The Goodwin / York Research Observatory (GYRO)

Neil Rondorf
SAIC

Introduction

GOALS:

- **Deploy a state-of-the-art, coastal, cabled observatory in the Chesapeake Bay to address regional environmental and security issues**
- **Support the Chesapeake Bay Observing System and the Virginia Estuarine and Coastal Observing System through robust, real-time data collection**
- **Enhance internal capabilities in the areas of cabled observatories, integrated ocean observing, and ocean data management**
- **Provide a basis for future R&D efforts and sensor studies**
- **Demonstrate solid academic/industry partnership**

Key Partners

- **Science Applications International Corporation (SAIC)**
- **Virginia Institute of Marine Science (VIMS)**
- **Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERRVA)**
- **NOAA National Data Buoy Center (NDBC)**

Project Requirements

- **Flexible buoy platform**
  - **large capacity**
  - **low maintenance**
  - **good sea keeping qualities**
- **Innovative sensors with COTS H/W to the maximum extent possible**
- **High-bandwidth, 2-way communications in both cabled and RF**
  - **operator-commanded**
  - **autonomous adaptive sampling**
- **Renewable power capability**

Initial Instrumentation Loadout

- **Campbell Scientific CR3000 Micrologger**
- **Nortek Aquadopp "Puckhead" current meter**
- **Nortek Aquadopp Profiler**
- **Nortek AWAC Profiler**
  - **bottom-mounted, cabled to buoy**
- **Falmouth Scientific NXIC CTD**

SAIC
From Science to Solutions

Buoy Infrastructure
Instrumentation

- Nortek Current Meters
  - 1 MHz Aquadopp Current Profiler (1.5m)
  - 2 MHz Aquadopp Current Meter (1.2m)
- Nortek Wave Gage
  - 1 MHz AWAC
- Falmouth Scientific CTD Sensor
- Solar panels and batteries
- Fiber optic cable to land base station

Instrumentation (cont'd)

- **PNI TCM-3 Digital Compass**
- **Vaisala WXT510 weather transmitter**
- **Coastal Environmental Weatherpak Met Sensor**
- **Nortek Vector High Res 3D Velocimeter**
  - **Bottom-mounted and cabled to buoy**
- **YSI Datasonde 6600 ocean sensor**

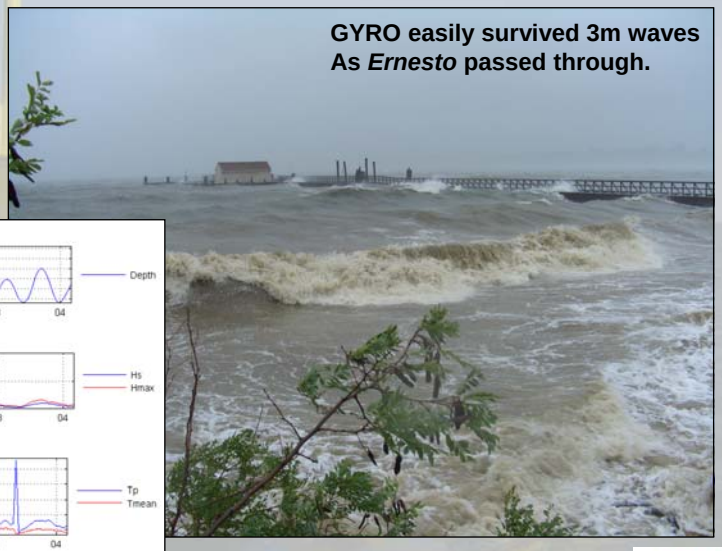
Buoy Power

- **2 independent solar arrays and battery storage systems**
  - **600 Ah each**
- **4 35-watt Siemens solar panels for comms, 5 for sensors**
- **Good up to 8 "no sun" days**
- **Reserve capacity for expansion**
- **30A charger/controller**

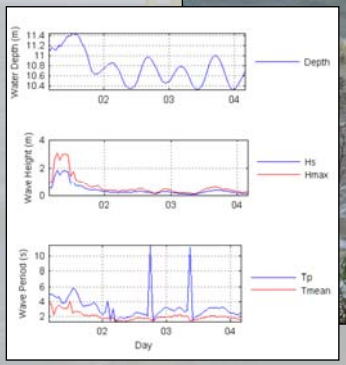
Communications

- Buoy-to-Goodwin Island:
  - 1.4 km of 0.5”, single mode, single fiber, armored oceanographic-grade submarine cable (100 Mbps capacity)
  - Currently 4 Ethernet channels (115 kbps each) and up to 4 serial ports (115 kbps)
  - COTS media converter
- Goodwin Island to VIMS:
  - Terabeam Marquee WiFi bridge with 2’ diameter dish antennas
  - Identical LAN architecture to buoy (4 Ethernet & 4 serial ports)
  - Provides sustained, reliable communications over an 8 km (over 5 miles) distance

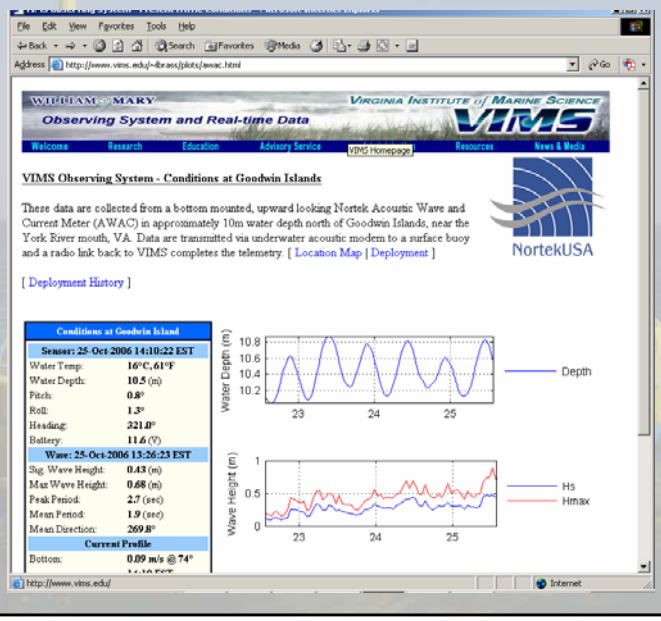
Recent “Weathering of the Storm” *Ernesto*



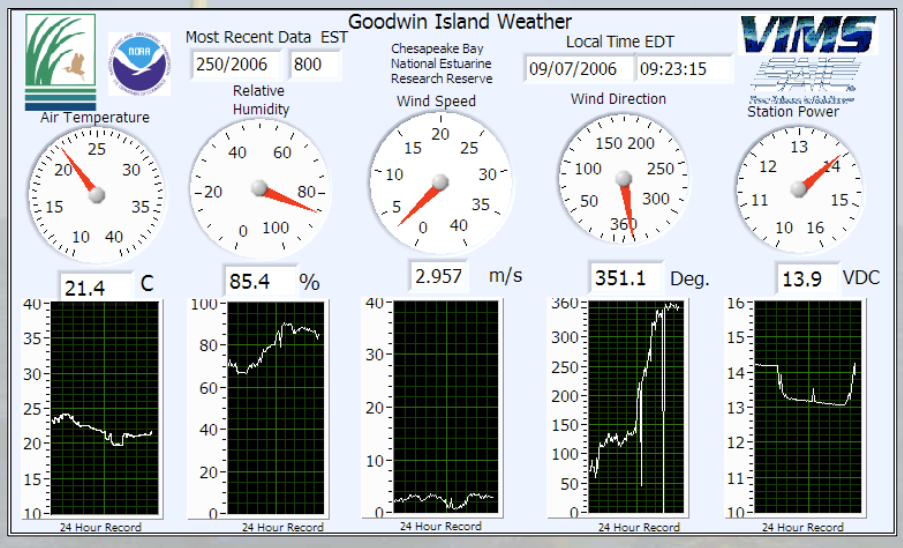
GYRO easily survived 3m waves As *Ernesto* passed through.



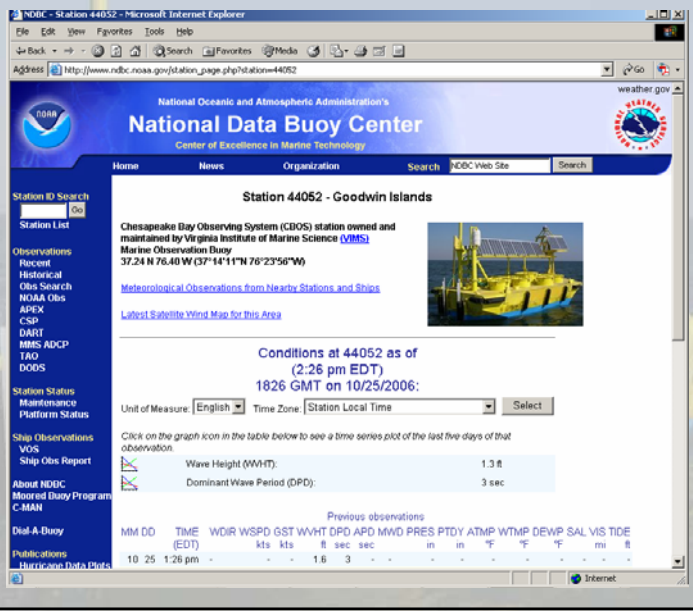
Data: VIMS Web Page



Data: CBNERRVA Web Page



Data: NDBC Web Page



Summary

- The GYRO project demonstrated successful industry / academia/ government collaboration on a complicated ocean observing project
- GYRO system data are contributing to a robust and extensive observing system that may be significant to the long term health of the Bay and other sensitive marine environments
- The GYRO system hopefully represents a stepping stone to further enhancing the science of protecting the Bay and the future of local, regional and global ocean observations.