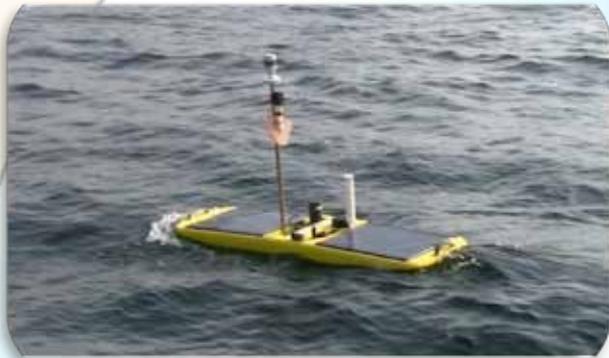


# Ocean observing system in the Gulf of Mexico

“Near” real-time visualization for wave-glider

Shin Kobara, Ph.D.

# Web map for near real-time glider data



Liquid Robotics Wave glider

**Challenge**



ArcGIS

**Time-series info**



Web map application

# Global Ocean Observing System



<http://www.ioc-goos.org/>

<http://unesdoc.unesco.org/images/0018/001878/187825E.pdf>

# What is the Global Ocean Observing System?

It is one of several major Earth observing systems including: World Weather Watch, Global Climate Observing System, and Global Terrestrial Observing System among others.

The Global Ocean Observing System has two components:

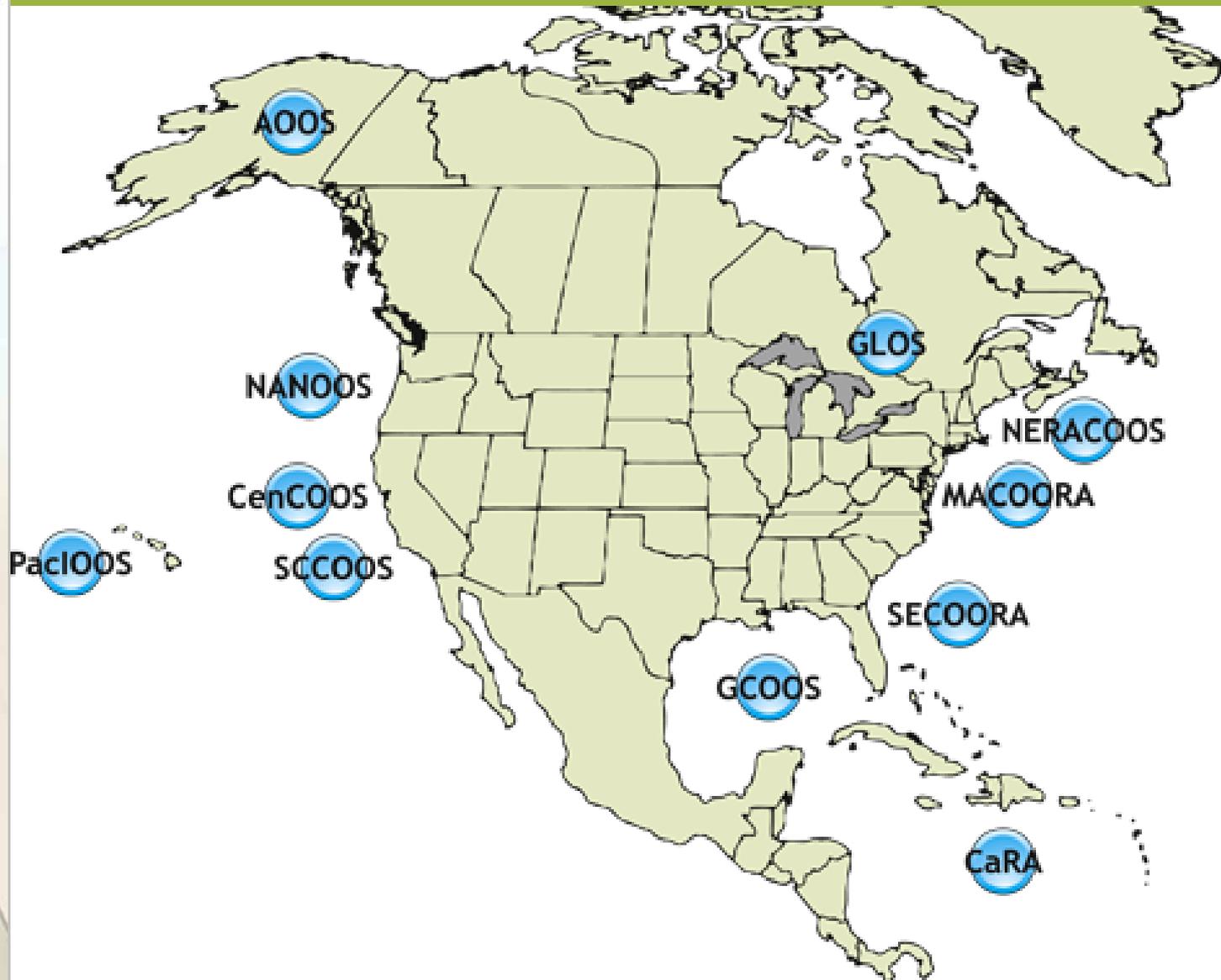
Global—observations, predictions and reports:

1. Weather over, and state of, the ocean
2. Role of the ocean in climate

Coastal—developed by nations and regions for socioeconomic benefits based on information regarding the coastal ocean

# GCOOS-RA

## Regional Associations Across The United States



# Activity: Working to Integrate Information

**GULF OF MEXICO COASTAL OCEAN OBSERVING SYSTEM DATA PORTAL**

Home | Regional Assoc. | Monitoring | Maps | Advanced Search

**Welcome to GCOOS Data Portal**

This **Data Portal** provides timely information about the environment of the United States portion of the Gulf of Mexico and its estuaries for use by decision-maker including researchers, government managers, industry, the military, educators, emergency responders, and the general public. Observing stations in the region are monitored constantly. Please visit the GCOOS main web site at <http://www.gcoos.org/> for more information on this regional association. The option to view the landscape in 3D (i.e. option "Earth") will require additional plug-in from Google Earth and this Add-on should be allowed to run.

**Region's Current Condition**

**NOTE:** The following information is for informational purposes only. For more information on the operation, [contact](#) the station details, visit the station details page.

**TABS Buoy F**  
 Coordinates: 28.8425, -94.9433  
 Last update: 2009-02-20T13:18:57Z  
 Operator: Texas Automated Buoy System  
 Observations: [Currents](#), [WaterTemperature](#)

**WAVCIS 1999**      **LUMCON 1999**

**USM 2004**      **DISL 2003**

**TCOON 1992**      **COMPS 1996**

**TABS 1995**      **MOTE 2004**

**Oil & Gas 2005**

**LSU/ESL 1988**      **IMaRS 1993**

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[Privacy Statement](#)   [Legal Notices](#)   [Contact Developer](#)

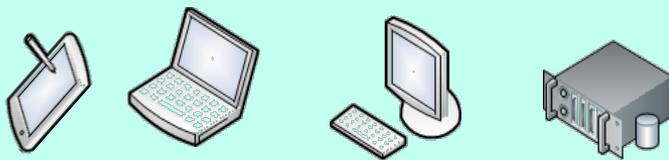


#### Data Access

getData  
(csv)

SOS (gml, csv,  
tsv, kml)

User  
Interfaces

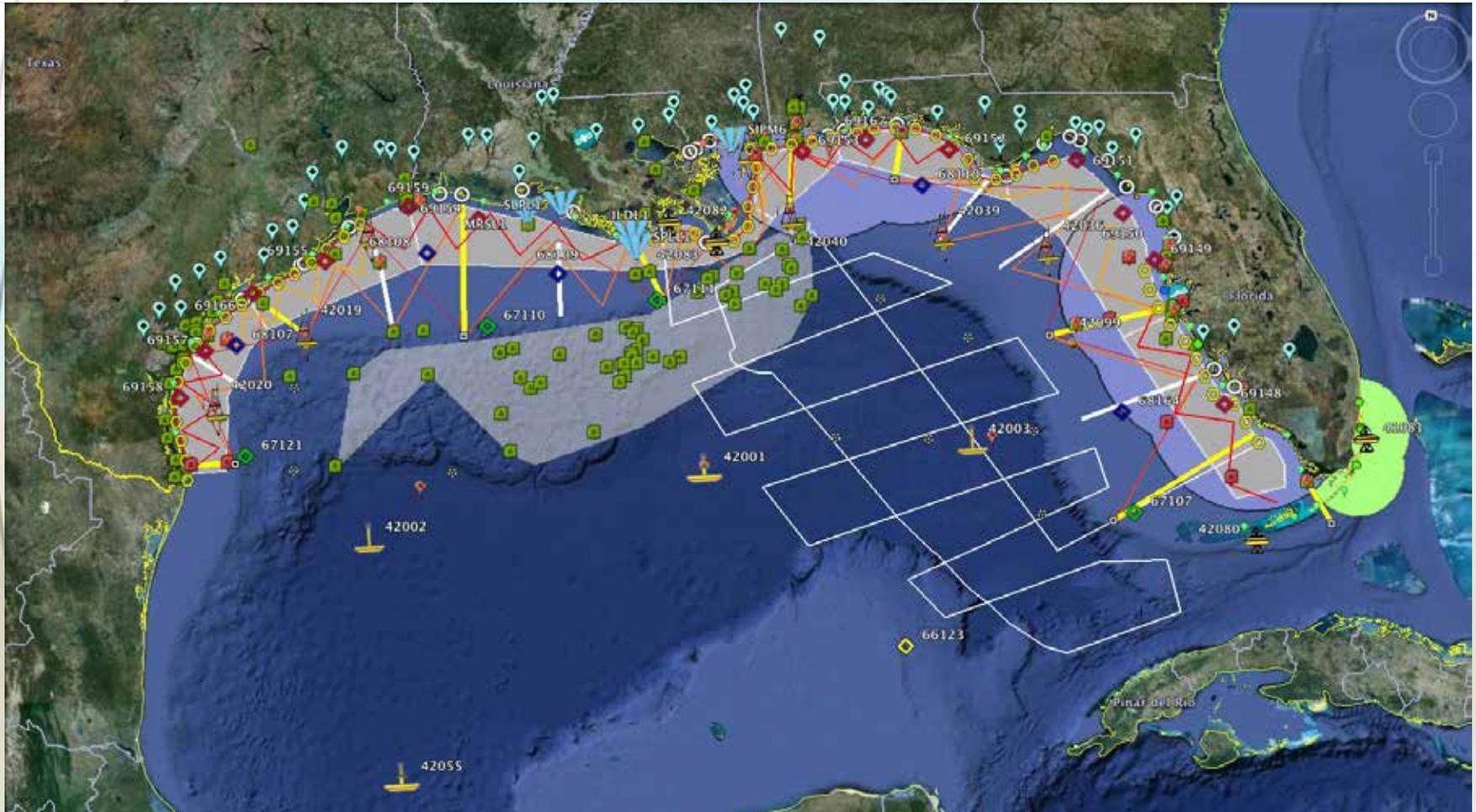


GCOOS Provides a number of facilities to facilitate data extraction.

- Sensor Observing Service (SOS) using NOAA's Data Interchange Framework (DIF);
- Direct data access using getData command (via http); and
- Interactive user interfaces.

use SOS to extract data as needed using the GetCapabilities, DescribeSensor and GetObservation modules.

# Full GCOOS Build-Out Plan: Coastal Ocean



# GCOOS Data Portal & Products

**Navigation:** GCOOS Home | Products Top | Data Portal | Maps | Mobile | **GCOOS Products**

**Observations** | **Maps** | **Satellites** | **Forecasts** | **Oil Spill** | **Bathymetry** | **HABs** | **Resources** | **Gliders** | **Outreach**

### Web Map Applications

 Lionfish distribution 1985-2...	 GCOOS Current/Proposed M...	 GSR Driftcard Map
 Get the Latitude and Longit...	 Clean Marinas in the Gulf of...	 T-S profile from gliders aft...
 T-S profile from floats after...	 Oil & Gas Info (Flex)	 Waveglider in the Gulf of M...

### Desktop

Standard web maps based on ArcGIS Javascript API and/or ArcGIS Viewer for Flex. More than 1024px-wide screen and WiFi/LAN network environment are recommended.

### Mobile/Tablet

Almost all map products and mobile maps are written in HTML5/Javascript and crafted with responsive design. Mobile version has less functionalities compared to Desktop version due to optimization for mobile network.

Open

**Regional COOS** | **National COOS Partners** | **GCOOS Local Data Nodes** | **IOOS & GCOOS Links**

Alaska Caribbean	Alliance for Coastal Technologies (ACT) Southeastern Universities Research	Dauphin Island Sea Laboratory (DISL) Texas Coastal Ocean Observation Network	Integrated Ocean Observing System IOOS
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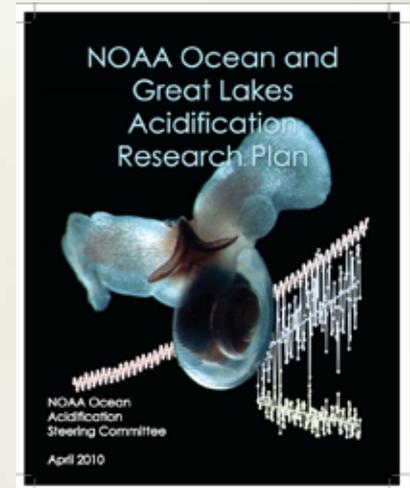
<http://gcoos.org/products/>

# A Pilot Project for Autonomous Ocean Acidification Surveys in the Northern Gulf with the Liquid Robotics Wave Glider.



# Background

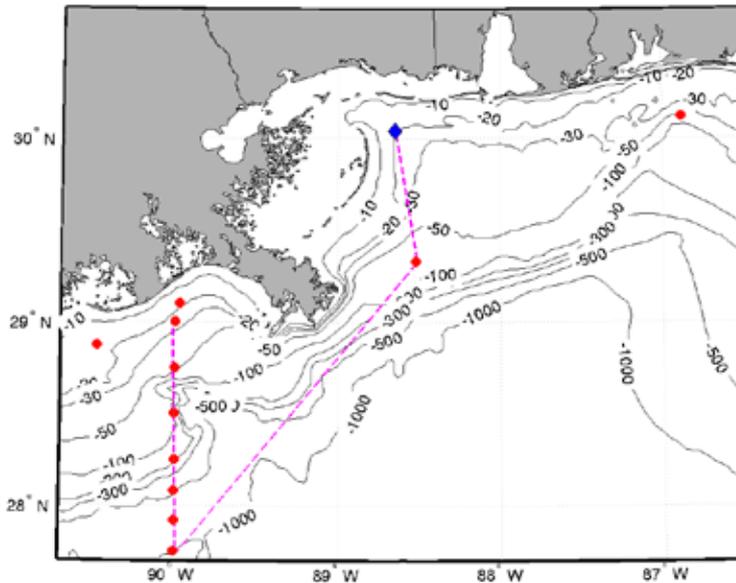
- Federal Ocean Acidification Research and Monitoring (FORAM) Act of 2009
  - NOAA have active monitoring and research program for ocean acidification
- NOAA Ocean and Great Lakes Acidification Research Plan



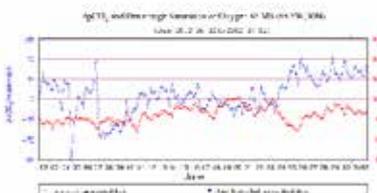
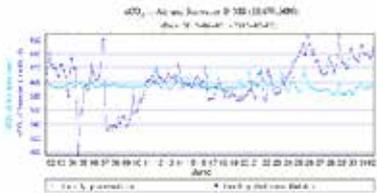
# Wave Glider Pilot Project

Liquid Robotics Wave Glider  
-MBARI CO2 System  
-Weather Station  
-dO & chlorophyll fluorometer

Launch at CenGOOS Buoy 10/15/2012



- GOMECS-II Stations (7/21/2012-8/13/2012)
- ◆ CenGOOS Buoy
- - - Wave Glider Track



# Challenge

- The east coast demo with NERACOOS and MARACOOS had band width issues
- Initial attempt to establish SOS did not work.
- Relatively short-term project
- Data from waveglider was saved in LR server and we need to fetch data
- Near Real-time update
- Show the result in web map (1 week, 3 days, etc. interval)



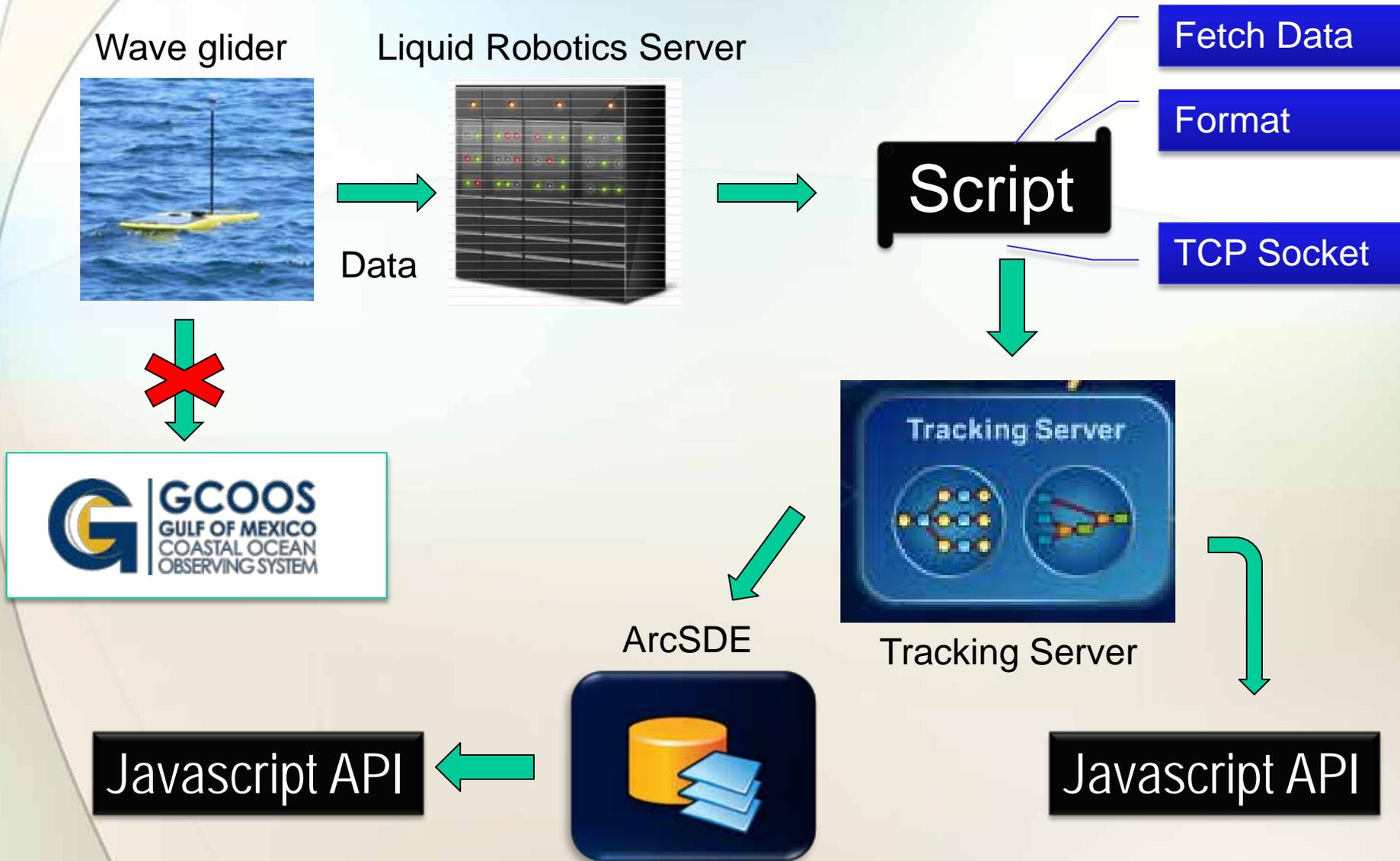
**We used ArcGIS Tracking Server 10.1**

GeoEvent Processor on ArcGIS 10.2

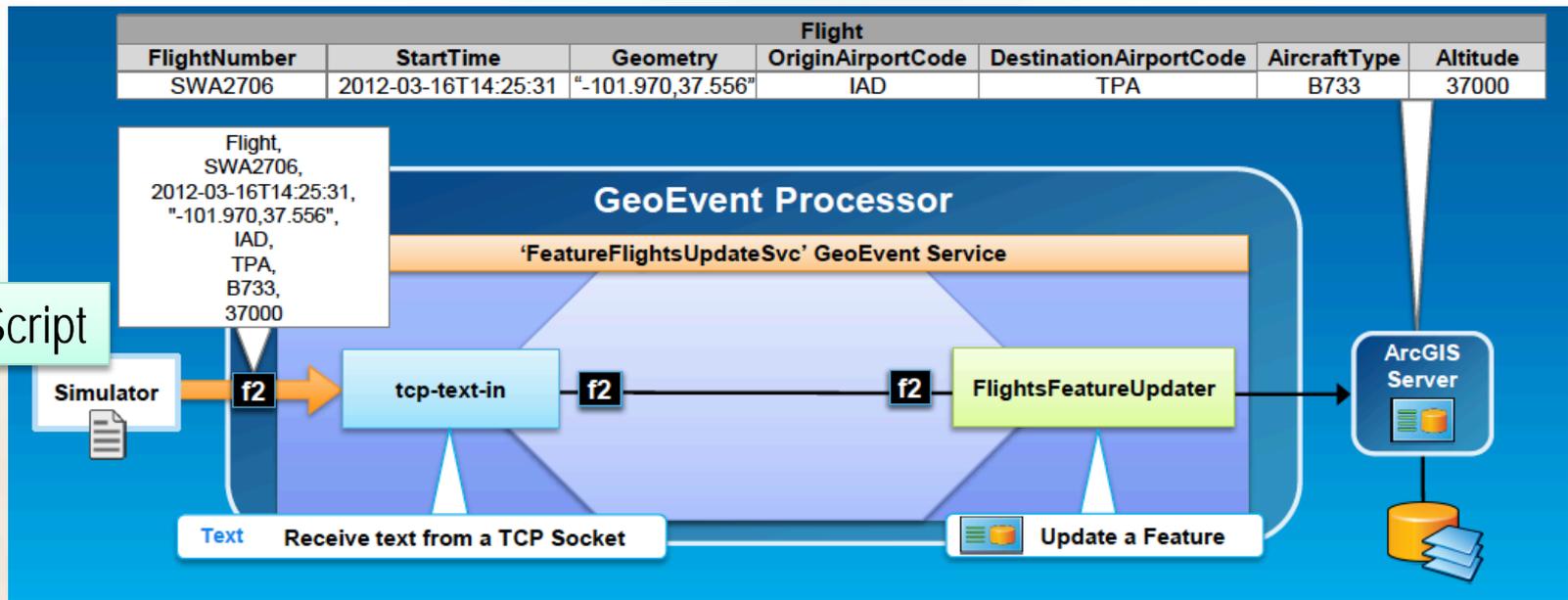
# Bringing real-time data in

- Tracking Server:
  - Data Messages coming into Tracking Server must have a format that matches a Message Definition
  - The Generic Input Data Link allows TEXT (CSV or XML) data messages to be pushed into Tracking Server.
- Our case:
  - No Push Service: Fetch Data (wget/cURL)
  - Python Script (format text, TCP socket) push data into Tracking Server

# Process

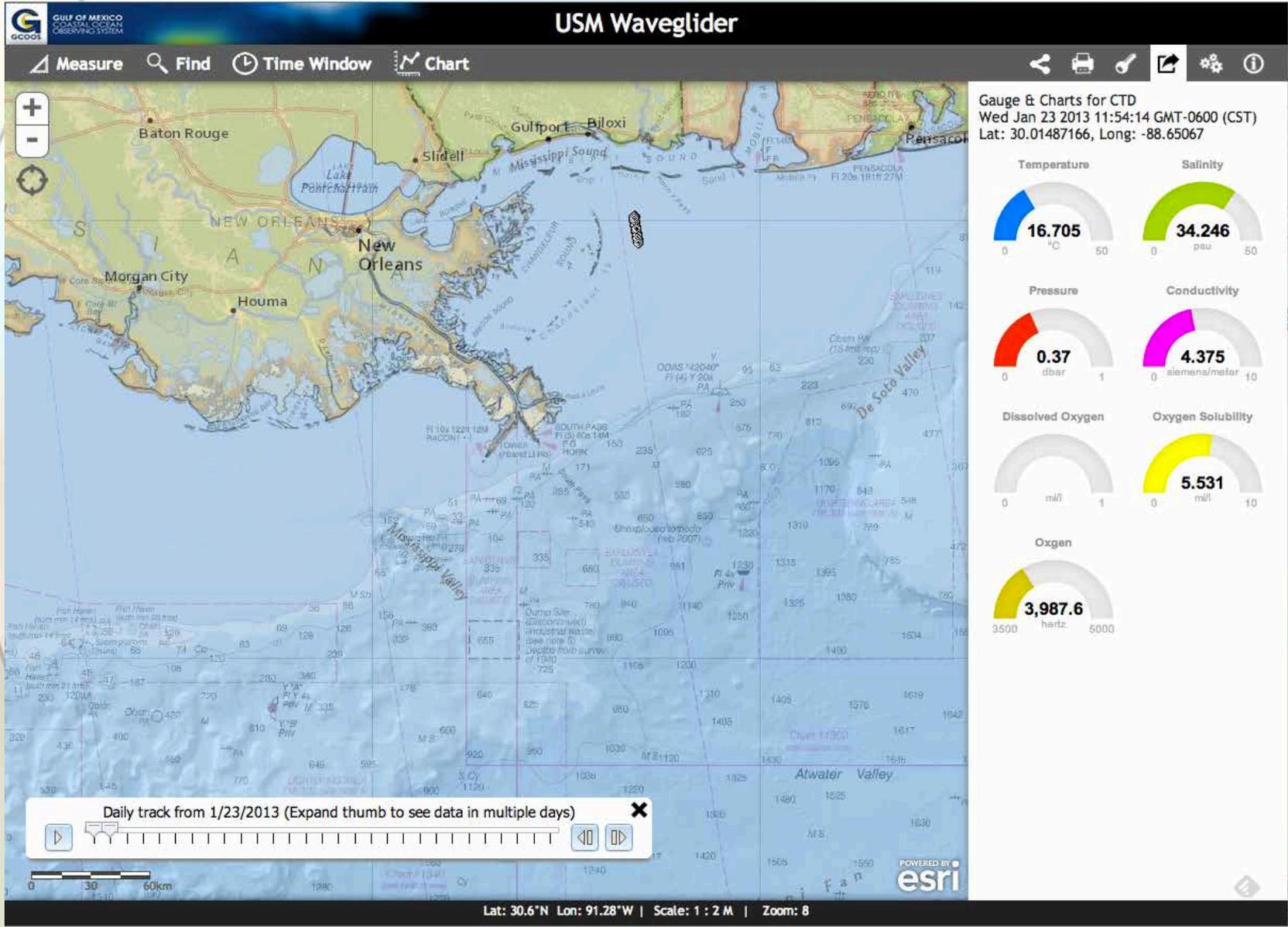


# Send text using a TCP Socket and Data definition



Source: ESRI GeoEvent Processor Beta Program

# Results



# Lesson learned

- Real-time data is that there's heterogeneous devices and format out in the field.
- Sometimes it doesn't work with an organizational data storage/process system. Also no push system and necessary to fetch data
- Tracking Server (GeoEvent Processor) helps to organize/update features (enterprise geo-database) easily
  - Sending data via TCP Socket is one of the simplest way to handle multiple data format with scripts (python, Matlab, IDL, etc. for netCDF, KML, XML, CSV)

# Thank you

<http://gcoos.org>  
shinichi@tamu.edu

# Demo: GISR Driftcard & Real-time Glider (7/5-14)

