA, 16 December 2016



About GHRC

- There are **12 NASA Earth Science Data Centers**. One of these data centers
- Each center serves one or more scientific Earth science disciplines
- **Global Hydrology Resource Center (GHRC)**, is located at the National Space Science and Technology Center in Huntsville, AL.
- GHRC is a collaborative effort between UAH and NASA



NASA Earth Science Data Systems Vision

Make NASA's free and open Earth science data interactive, interoperable and accessible for research and societal benefit today and tomorrow.

Mission Statement

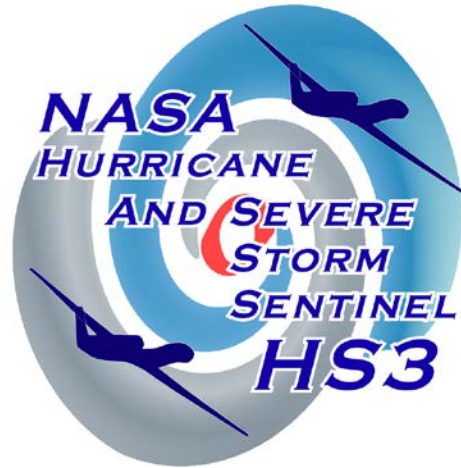
- To provide a comprehensive and active archive of both data and knowledge augmentation services with a focus on **hazardous weather, its governing dynamical and physical processes, and associated applications.**
- Within this broad mandate, GHRC will focus on **lightning, tropical cyclones and storm-induced hazards** through integrated collections of satellite, airborne, and in-situ data sets.

<http://ghrc.nsstc.nasa.gov/>



Hurricane and Severe Storm Sentinel (HS3)

- **Objective** - To measure environmental and inner-core processes that lead to storm formation and intensification into major hurricanes
- **Temporal Extent** – 2012 to 2014



Data Users

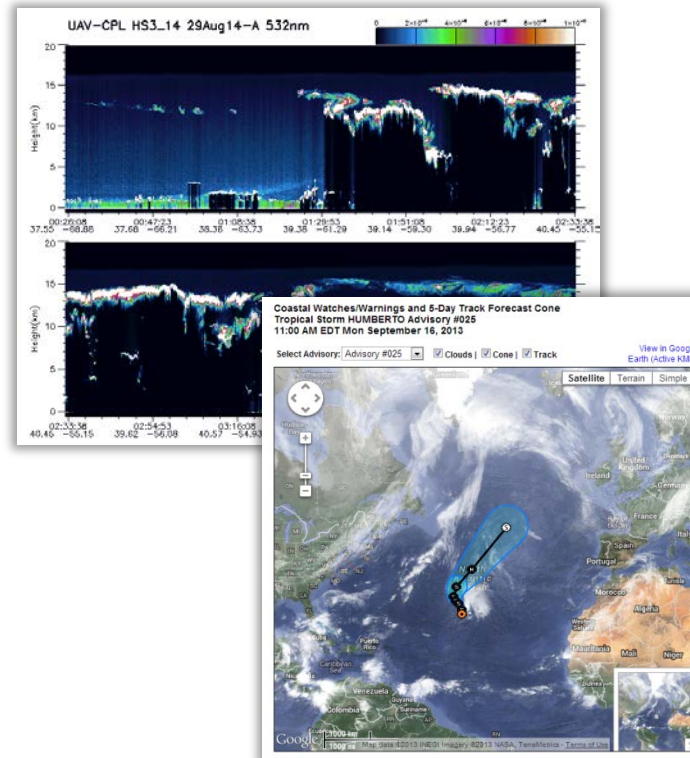
- HS3 science team
- NASA Hurricane Science Research Program (HSRP)
- Operational users at the NOAA National Hurricane Center
- Larger scientific community

Platform	Instrument
Global Hawk UAV	High-resolution Interferometer Sounder (S-HIS)
Global Hawk UAV	Airborne Vertical Atmospheric Profiling System (AVAPS)
Global Hawk UAV	Cloud Physics Lidar (CPL)
Global Hawk UAV	High-Altitude Imaging Wind and Rain Airborne Profiler (HIWRAP)
Global Hawk UAV	Hurricane Imaging Radiometer (HIRAD) multi-frequency interferometric radiometer
Global Hawk UAV	High altitude MMIC sounding Radiometer (HAMSR)



User Needs

- Importance of event-based research
- Heterogeneous data
 - Data Format
 - Dimension
 - Processing methods
 - Visualization methods
- Identify data around a specific feature or event
- Requires several instrument measurements of the feature/event
- Less manual and time consuming process



Flight reports

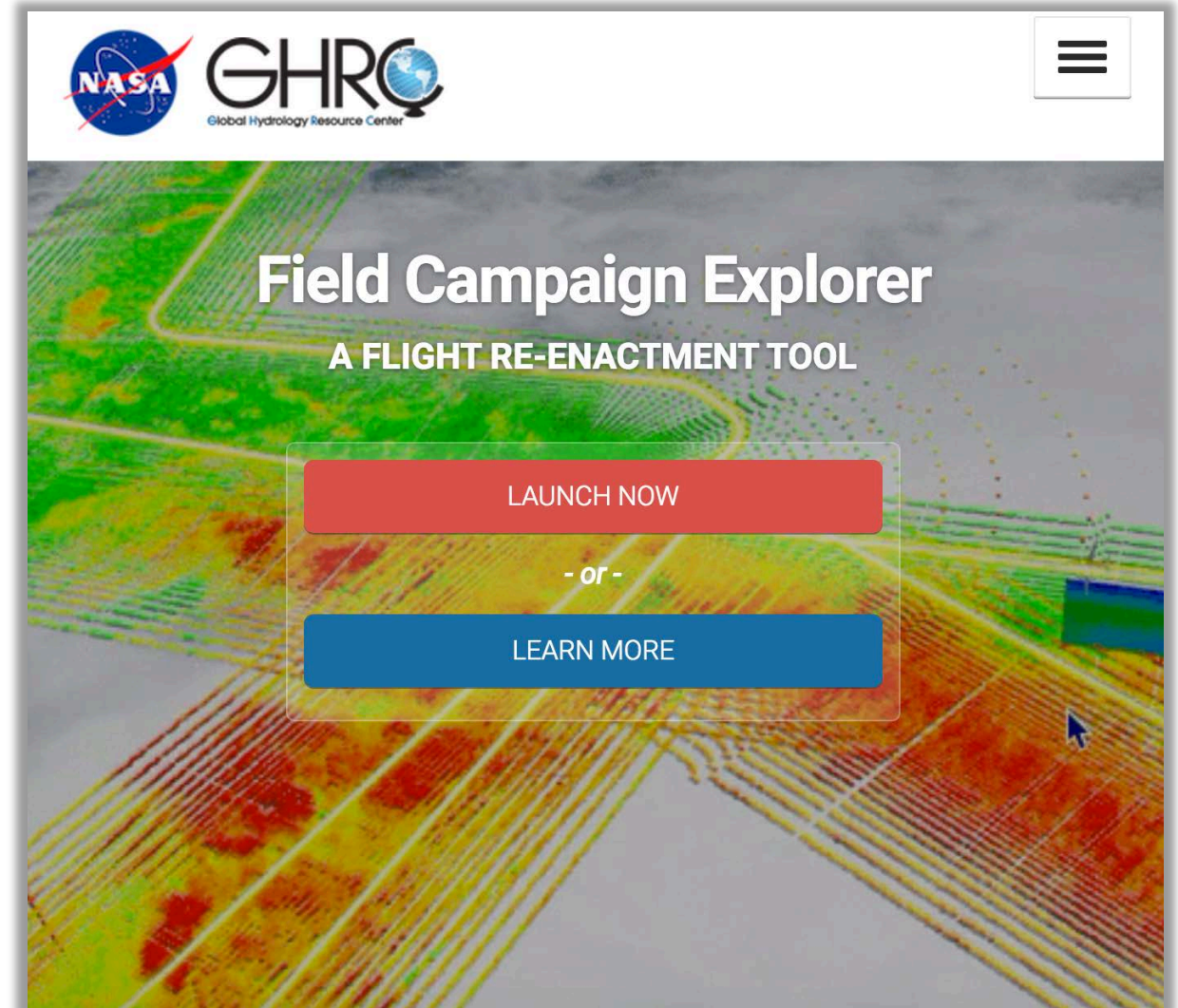
- Information rich contents
- Quality of the data
- Additional multimedia
- Important for data search and discovery

Field campaign data

- “Golden cases”
- Event-based data (GHRC goal)
 - Tropical Cyclone Precipitation Feature (TCPF)
 - HS3 subset of World Wide Lightning Location Network (WWLLN)

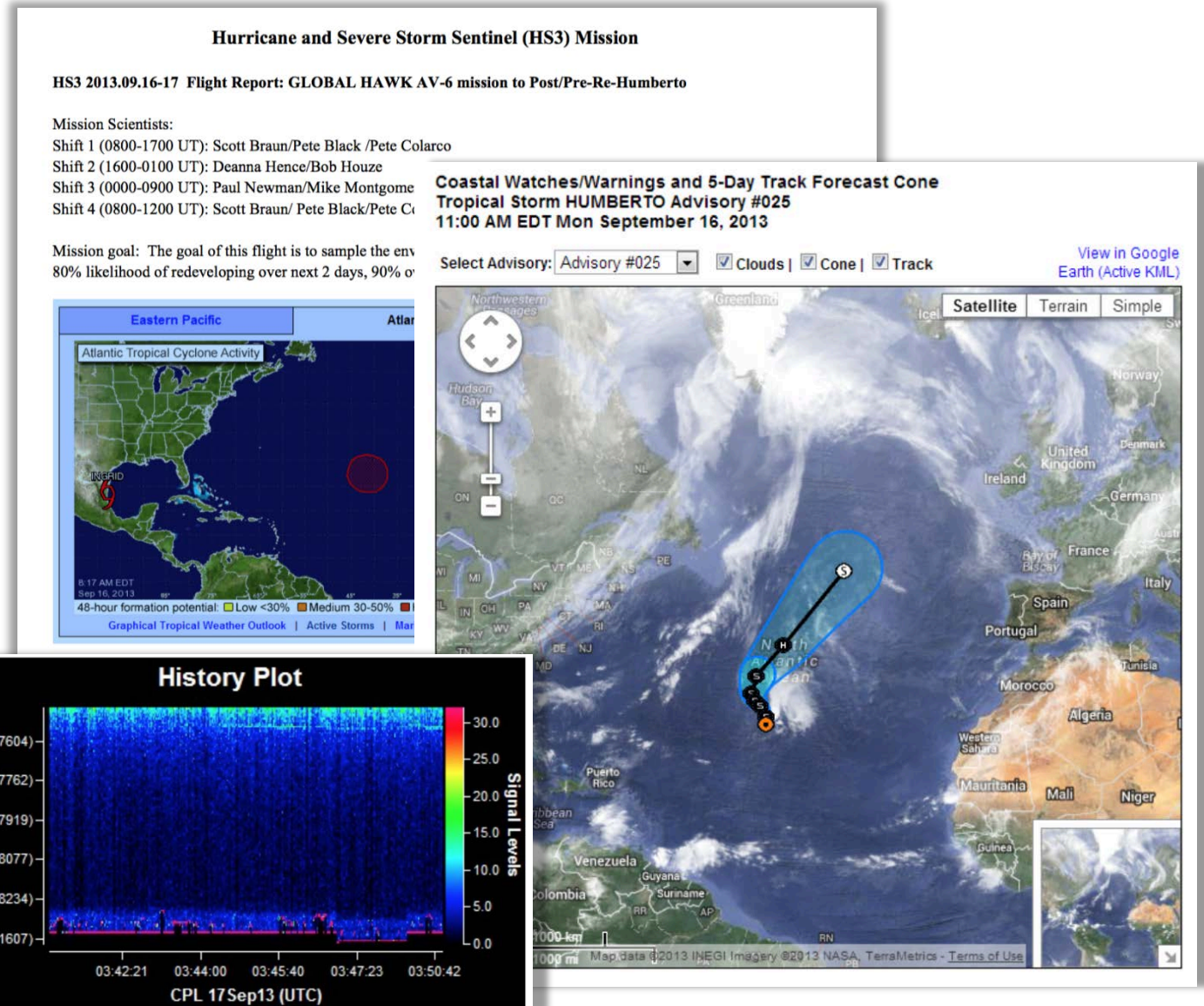
Field Campaign Explorer System (FCX)

- HS3 field campaign data
- Created to reduce the effort in discovering field campaign data to study atmospheric events
- Caters to event-based research
 - Target “Golden Cases” - multiple instruments available to study a physical processes
- Seamless movement between data visualization, discovery and acquisition
- Leverages critical unstructured resources
 - Flight and mission reports
 - Geospatial and temporal tags



Current Data

- Science data – netCDF/CF
 - High-Amplitude Wind and Rain Airborne Profiler (HIWRAP)
 - Hurricane Imaging Radiometer (HIRAD) multi-frequency interferometric radiometer
 - High altitude MMIC sounding radiometer (HAMSR)
- Browse images
- Flight reports
- Flight tracks



FCX Unstructured Resources

- Manual information extraction from HS3 flight and mission reports
- Content was ingested into a database
- Information queried through spatial and temporal tags

The screenshot displays the 'Field Campaign Reports Management Portal' for NASA's Hurricane and Severe Storm Sentinel (HS3) mission. The page features a navigation bar with a 'Home' button and a 'Flight Reports' section. A list of reports is shown, with the selected report being 'HS3 2013.09.25-26 Flight Report: GLOBAL HAWK AV-1 mission convection near Florida and then transit back to Dryden'. The detailed report includes a mission goal, submission information, and a flight record item. A weather radar image is displayed, showing convection over the Florida region. A filter panel on the right allows users to select a storm and flight report, and a 'FLIGHT RECORD ITEM' section lists various data sources with checkboxes.

NASA HURRICANE AND SEVERE STORM SENTINEL HS3

Field Campaign Reports Management Portal

Home

Flight Reports

Title
HS3 2013.09.25-26 Flight Report: GLOBAL HAWK AV-1
TCI/HS3 2014 17 Oct Flight Report: WB-57 Gonzalo Flig
2014-10-15_WB57_Gonzalo1
HS3 2013.09.19-20 Flight Report: GLOBAL HAWK AV-6
HS3 2013.09.16-17 Flight Report: GLOBAL HAWK AV-6
HS3 2013.09.03--04 Flight Report: GLOBAL HAWK AV-
HS3 2013-08-20 Flight Report: GLOBALHAWK AV-6 mis
HS3 2013.09.07-08 Flight Report: GLOBAL HAWK AV-6
HS3 2013.08.29-30 Flight Report: GLOBAL HAWK AV-6
HS3 - Global Hawk #872 09/22/12 - 09/23/12 Science Re

HS3 2013.09.25-26 Flight Report: GLOBAL HAWK AV-1 mission convection near Florida and then transit back to Dryden

Submitted by bstone on Tue, 03/15/2016 - 13:25

Mission goal: Transit of AV-1 back to Dryden. We will do a coordinated flight with t comparisons as well as HIRAD (GH) and SFMR (P-3) comparisons. The target for t scale frontal system. Most of the precipitation was expected to be east of Florida, b west coast of Florida. However, given AV-1 altitude concerns, the eastern target is

Flight Record Item:

Time:
Wednesday, September 25, 2013 - 12:00
Feature:
Convection

Image:

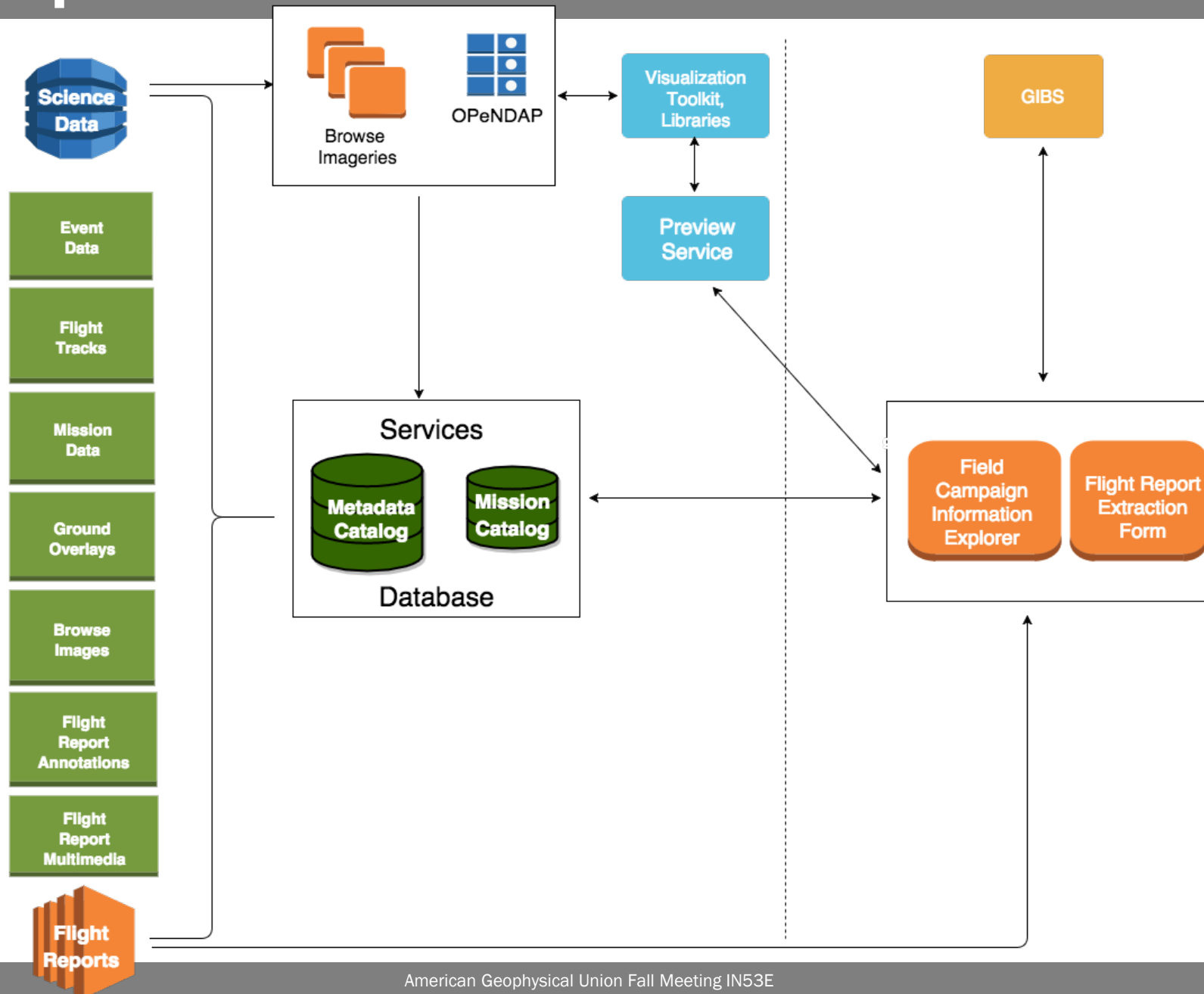
Storm
- None -

Flight Report
- None -

FLIGHT RECORD ITEM

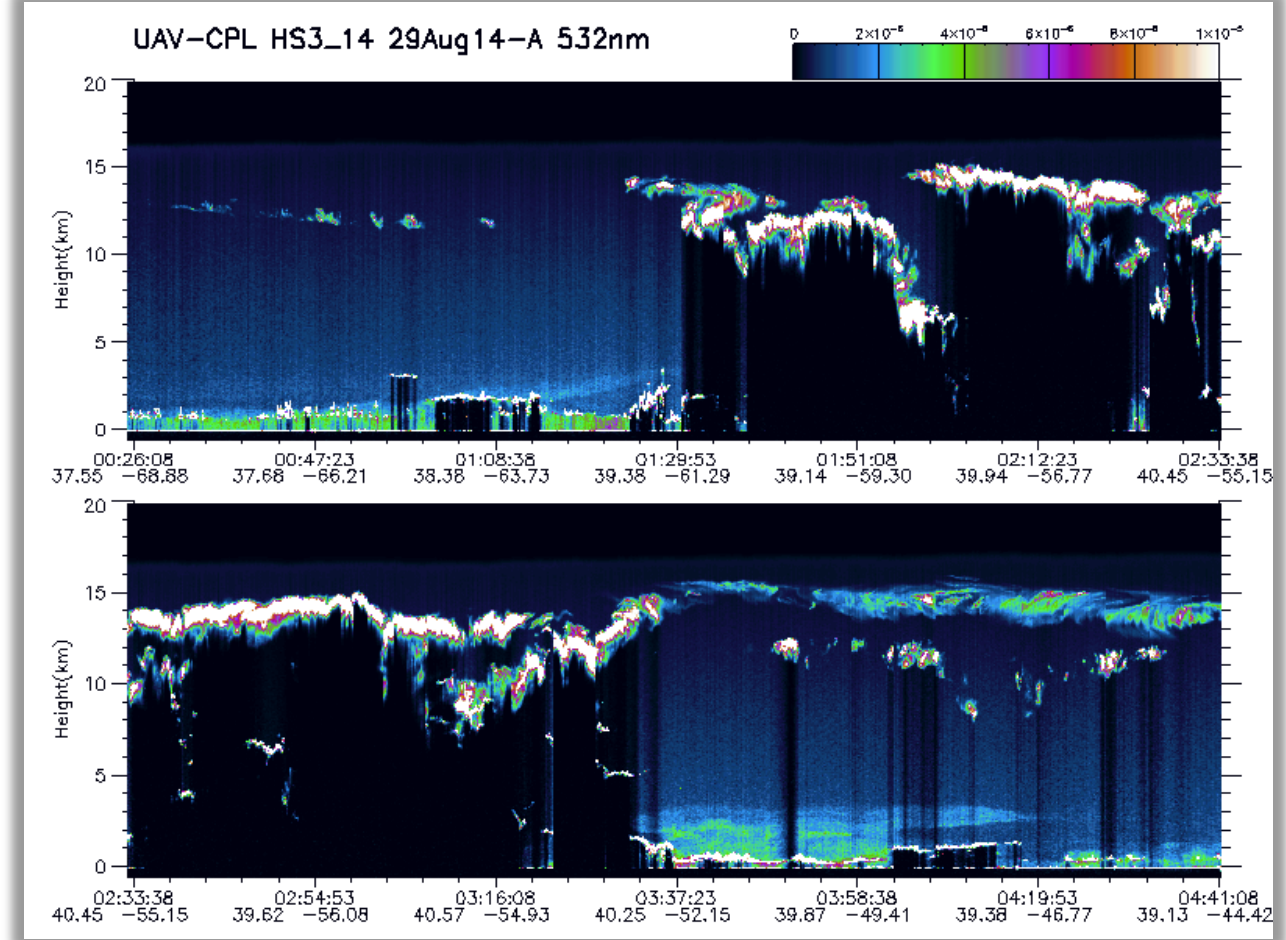
TIME	Date	Time
<input type="checkbox"/>	AVAPS	
<input type="checkbox"/>	CPL	
<input type="checkbox"/>	GMI	
<input type="checkbox"/>	HAMSR	
<input type="checkbox"/>	HIRAD	
<input type="checkbox"/>	HIWRAP	
<input type="checkbox"/>	S-HIS	
<input type="checkbox"/>	Platform	
<input type="checkbox"/>	AF C130	
<input type="checkbox"/>	AF/Radar	
<input type="checkbox"/>	Altamira Mexico Radar	
<input type="checkbox"/>	AQUA	
<input type="checkbox"/>	ASCAT	
<input type="checkbox"/>	Barbados Radar	
<input type="checkbox"/>	Barbados Sounding	
<input type="checkbox"/>	COAMPS	

FCX Components



FCX Capabilities

- Analyze historical hurricane trends and parameters
- Target data and information for a particular hurricane or period of interest
- Data exploration with an interactive map viewer
- Re-enact mission flights – fly along the Global Hawk UAV as it collects data
- On-the-fly data visualization and subsetting using OPeNDAP
 - Reduces size of data acquired
- Data download

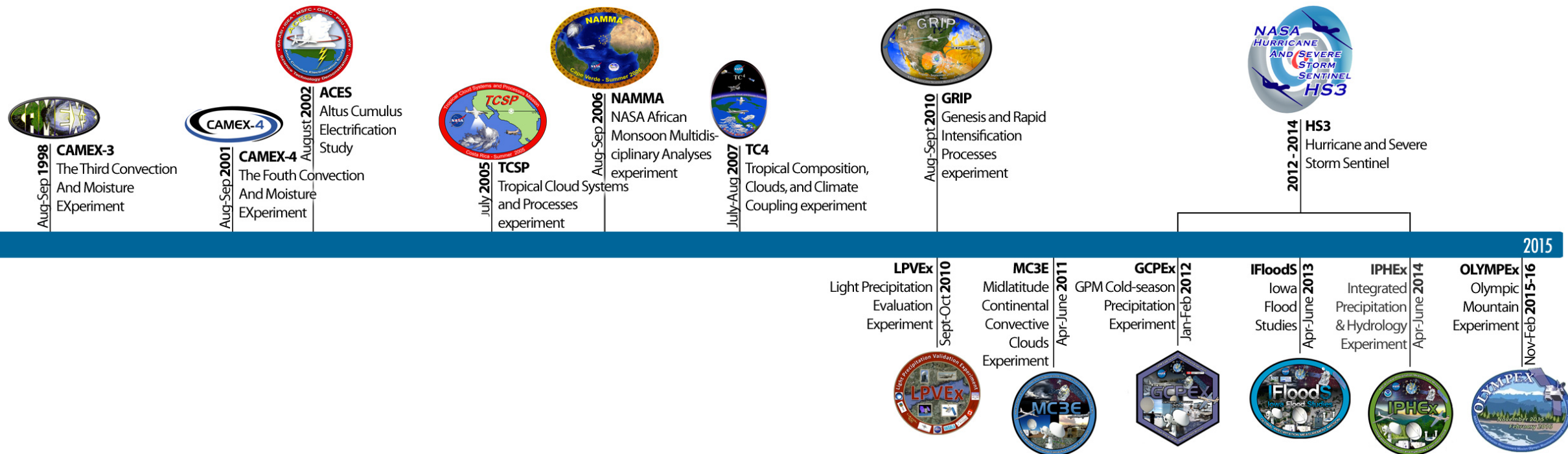


FCX Capabilities



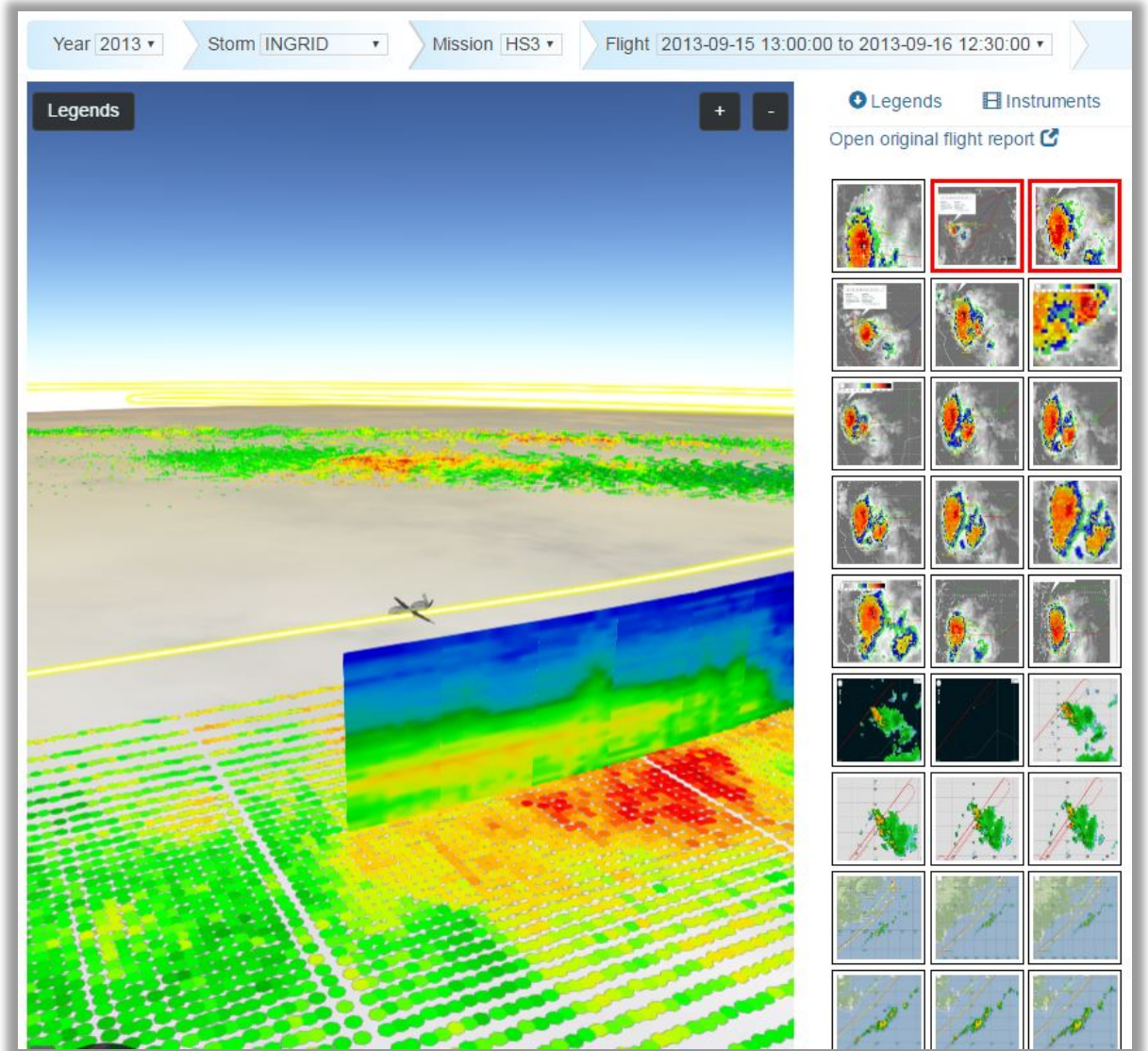
Future Plans

- Explore the tool at: <https://ghrcdev.nsstc.nasa.gov/fc-explorer/>
- FCX will become operational and available to the public in **2017**
- Work to transition other GHRC field campaign data collections into the system
- Enhance user experience by improving FCX usability



Conclusions

- FCX was designed using an adaptable infrastructure
- Leverages unstructured resources through geographic and temporal tagging
- Allows data of various formats and dimensions to be visualized and subsetting on the fly within an interactive map viewer
- Eases the labor intensive data discovery and visualization process for event-based research



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HS3 Science Team



Thank you

Questions?

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