Measuring for Management: The Great Lakes Observing System

A Collaborator & Facilitator for Data Collection, Management and Integration in the Great Lakes Region

Wednesday, May 7, 2014

Great Lakes Workshop Series on Remote Sensing of Water Quality, 2

Jennifer Read, Executive Director

GLOS

GOALS

- Increased familiarity with Great Lakes Observing System

- Increased understanding of GLOS mission and approach

- Piqued interest in partnering with GLOS

GLOS

Overview

- What is GLOS?
  - Role
  - Activities
- GLOS and You
- Ways to Engage

The FOUR V's of Big Data

From traffic patterns and music downloads to web history and medical records, data is recorded, stored, and analyzed to enable the technology and services that the world relies on every day. But what exactly is big data, and how can these massive amounts of data be used?

As a leader in the sector, IBM data scientists break big data into four dimensions: **Volume, Velocity, Variety and Veracity**

Depending on the industry and organization, big data encompasses information from multiple internal and external sources such as transactions, social media, enterprise content, sensors and mobile devices. Companies can leverage data to adapt their products and services to better meet customer needs, optimize operations and infrastructure, and find new sources of revenue.

By 2015
4.4 MILLION IT JOBS
will be created globally to support big data, with 1.9 million in the United States

Volume
SCALE OF DATA

40 ZETTABYTES
[43 TRILLION GIGABYTES]
of data will be created by 2020, an increase of 300 times from 2005

It's estimated that
2.5 QUINTILLION BYTES
[2.3 TRILLION GIGABYTES]
of data are created each day

6 BILLION PEOPLE
have cell phones

WORLD POPULATION: 7 BILLION

Most companies in the U.S. have at least
100 TERABYTES
[100,000 GIGABYTES]
of data stored

Velocity
ANALYSIS OF STREAMING DATA

The New York Stock Exchange captures
1 TB OF TRADE INFORMATION
during each trading session

Modern cars have close to
100 SENSORS
that monitor items such as fuel level and tire pressure

By 2016, it is projected there will be
18.9 BILLION NETWORK CONNECTIONS
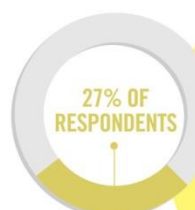– almost 2.5 connections per person on earth

Variety
DIFFERENT FORMS OF DATA

As of 2011, the global size of data in healthcare was estimated to be
150 EXABYTES
[161 BILLION GIGABYTES]

By 2014, it's anticipated there will be
420 MILLION WEARABLE, WIRELESS HEALTH MONITORS

4 BILLION+ HOURS OF VIDEO
are watched on YouTube each month

30 BILLION PIECES OF CONTENT
are shared on Facebook every month

400 MILLION TWEETS
are sent per day by about 200 million monthly active users

Veracity
UNCERTAINTY OF DATA

1 IN 3 BUSINESS LEADERS
don't trust the information they use to make decisions

Poor data quality costs the US economy around
$3.1 TRILLION A YEAR

27% OF RESPONDENTS
in one survey were unsure of how much of their data was inaccurate

IBM

GLOS

IOOS INTEGRATED OCEAN OBSERVING SYSTEM

A Global Voice for the Great Lakes

Larger Scales of Data Integration
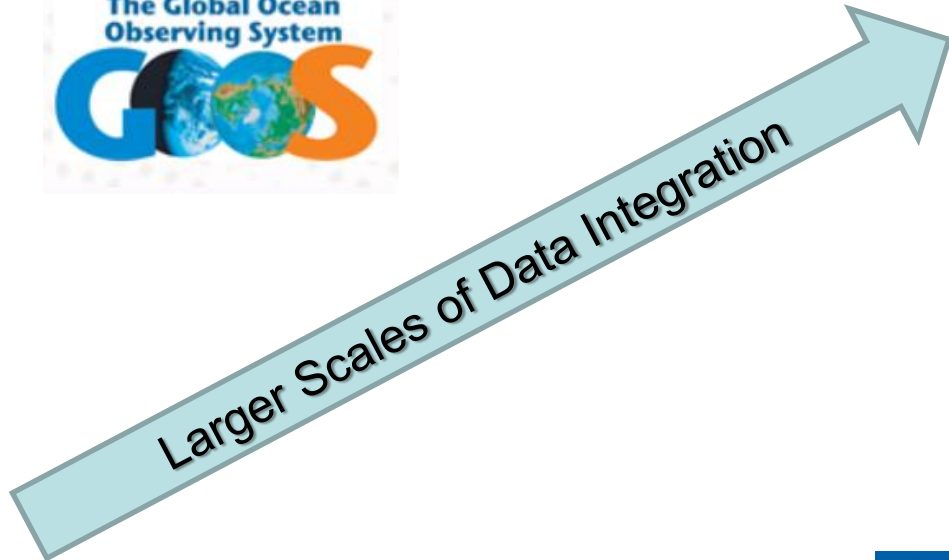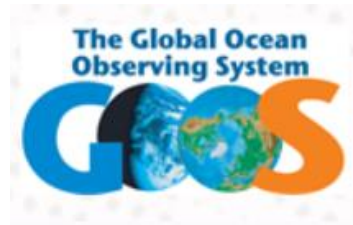
GLOS Role

Research Community   **Decision-Makers**   **Resource Managers**

Connecting data users to data providers in ways that support management and policy decisions.

GLOS ACTIVITIES

Focus Areas

ECOSYSTEM HEALTH

– Fisheries, Areas Of Concern(AOC)/LaMPs

MARITIME OPERATIONS
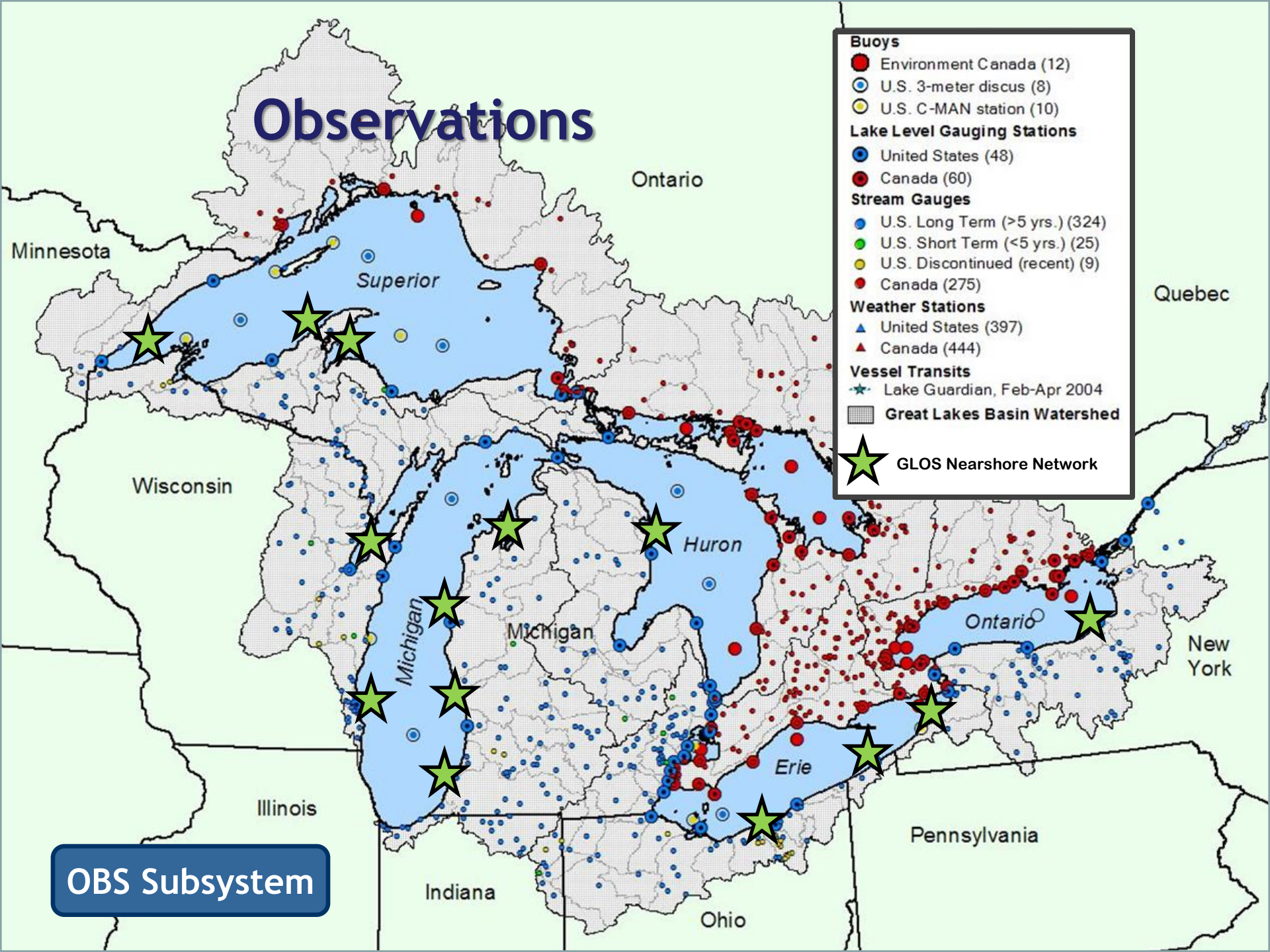
– Recreational boaters

PUBLIC HEALTH & WATER SECURITY

– Beach managers, water intake operators

CLIMATE CHANGE ADPATATION

– Municipal water infrastructure managers

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Observations

OBS Subsystem

Buoys
- 🔴 Environment Canada (12)
- ◉ U.S. 3-meter discus (8)
- ◉ U.S. C-MAN station (10)

Lake Level Gauging Stations
- 🔵 United States (48)
- 🔴 Canada (60)

Stream Gauges
- 🔵 U.S. Long Term (>5 yrs.) (324)
- 🟢 U.S. Short Term (<5 yrs.) (25)
- 🟡 U.S. Discontinued (recent) (9)
- 🔴 Canada (275)

Weather Stations
- ▲ United States (397)
- ▲ Canada (444)

Vessel Transits
- ✳ Lake Guardian, Feb-Apr 2004
- ▦ **Great Lakes Basin Watershed**

- ⭐ GLOS Nearshore Network

Remote Sensing

- Physical Obs – wind, waves, temp
- Lake Bottom Mapping
- Lake Ice
- Shoreline Mapping
- Lake Quality

Fixed Buoys   Wed 16:00Z 21-Mar-12
MODIS Sea Sfc Temperature 1km (F)   Wed 16:21Z 21-Mar-12

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IOOS   INTEGRATED OCEAN OBSERVING SYSTEM

Data Management

- Data Infrastructure
  - Hardware
  - Software – US IOOS / regional
- Applications
  - Data Storage and retrieval
  - Viewers and access

GLOS

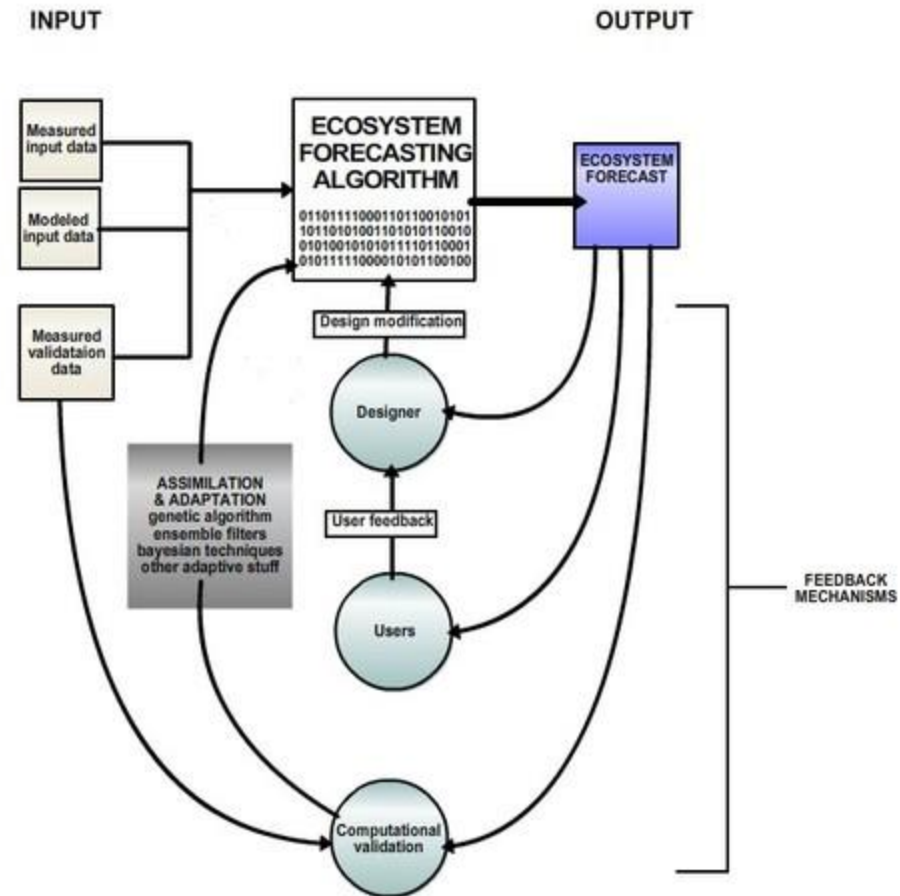IOOS   INTEGRATED OCEAN OBSERVING SYSTEM

Models

- Currents, water levels, waves, pollution tracking, sediment, temperature

- Real-time models (24/7)
  - Nowcast (current conditions)
  - Forecasts (up to 120 hours)
  - Scenarios (past, future-climate)

- Beach-scale to Lake-scale

MODEL Subsystem

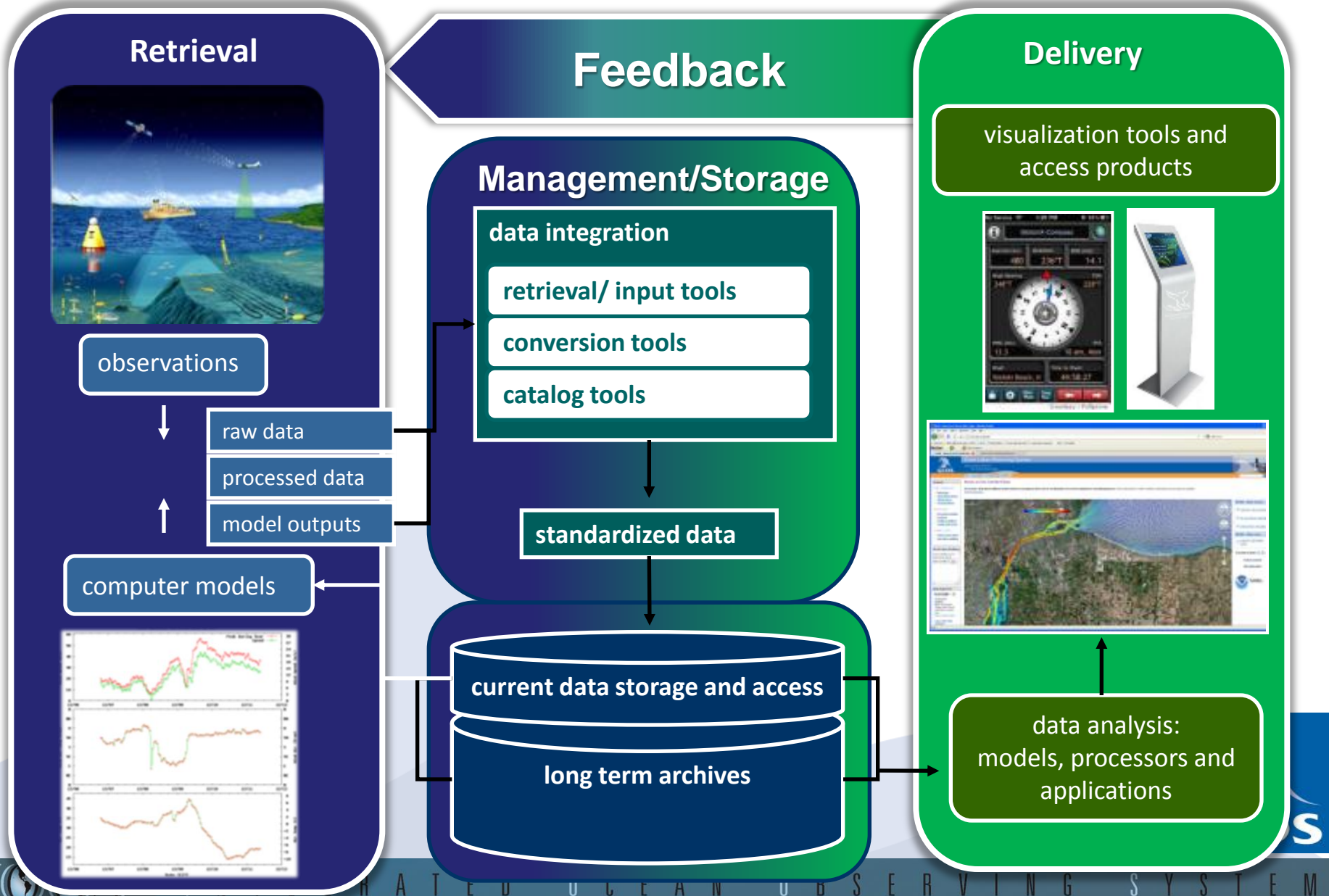FEEDBACK IN ECOLOGICAL FORECASTING SYSTEMS

Facilitation & Coordination

- Ecosystem Forecasting
- GEO Great Lakes
- Regional communities of practice, e.g., Observations, Data management
- Adaptive Management

OUT Subsystem

GLOS

It All Fits Together…

Retrieval

observations

raw data

processed data

model outputs

computer models

Feedback

Management/Storage

data integration

retrieval/ input tools

conversion tools

catalog tools

standardized data

current data storage and access

long term archives

Delivery

visualization tools and access products

data analysis:
models, processors and applications

GLOS and YOU: Data Users

- GLOS Data Portal
  - Melding Obs Explorer and Data Catalog into one product
- GLOS metadata

Metadata

- Metadata allows users to find and link to useful data

- Linked from Data Portal Search Results

- Standardized and ISO compliant

- GeoNetwork – registered with GEOSS

GLOS

GLOS and YOU: Data Provider

- GLOS is a distributed system
- Connect to GLOS = connect to GEOSS
- Contact dmac@glos.us

- *But what about other ways to engage?*

GLOS

Points of Entry

GLOS Planning and Evaluation Cycle

Ideas Invited

We're Here!

Month	Year 1 Implement	Year 2 Analyze and Adapt	Year 3 Analyze and Adapt	Year 4 Set Priorities	Year 5 Develop Strategies
Jan	Finish Previous Cycle Implementation				Release request for pre-proposal
Feb	Re-Scope Yr 1 Annual Plan	Re-Scope Yr 2 Annual Plan	Re-Scope Yr 3 Annual Plan	Re-Scope Yr 4 Annual Plan	Re-Scope Yr 5 Annual Plan
March					
April					
May					
June	Begin New Cycle Implementation	Progress Updates and Evaluation	Project Evaluation & Strategic Plan Update	Complete Strategic Plan update	Review and select project proposals – Tech Advisory Committee
July					
Aug					Develop IOOS proposal
Sep					
Oct					Submit IOOS proposal
Nov	Project Presentations	Project Updates	Evaluation & Planning	Promote Strategic Plan	In Review- Success Stories
Dec					

Semi-Annual webinar (June) and Annual (November) meetings – opportunities for Stakeholder and Industry to meet/provide input

Thank You

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