Mobile Platform Observations in the Gulf of Mexico

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- Origin and Technique of Seakeepers
- Data and Meta Data Availability
- Space/Time Structure of the data
- Quality of the data
- Assessment of the present situation
Report about integration of mobile observation platform data into GCOOS:

The following is an interactive map to display resources and status of coastal and ocean observing stations. Green markers represent stations in full operation, orange markers are those with defective sensors and red-marked stations are those that are currently not transmitting data. Click on the station to view station details. Not all stations may be visible at the current scale, zoom-in or pan an area to reveal all the stations. The HF Radar overlay uses Coastal Observing Research and Development Center (CORDC) published "HF Radar APT. Click here to toggle back to 2D mapping from 3D display."

WHAT'S NEW:
- (2011-06-15) Update was posted on the Download page for the GCOOS version of ICOS DIF implementation using SQLite DBE. Click here to go to the Download page.
- (2011-06-05) The BETA version of the mobile-friendly GCOOS Data Portal is now available. See more here: /portal/mobile/portal.html

SHP
Coordinates: 30.059, -84.29
Last update: 2011-06-30T14:00:00Z
Operator: University of South Florida Coastal Ocean Monitoring and Prediction System
Observation(s):
- AirTemperature
- RelativeHumidity
- Salinity
- WaterLevel
- Wind
Origin of Seakeepers

“When SeaKeepers Society began 1998, the premise was simple, specific, and altruistic.

- Could a group of private yacht owners effectively create a new system for oceanographic monitoring, utilizing their vessels as the initial platform for deployment?
- Could the system play a meaningful role in helping to measure what is happening in the sea with the ultimate purpose of aiding conservation of the declining marine ecosystem?”

Mission of Seakeepers

…”to gather and distribute the most useful oceanographic and atmospheric data from which to draw rational conclusions concerning the health of the world’s oceans and climate. This data is provided to governments, scientists, educational institutions and private citizens throughout the world.”
Number of installations
70 actual > 90 since 1998

- Commercial Ships
- NOAA Buoys
- Private Yachts
- United States Coast Guard Ice Breaker
- Lighthouses
- Piers

http://www.seakeepers.org/cruise-tracks.php

The above image shows the tracks of the satellite data transmissions for SeaKeepers vessels in 2008. In many cases overlapping tracks hide multiple transmission points. In 2008 SeaKeepers will take approximately 9 million data samples; each data sample typically represents at least 10 different precise measurements, which are available to thousands of scientists worldwide analyzing and modeling our changing oceans.
Technique

**SeaKeeper 1000™ YSI Appointed Exclusive Licensee**

**Water intake and antifouling device**

*Outside hull*
- Stainless steel braided Teflon discharge hose

**Dimensions**
- Diameter: 9 inches (230 mm)
- Height: 25 inches (640 mm)

*Inside hull*
- 1 ½” Lloyds certified, guillotine, inlet gate valve
- ¾” Lloyds certified discharge gate valve
- Platinum thermometer and antifouling device external to hull.

**Dimensions**
- Height: 6.5 in. (165 mm)
- Max Dim: 15 in. (380 mm)

**Meteorological Station**
- Wind speed and direction sensor
- Radiation shield containing air temperature & relative humidity sensors
- Dynamic pressure port for barometer
- Electronic compass and serial interfacing unit
- Digital barometer
**Technique**

**SeaKeeper 1000™**

**Ocean Monitoring System (doors open)**

- **Instrument Enclosure**
  - Dimensions: 30 x 16 x 10 inches (770 x 410 x 260 mm)
  - Weight: 87 lbs (40 Kg)
  - Water Through-put: approx. 4 gallons (16 liters) per minute

- **Computer Enclosure**
  - System Computer
  - Spare Sensor Bay (1)
  - Prototype Trace Metals Sensor (2)
  - Chlorophyll “A” Sensor (3)
  - Temperature, Salinity, Dissolved Oxygen, pH, & Redox Sensor (4)
  - Spare Sensor Bay (5)

- **Other Components**
  - Water Distribution Manifold
  - Moisture Detector & Emergency Shut Off
  - Seawater Circulation Pump

**No Sampling**
**Technique**

**EXISTING FLOW THROUGH SENSORS**

- **IDRONAUT**
  6 Parameter Sensor
  Measures Conductivity, Temperature, Pressure, O₂, pH, & Redox

- **SEABIRD ELECTRONICS**
  Thermosalinograph
  Utilizing SBE electrode cell

- **SEAPoint SENSORS, INC.**
  Fluorometer
  Measures Chlorophyll "A" concentration

- **GENERAL OCEANICS, Inc**
  pCO₂ System
  Idronaut 7P-CTD (top) and pCO₂ with Equilibrator (bottom)

- **FSIS™ MOUNTING MODULE**

- **SATLANTIC**
  ISUS Nitrate Sensor
  Measures absorption spectra

- **ENVIROTECH**
  Nutrient Analysis Sensor
  Uses Reagents in IV Bags

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FerryBox Workshop, Sep. 1/2, 2011
1 minute high resolution (“raw”) data

- Stored at onboard computer; downloaded and archived by Seakeepers Society
- Not included in the data portals

Transmitted data

- Based on 1 min data
- transmission via Satcom C each three (one) hours
- transmitted data tuples are averages of the last 10 minutes before transmission
Data Extraction Request

- No link from Seakeepers Society web pages (or any else)
- Contains meteo- and oceanographic standard sensor data
- Data quality (window with wide ranges) coded in colours
- No data plots
- Works only with Near real-time data portals
• For internal use and hence only basic functionality: directory with link to files
• Contains sensor data beyond meteo- and oceanogr. standard
• Clumsy data format
• No quality check
Meta data

The image shows a screenshot of a software interface with various data fields and units of measurement. The fields include:

- **DATE/TIME/LOCATION STAMP**
- **OCEAN DATA**
  - Cell Pressure: kPa
  - Cell Temperature: °C
  - Conductivity: mS/m
  - Sea Surface Salinity (SST): g/kg
  - Oxygen Saturation: %
  - Oxygen Concentration: mg/l
  - pH
  - EK
  - Sea Surface Temperature (External): °C

- **ATMOSPHERIC DATA**
  - Wind Speed (Actual): m/s
  - Magnetic Wind Direction (Apparent): °
  - Air Temperature: °C
  - Relative Humidity: %
  - Barometric Pressure: hPa
  - Compass Heading: °
  - Relative Wind Direction: °
  - True Wind Speed: m/s
  - True Wind Direction: °
  - Course Over Ground (COG): °
  - Speed Over Ground (SOG): m/s

The interface also includes fields for variable names, units, and measurement ranges.
where and when

all tracks of satellite data transmissions

2004 - June 2011

2004 - 2007

Carnival Miracle
Where and When

All tracks of satellite data transmissions

2008 - 2009

2010 - June 2011

Manta/NOAA
Examples of data

The problem of transmitted data
(10 minute averages)

High resolution (1 min) data

Salinity
Examples of data

High resolution (1 min) data

Meduse with 5 knot threshold

Latitude

Knots

DO

SST
Examples of data

Gulf of Mexico - Seakeeper
493171238; 26-Sep-2004 00:00:25 to 31-Dec-2007 21:00:23

Belice
Cuba
Florida

Oxygen conc. [kgm⁻³]

Salinity

SST [°C]

2004-2007
Examples of data

2008-2011

SST [°C]

Oxygen conc. [kgm⁻³]

Salinity

Latitude

Manta
Summary

For the Gulf of Mexico

- Only one 3 years data series on a defined track ("Carnival Miracle")
- In most cases data too sporadic and not guided by clear objectives
- Large parts of the Gulf not covered

In general

- Limited accessibility for outsiders
- Limited meta data information

Data quality limited:
- Maintenance of the systems and re-calibration scheme of the sensors intransparent for outsiders;
- Quality of the data limited (e.g., operation of pumps) recorded
- No sampling

Without access to the high-resolution data Seakeepers data can not be corrected and interpreted

Until recently, obviously nobody had looked critically at the oceanographic data

No publications in refereed journals using Seakeeper data

To establish working procedures that deliver high quality and informative long-term observations projects with clear scientific and/or coastal management objectives are required.