

FIELD CAMPAIGN DATA

At the GHRC DAAC

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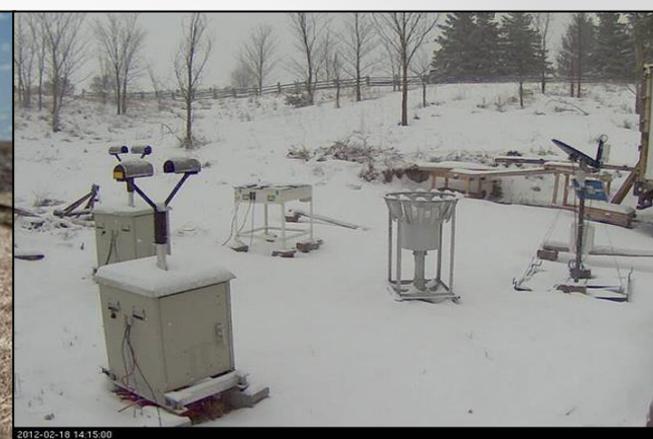
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Presented at the GHRC User Working Group Meeting
September 25-26, 2014



Overview

- What type of field campaign data do we serve?
 - Hurricane Science data
 - GPM Ground Validation data
- GHRC support during field campaigns
- GHRC support after campaigns
- Dataset Statistics



What Kind of Field Campaign Data Do We Serve?

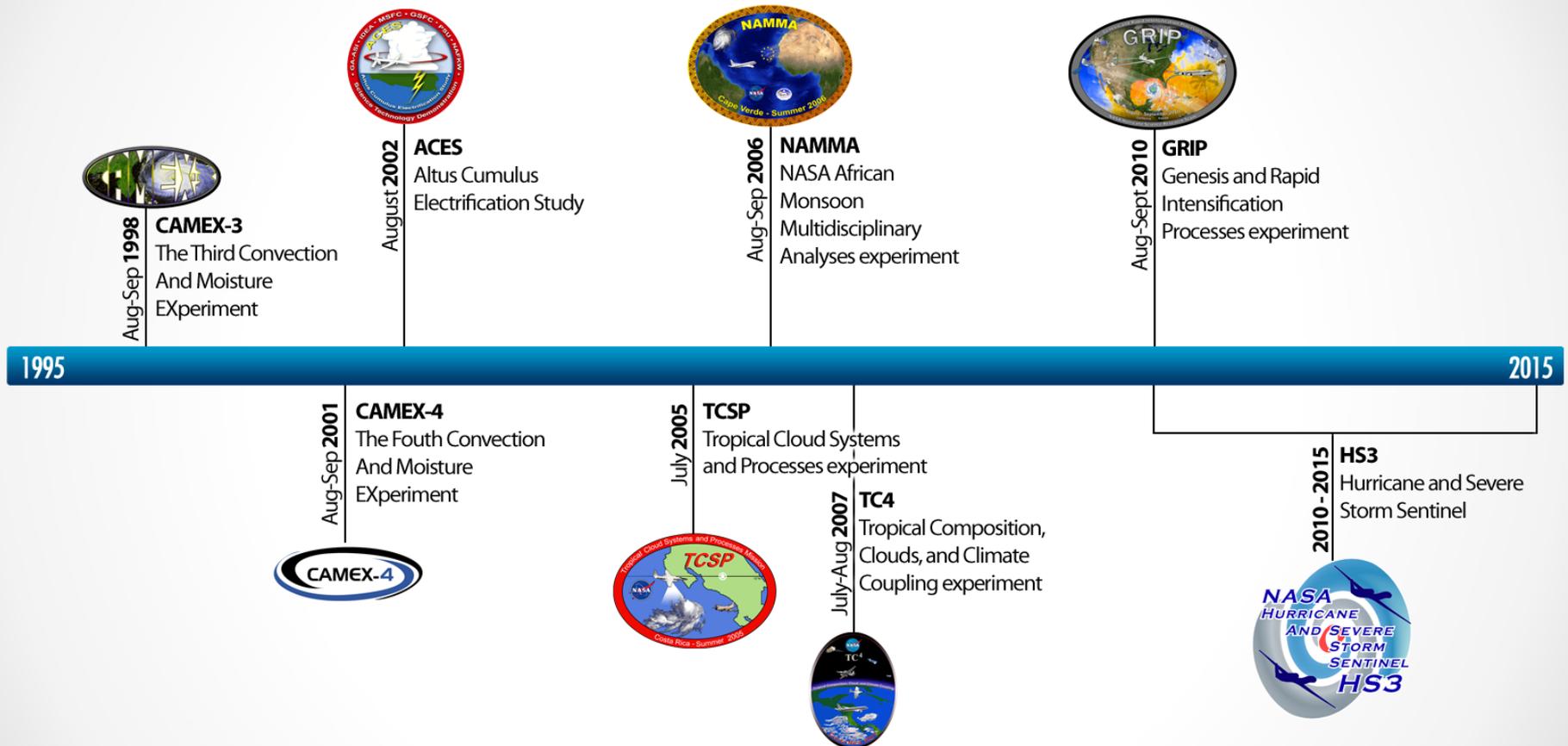
- Hurricane Science
- Global Precipitation Measurement (GPM) Ground Validation Mission



Hurricane Science

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Hurricane Science Timeline



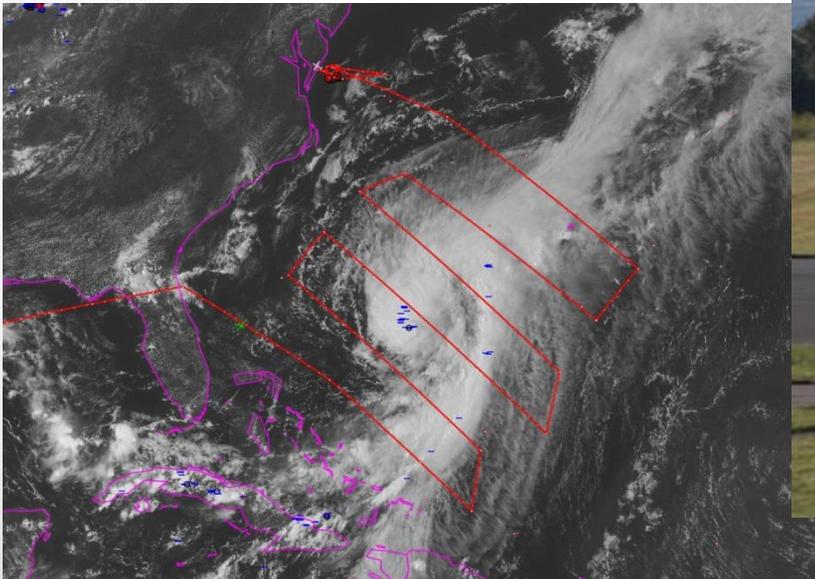
GRIP

- Genesis and Rapid Intensification Process (GRIP)
- Investigates: Tropical storm formation and development
- Year: 2010
- Aircraft: Global Hawk UAV, DC-8
- RTMM: Real-Time Mission Monitor



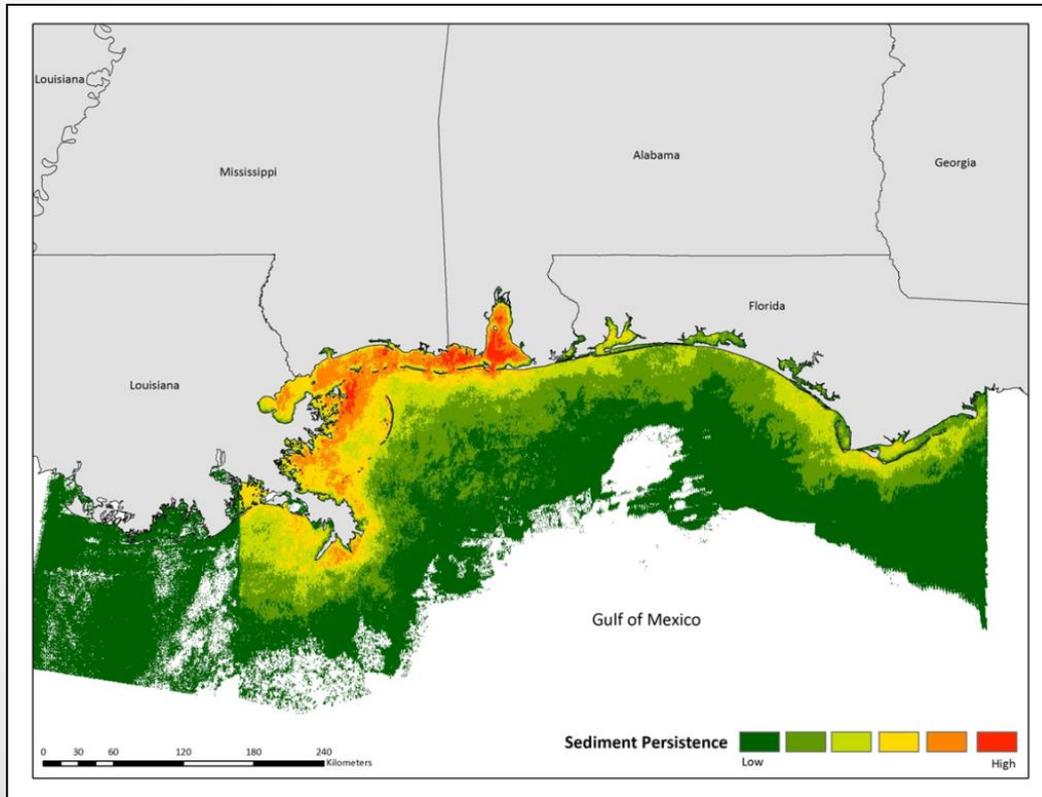
HS3

- Hurricane and Severe Storm Sentinel
 - EV-1 Mission
- Location: Atlantic Ocean basin
- Years: 2010 - 2015
- Investigates: Hurricane formation and development
- Aircraft: Global Hawk UAS



SANDS

- The Sediment Analysis Network for Decision Support
- Created using MODIS and Landsat imagery from 10 tropical cyclones



Storm	Landfall Date
Tropical Storm Helene	September 21, 2000
Hurricane Ivan	September 15, 2004
Tropical Storm Arlene	June 11, 2005
Hurricane Dennis	July 10, 2005
Hurricane Katrina	August 28, 2005
Tropical Storm Fay	August 19, 2008
Hurricane Gustav	September 1, 2008



Global Precipitation Measurement Ground Validation Missions

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What is the GPM Mission?

- Network of international satellites providing global rain and snow observations
- Created to help improve our understanding of water and energy cycles
- Core observatory launched February 27, 2014

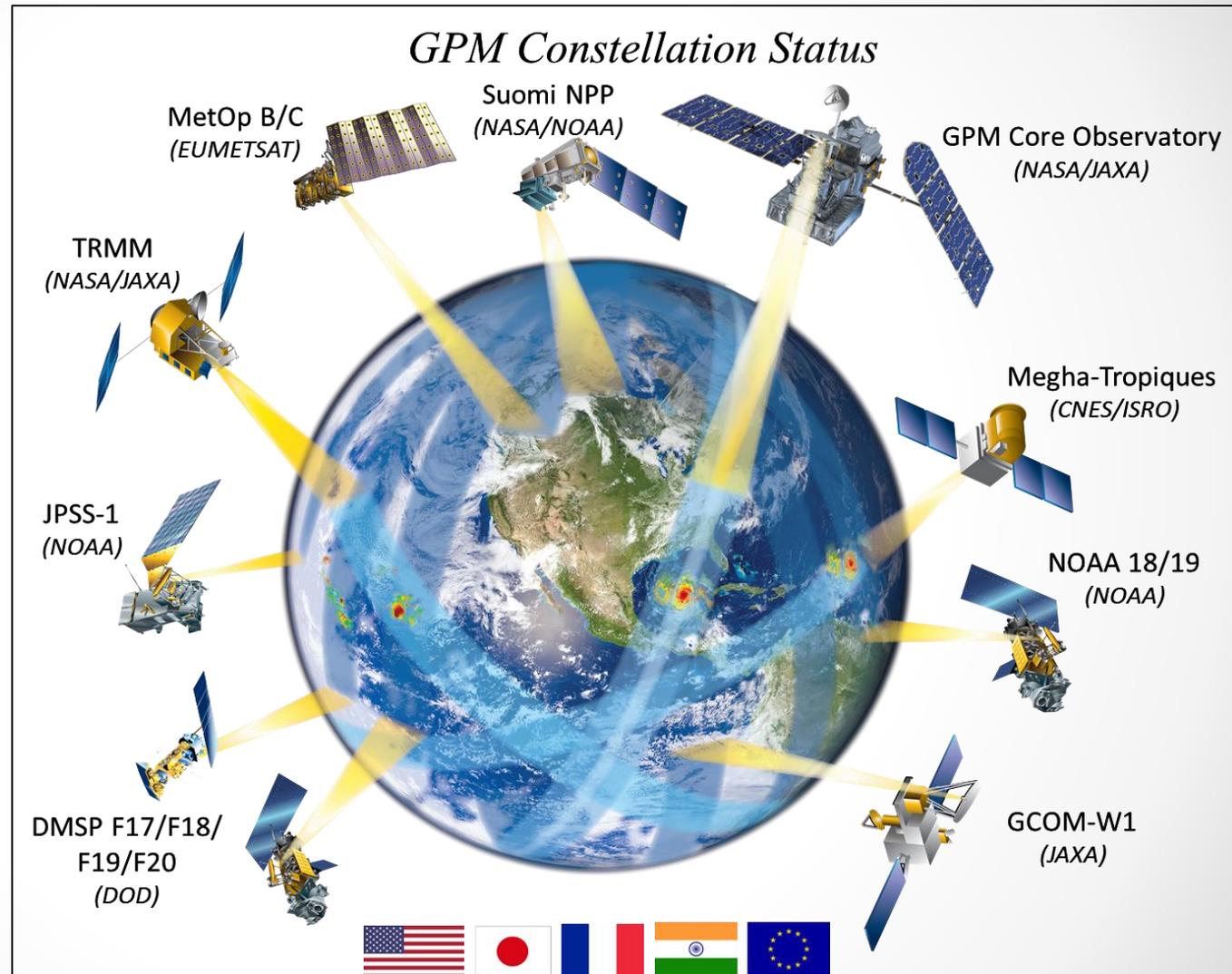
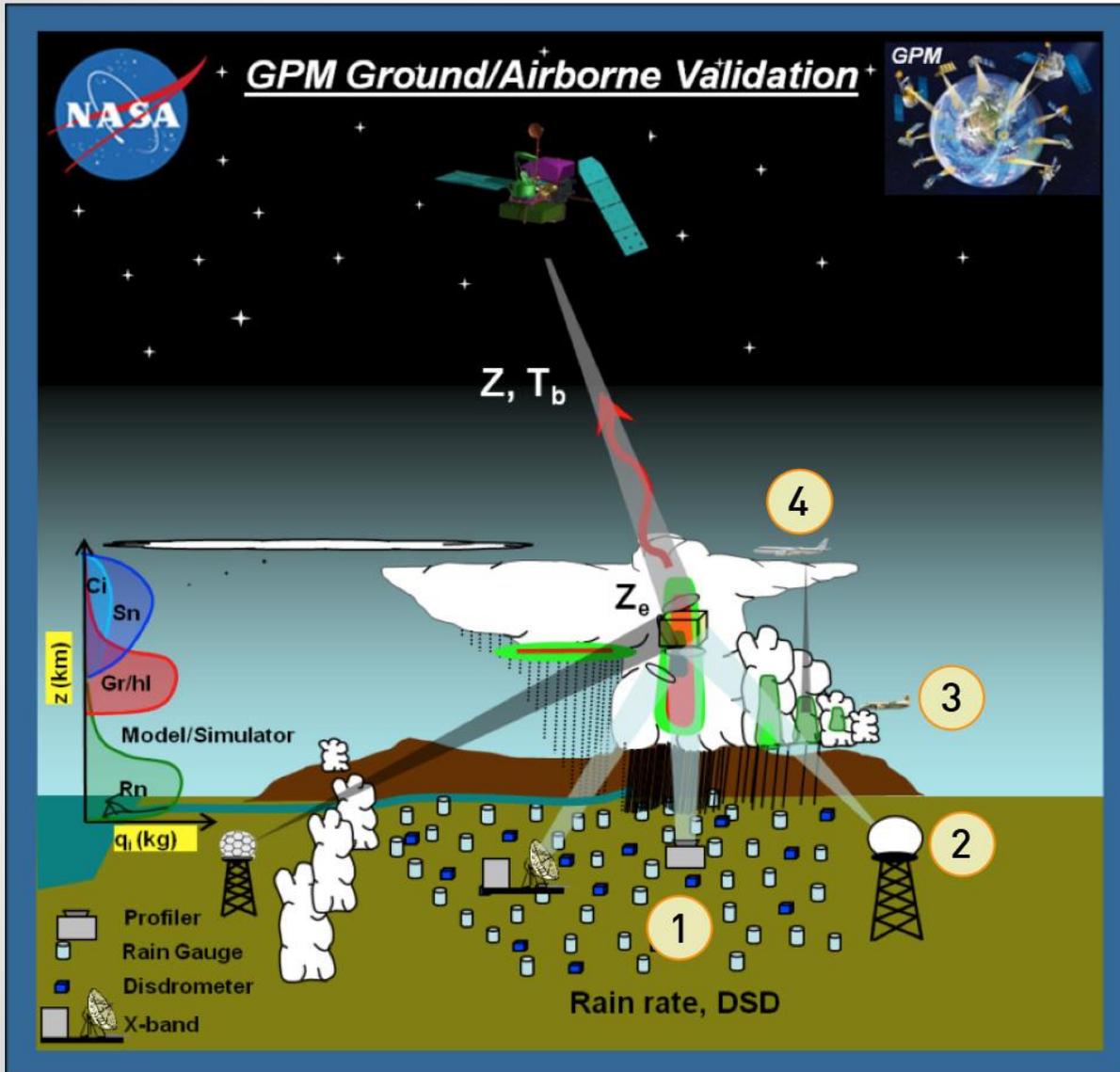


Image Source: NASA, <http://pmm.nasa.gov/image-gallery/gpm-constellation>

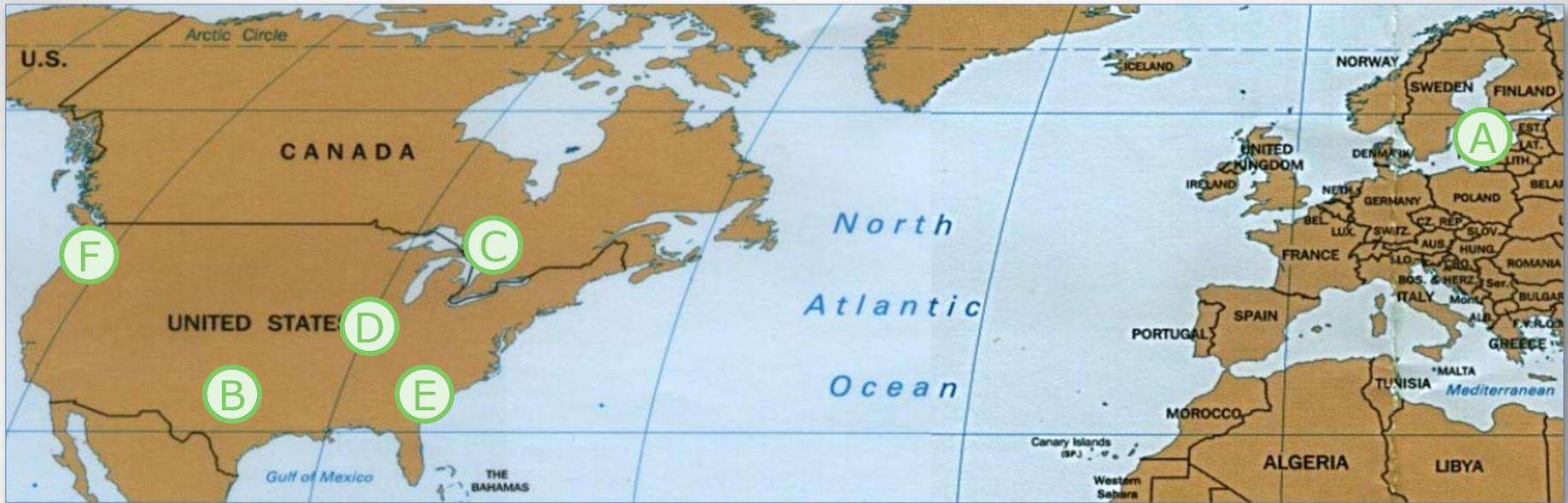
Global Precipitation Measurement (GPM) Ground Validation Experiments



What are the GPM Ground Validation Experiments?

- Network of instruments including:
 - Ground-based: Disdrometers, rain gauges
 - Aircraft-based: micro-physical sensors, radar
 - Satellite-based: AMSR-E, GOES IR, TMI
- Observations are used to calibrate & validate GPM Core Observatory science algorithms

GPM Ground Validation Mission Locations



- a) **LPVEx**, Gulf of Finland in autumn 2010, to study *rainfall in high latitude environments*
- b) **MC3E**, central Oklahoma spring and early summer 2011, to develop a *complete characterization of convective cloud systems, precipitation and the environment*
- c) **GCPEX**, Ontario, Canada winter of 2011-2012, direct and remote sensing observations, and coordinated model simulations of *precipitating snow*
- d) **IFloodS**, Iowa, spring and early summer 2013, to study the relative roles of rainfall quantities and other factors in *flood genesis*
- e) **IPHEX**, N. Carolina Appalachians/Piedmont region May-June 2014, for *hydrologic validation over topography*
- f) **OLYMPEx**, Washington's Olympic Peninsula scheduled November 2015-February 2016, for *hydrologic validation in extreme coastal and topographic gradients*

GPM Ground Validation Mission – Recent and Upcoming Campaigns

IPHEX

- Location: North Carolina
- Investigated: Orographic precipitation formation
- Data Includes: Radar, rain gauge measurements, disdrometers



OLYMPEX

- Location: Olympic peninsula in Washington state
- Investigates: Hydrologic validation in extreme coastal and topographic gradients



How does the GHRC support scientists during each mission?

Real Time Mission Coordination:

- Access to near-real-time ancillary data (NEXRAD, GOES, Forecast Models)
- Access to uploaded plan of the day, instrument data, forecasting, mission reports, documentation, quick look imagery, etc.

The screenshot shows the IFlloodS Iowa Flood Studies website. The header includes the NASA and Iowa Flood Center logos, a search bar, and navigation links: Portal Home, About Field Campaign, Forecaster Resources, Catalog, View Data, Get Data, External Data Sources, Iowa Flood Center, and Contact US. The main content area is titled "Home" and features several sections:

- Daily Events Schedule:** 0900* Daily weather briefing and Mission Scientist Discussion (Lead Forecaster/Mission Scientists). Contact: 1-866-763-8998, Passcode: 1336337. Note: * Time will adjust as missions and POD dictate.
- Plan of the Day:** Title: Plan of the day for 12 June 2013. Date: Wednesday, June 12, 2013 - 09:45. Discussion: We are expecting a severe weather event today (this afternoon) near and east of the NPOL radar site, to include the XPOL domain and Turkey as well (could be even worse there). So, ops will run accordingly- looking for tornado, hail, wind threat. For wind, we will likely try and push the envelope a bit with NPOL to test our threshold (and collect good data). We will, however, be very conservative on hail threat. XPOLs will operate in campaign...
- Latest Instrument Status Reports:** Ground section with updates for 2D Video Disdrometer, Autonomous Parsivel Units (APU), and Micro Rain Radar (MRR) Disdrometer. Radar section is partially visible.
- Plan of the Day (right sidebar):** List of daily plans for June 2013, including a "Post new Plan of the Day" button.
- Hydro Forecasts (right sidebar):** List of hydro forecasts from 6/3/2013 to 6/10/2013, with a "Post new Hydro Forecast Report" button.
- Weather Forecasts (right sidebar):** List of weather discussions from 6/8/13 to 6/12/13, with a "Post new Weather Forecast Report" button.

How does the GHRC support scientists post mission?

Publish data products in NASA search engines:

- Reverb, GCMD, and HyDRO – GHRC search & order system

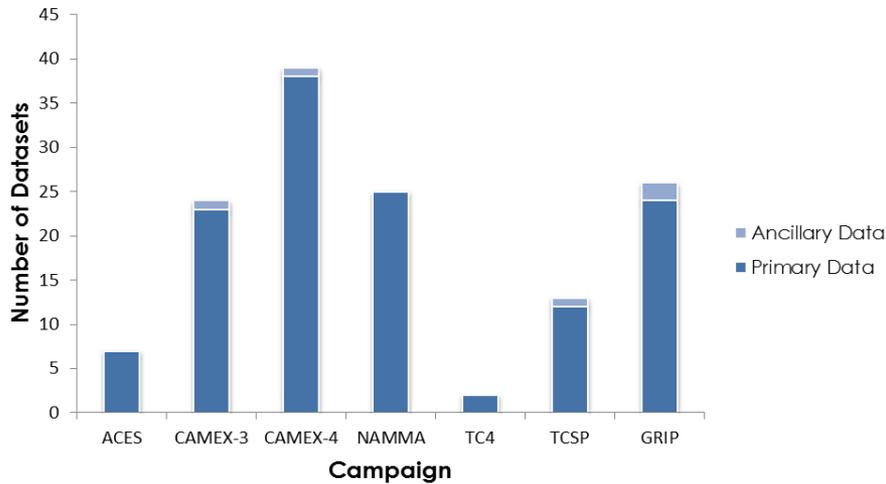
Publication to search engines includes:

- Cataloging metadata for source, sensor, parameters, temporal and spatial attributes to NASA search engines
- Staging data/images to GHRC FTP
- Documenting high level data guides

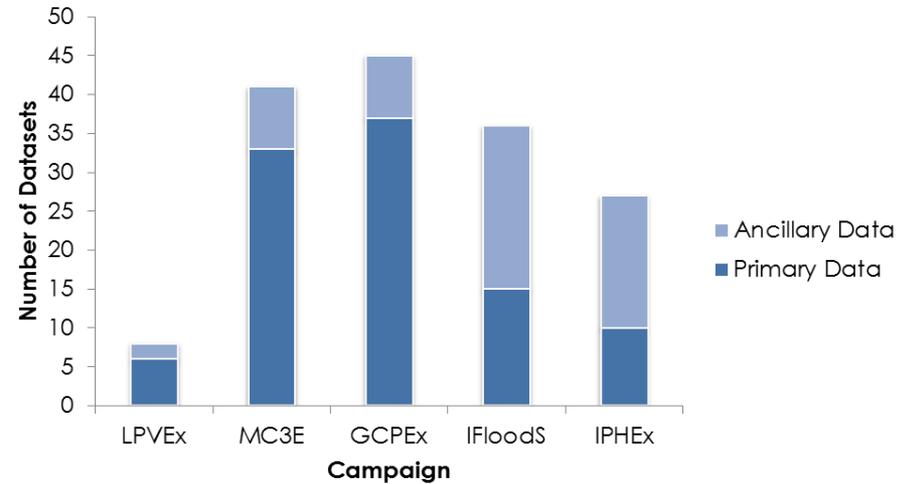
<input type="checkbox"/>	CAMEX-4 Products (42 datasets)
<input type="checkbox"/>	GPM-GV GCPEX Products (34 datasets)
<input type="checkbox"/>	GPM Ground Validation Advanced Microwave Radiometer Rain Identification (ADMIRARI) GCPEX * i ↓ ↻
<input type="checkbox"/>	GPM Ground Validation Airborne Second Generation Precipitation Radar (APR-2) GCPEX * i ↓ ↻
<input type="checkbox"/>	GPM Ground Validation Autonomous Parsivel Unit (APU) GCPEX * i ↓
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<input type="checkbox"/>	GPM Ground Validation DC-8 Navigation and Housekeeping Data GCPEX * i ↓
<input type="checkbox"/>	GPM Ground Validation Dual Polarization Radiometer GCPEX * i ↓ ↻
<input type="checkbox"/>	GPM Ground Validation Dual Polarized C-Band Doppler Radar King City GCPEX * i ↓ ↻
<input type="checkbox"/>	GPM Ground Validation Dual-frequency Dual-polarized Doppler Radar (D3R) GCPEX * i ↓ ↻
<input type="checkbox"/>	GPM Ground Validation Environment Canada (EC) Manual Precipitation Measurements GCPEX * i ↓
<input type="checkbox"/>	GPM Ground Validation Environment Canada (EC) Micro Rain Radar (MRR) GCPEX * i ↓ ↻
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<input type="checkbox"/>	GPM Ground Validation Environment Canada (EC) Precipitation Occurrence Sensor System (POSS) GCPEX * i ↓ ↻
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<input type="checkbox"/>	GPM Ground Validation McGill W-Band Radar GCPEX * i ↓
<input type="checkbox"/>	GPM Ground Validation Meteorological Tower Environment Canada GCPEX * i ↓ ↻
<input type="checkbox"/>	GPM Ground Validation NASA Micro Rain Radar (MRR) GCPEX * i ↓
<input type="checkbox"/>	GPM Ground Validation NCAR Cloud Microphysics Particle Probes GCPEX * i ↓ ↻
<input type="checkbox"/>	GPM Ground Validation Pluvis Precipitation Gauge GCPEX * i ↓
<input type="checkbox"/>	GPM Ground Validation Precipitation Video Imager (PVI) GCPEX * i ↓ ↻
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<input type="checkbox"/>	GPM Ground Validation Two-Dimensional Video Disdrometer (2DVD) GCPEX * i ↓
<input type="checkbox"/>	GPM Ground Validation UND Citation Cloud Microphysics GCPEX * i ↓
<input type="checkbox"/>	GPM Ground Validation UND Citation Navigation Data GCPEX * i ↓
<input type="checkbox"/>	GPM-GV IFloodS Products (5 datasets)

Datasets per Campaign

Hurricane Science Data Holdings



GPM-GV Data Holdings



Primary mission data are from instruments that were deployed to the region specifically for the campaign.

Ancillary data are other data already being collected in the region (NWS radars, rain gauges, satellite products, etc.)

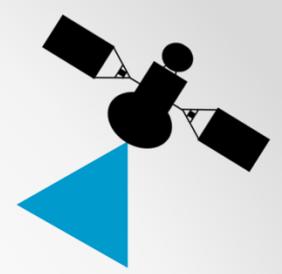
FIELD CAMPAIGN PORTALS

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Presented at the GHRC User Working Group Meeting
September 25-26, 2014



Goals For GHRC Field Campaign Portals

- Provide an intuitive way for investigators to document campaign information
 - Campaign/Mission coordination
 - Logistics information
 - Daily campaign reporting
- Provide data services and data storage (one stop shop) for campaign data
 - Uploading / storing campaign data
 - Provide visualization tools for quicklooks
 - Convenient to search and download data
- Improving/maximizing user experience
 - User feedback
 - Lessons learned

Field Campaign Portals Evolution

History – Technology Advancement

- HTML/CGI portal
 - CAMEX3
- JAVA JSP dynamic web portal
 - CAMEX4
- WordPress content management system
 - NAMMA, TCSP, TC4
- Drupal content management system
 - GRIP, GPM GV

The screenshot shows the GRIP Team Dashboard website. The header includes the NASA logo and the text 'NATIONAL AERONAUTICS AND SPACE ADMINISTRATION'. Below the header is a navigation menu with links like 'Portal Home', 'About GRIP', and 'GRIP-RTMM_2ndGen'. The main content area is divided into several sections:

- DASHBOARDS:** Includes 'GRIP Default Dashboard' and 'Forecasters Dashboard'.
- MY LINKS:** Lists various resources like 'How to Access GRIP Data', 'GRIP Image galleries', and 'GRIP News Gallery'.
- PLAN OF THE DAY:** A section for daily updates.
- LOGISTICS:** Contains information about 'Evacuation Plan', 'Fort Lauderdale Shipping Address', and 'GRIP Participants List'.
- GRIP DEPLOYMENT SCHEDULES:** A section for mission schedules.
- Science Meeting:** Announces a meeting on June 6-8, 2011, at the Embassy Suites LAX South.
- Integrated Flight Schedules:** Lists flight schedules for G-4 and All Aircraft.
- Mission Manager Flight Reports:** A table showing flight details for DC-8 aircraft.

Title	Aircraft	Sortie Number	Flight Date	Take Off Time	Landing Time	Flight Hours Used
DC-8 NB17NA Flight #100625	DC-8	100625	Sat, 09/25/2010	Sat, 09/25/2010 - 12:57	Sat, 09/25/2010 - 17:57	4.70
DC-8 NB17NA Flight #100624	DC-8	100624	Wed, 09/22/2010	Wed, 09/22/2010 - 16:00	Wed, 09/22/2010 - 23:37	7.70

TC4 is sponsored by the NASA Headquarters Atmospheric Composition Focus Area including the Upper Atmospheric Research Program (Michael Kurlyo, Program Manager), the Radiation Science Program (Hal Maring, Program Manager) and the Tropospheric Chemistry Program (Jim Crawford, Program Manager). TC4 is planned for July 2007 in San Jose, Costa Rica.

The Real Time Mission Monitor will provide simultaneous aircraft status for three aircraft during the TC4 experiment. During TC4, the NASA ER-2, WB-57 and DC-8 aircraft will fly missions at various altitudes. The science flights are scheduled between 17 July and 8 August, 2007. The exact schedule will be decided on a day-to-day basis.

+ Freedom of Information Act
 + The President's Management Agenda
 + NASA Privacy Statement, Disclaimer, and Accessibility Information

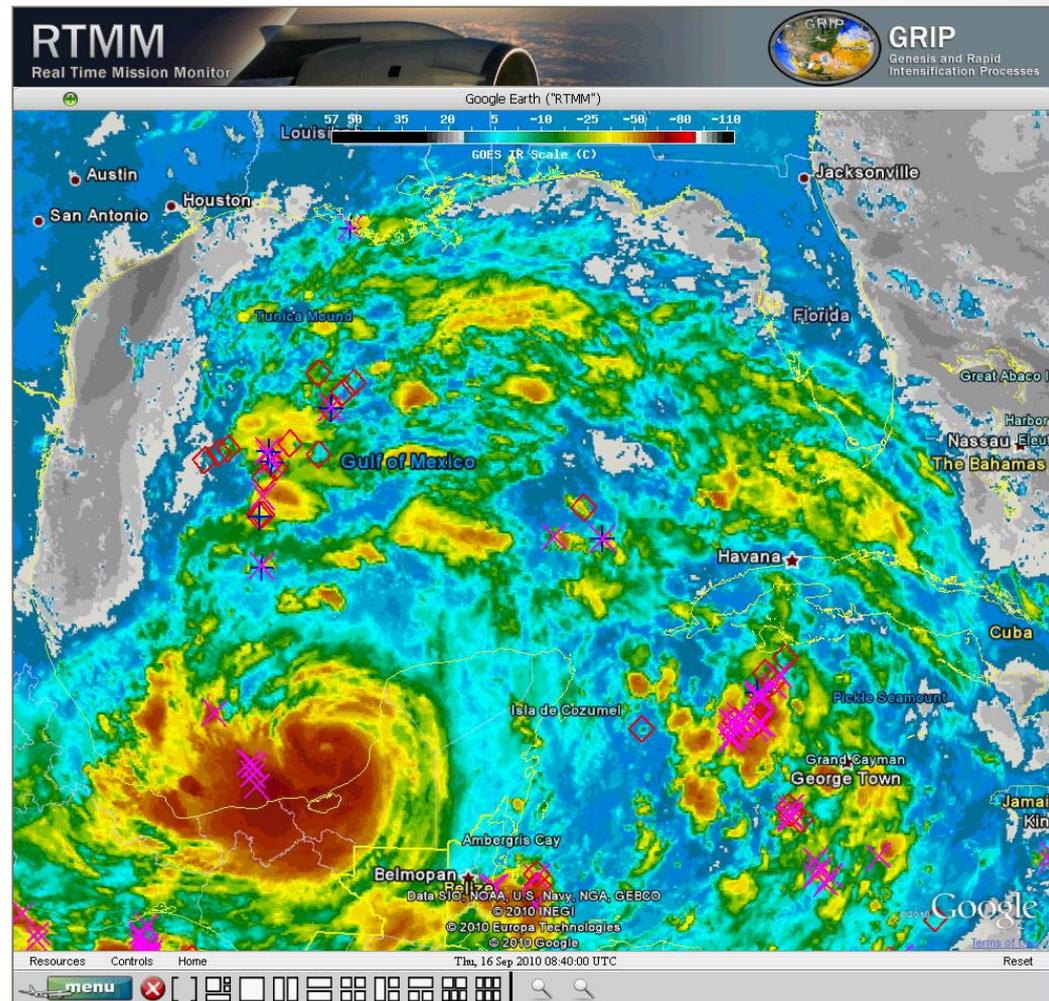


NASA Official: Michael Goodman
 Curator: Danny Hardin

Connected to ws1.ems... Waiting for ws1.ems.eosdis... Connected to ws1.ems.eosdis.nasa.gov...

Real Time Mission Monitor (RTMM)

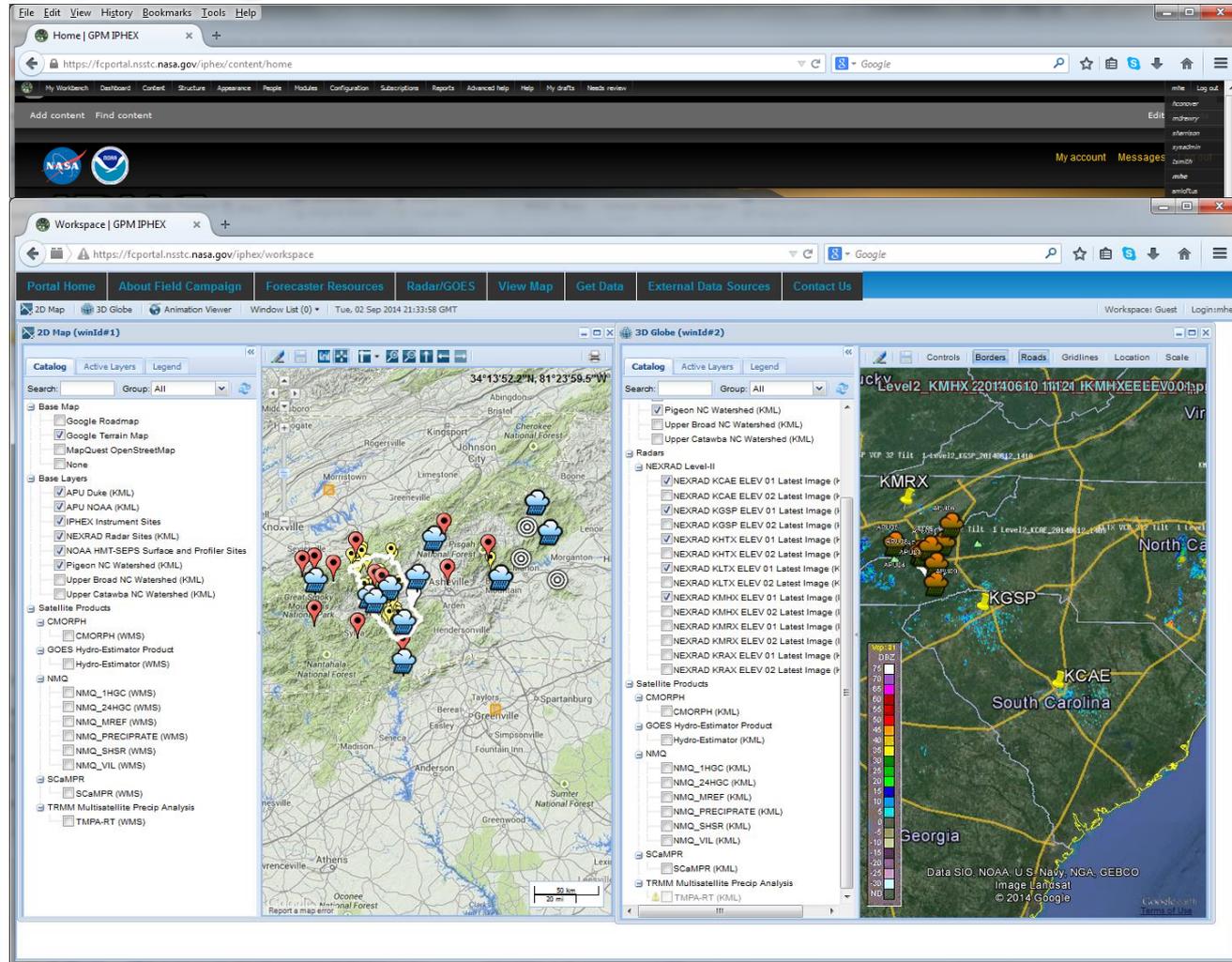
- Real time data visualization with Google Earth
- Quick flight planning/updating with Way Point Tool
- Real time communication with IRC Chat
- Other tools to support field campaign



2010-09-16, Hurricane Karl, Flights include Air Force C-130 Hurricane Hunter, NOAA42, NOAA49, NASA Global Hawk, NASA WB-57, and NASA DC-8.

Data Mapping and Visualization

- ORION Visualization Tool for IPHEX
 - Data Ingest
 - GeoServer and THREDDS Services
 - Stackable 2-D Map, 3-D Google Earth, and Animation Viewer windows.



ORION Visualization Tool in IPHEX Portal

Summary

- Current Drupal content management system provides a good way for campaign documenting and coordination
- Data services at GHRC meet users' need on data management
- Visualization tools provides real time data quicklooks to the data users
- Portal is becoming the one stop shop for all data needs
- We kept the best practices for enhancing user experience

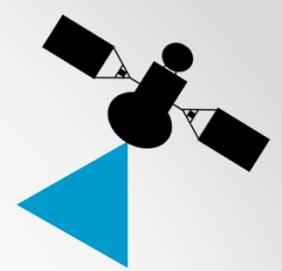
HS3 DATA SYSTEM

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Presented at the GHRC User Working Group Meeting
September 25-26, 2014



HS3 – The mission



- Hurricane and Severe Storm Sentinel
 - Objective
 - Obtain critical measurements in hurricane environment
 - Identify the role of key factors – large-scale wind systems (troughs, jet streams)
 - Observe and understand 3D mesoscale and convective-scale internal structures of tropical disturbances and cyclones and their role in intensity change
 - Science Questions
 - What impact does the large-scale environment have on intensity change?
 - What is the role of storm internal processes such as deep convective towers?
 - To what extent are these intensification processes predictable?

HS3 – The mission

- Sustained measurements over several years
 - Address science questions
 - Larger data volume
- Build upon results from previous missions
- Deployments: mid-Aug to mid-Sep 2012-2014
- Ten 30-h flights per deployment
- Primary data users:
 - HS3 science team
 - NASA Hurricane Science Research Program
- Other users:
 - NOAA funded researchers – collaborators with HS3 team
 - Operational users at NHC
 - Larger hurricane science community



HS3 Data System

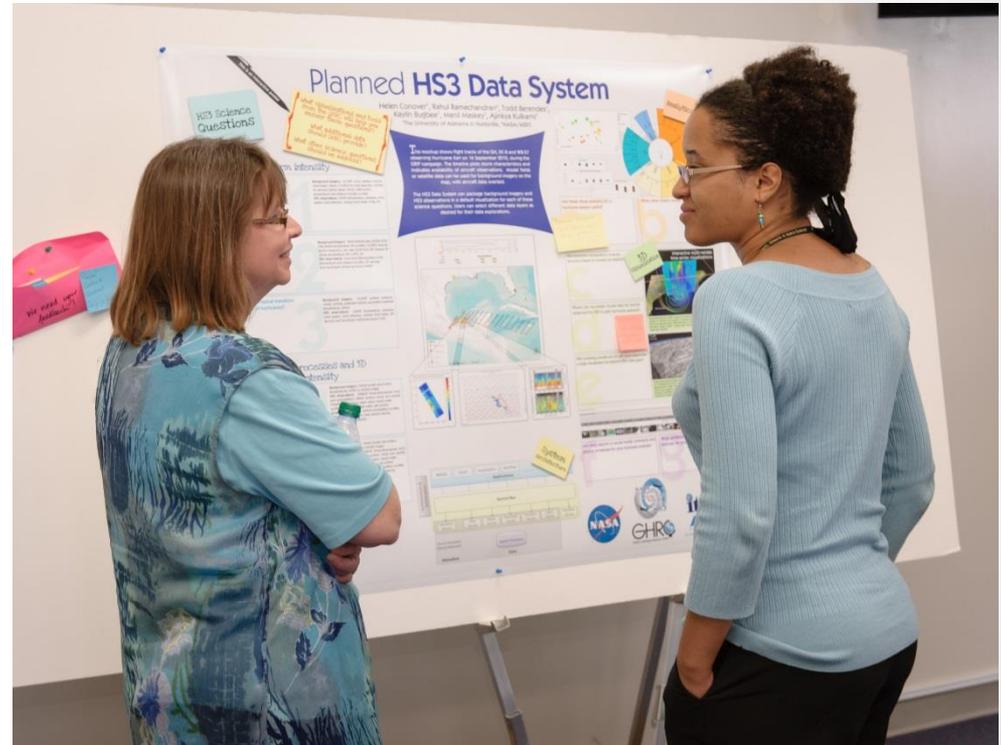
- Data System
 - Consists of various system elements
 - Is accessible to programs and users – User Interfaces & APIs
- Move seamlessly from **data discovery** through **delivery** to **visualization** and **analysis**
- Processes: Data Collection, workflow, management, analysis and reporting
- **Enhance current GHRC Data System**

New Elements

- Largely automated metadata ingestion
- Flight track-based data search
- Flight report-based data search
- Faceted search – aircrafts, instruments, campaigns, variables
- On the fly data subsetting
- Libraries for direct data access – hs3lib: Python, IDL
- **Visualization interfaces - 2D & 3D**
 - Link to data files
 - Interactive
 - Multivariate
 - Instrument dashboard
 - Playback
 - Web and Desktop
- And More ...

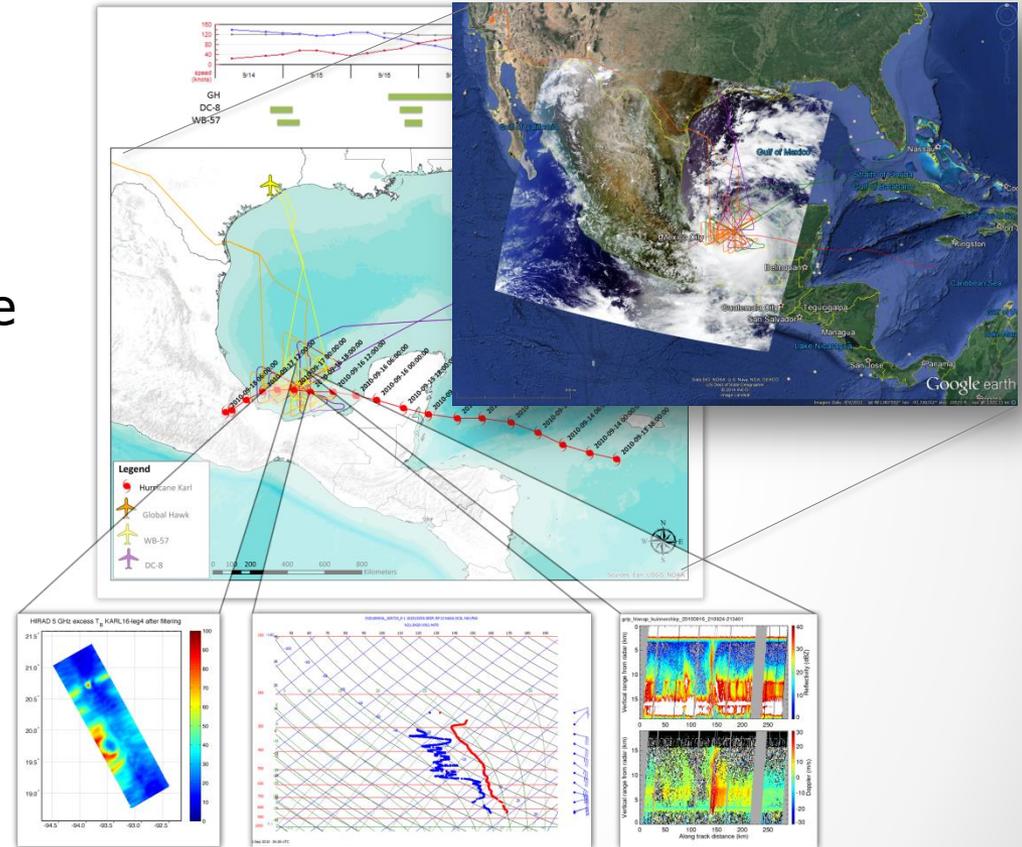
Roadmap

- Requirements gathering
- Software stack evaluation
- Prototype
- Short term
 - Integration platform
 - Mediation interfaces of existing services
- Medium term
 - Robust platform
 - Visualization interfaces
 - Reusable security service (URS, Drupal)
- Long term
 - Shared integration platform
 - Workflow capabilities

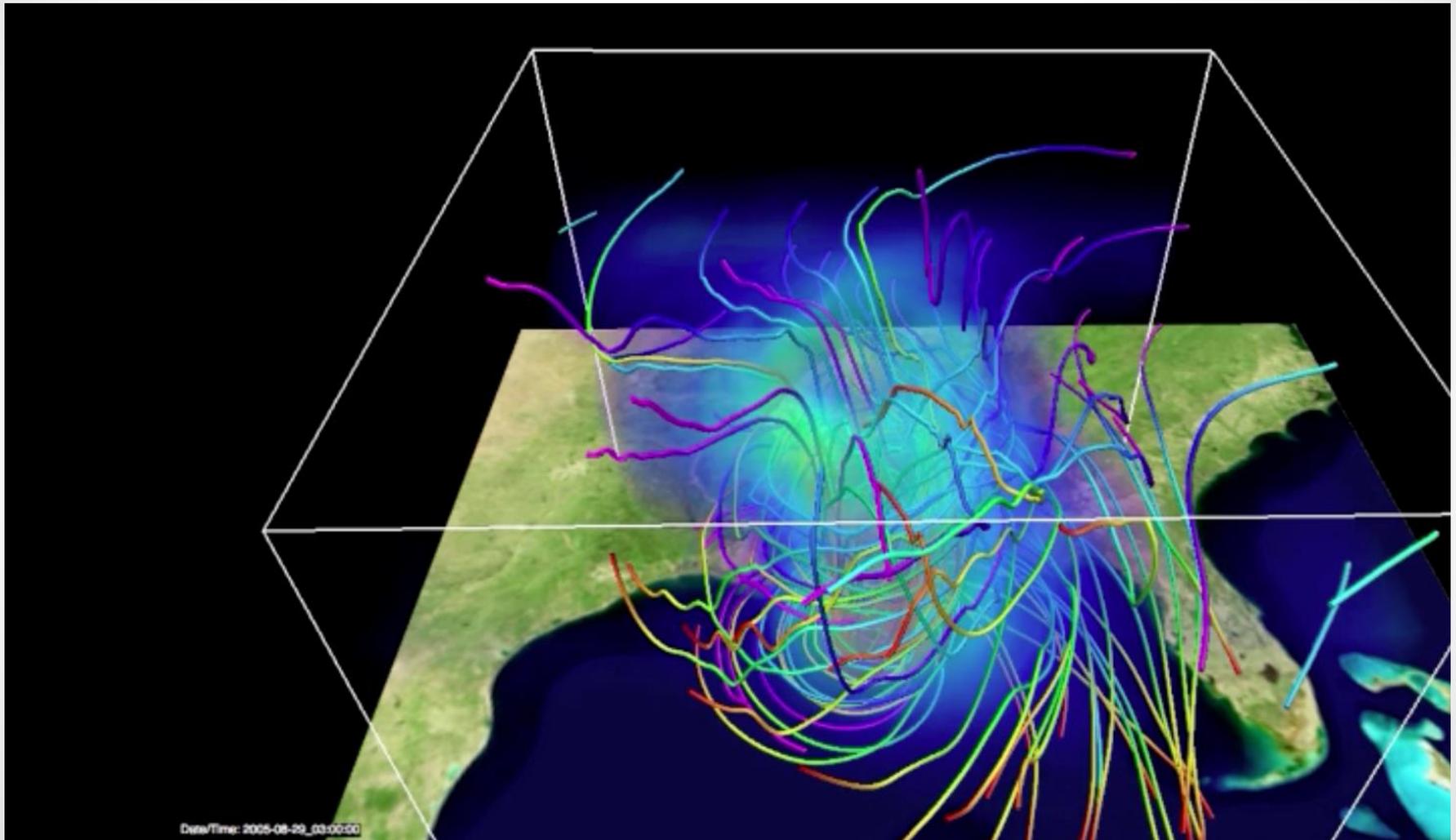


Example Visualization Interface

- Map-based navigation
 - Data of interest
 - Mockups: GH, DC-8, WB-57 flight tracks (Hurricane Karl for GRIP)
 - Timeline plots: storm characteristics and availability of aircraft observations
 - Model results or satellite data for background imagery



Example Visualization Interface



Discussion

Data

- **Field campaigns provide many diverse data sets from a variety of instruments and data providers -**
 - Can you suggest efficiencies in working with the many PIs and other data providers?
 - How can we improve collection of metadata and documentation?
- **What is your preferred data format for these data?**
- **How do you search for and access field campaign data?**
 - By campaign and/or flight?
 - By instrument? Across campaigns?
 - By geophysical parameter?
 - By event (e.g., hurricane, precipitation type)?
 - By location?

Discussion

Services

- **Are there data services available through the field campaign coordination portals that would be for public data exploration and access?**
- **Are there other data access mechanisms you would recommend?**
- **Do you have a preferred data exploration tool?**
- **Specific to planned HS3 data system:**
 - Will interactive visualizations of storm structure be helpful?
 - Will interactive fly-through and observed data visualization be helpful?
 - Can visualizing Model and Observation data in a single visualization be helpful to fill-in the data gap?
 - Will the HS3 Data System answer science mission questions?