AIS Binary Messages
Domain Examples
and
A case for a XML message definition language

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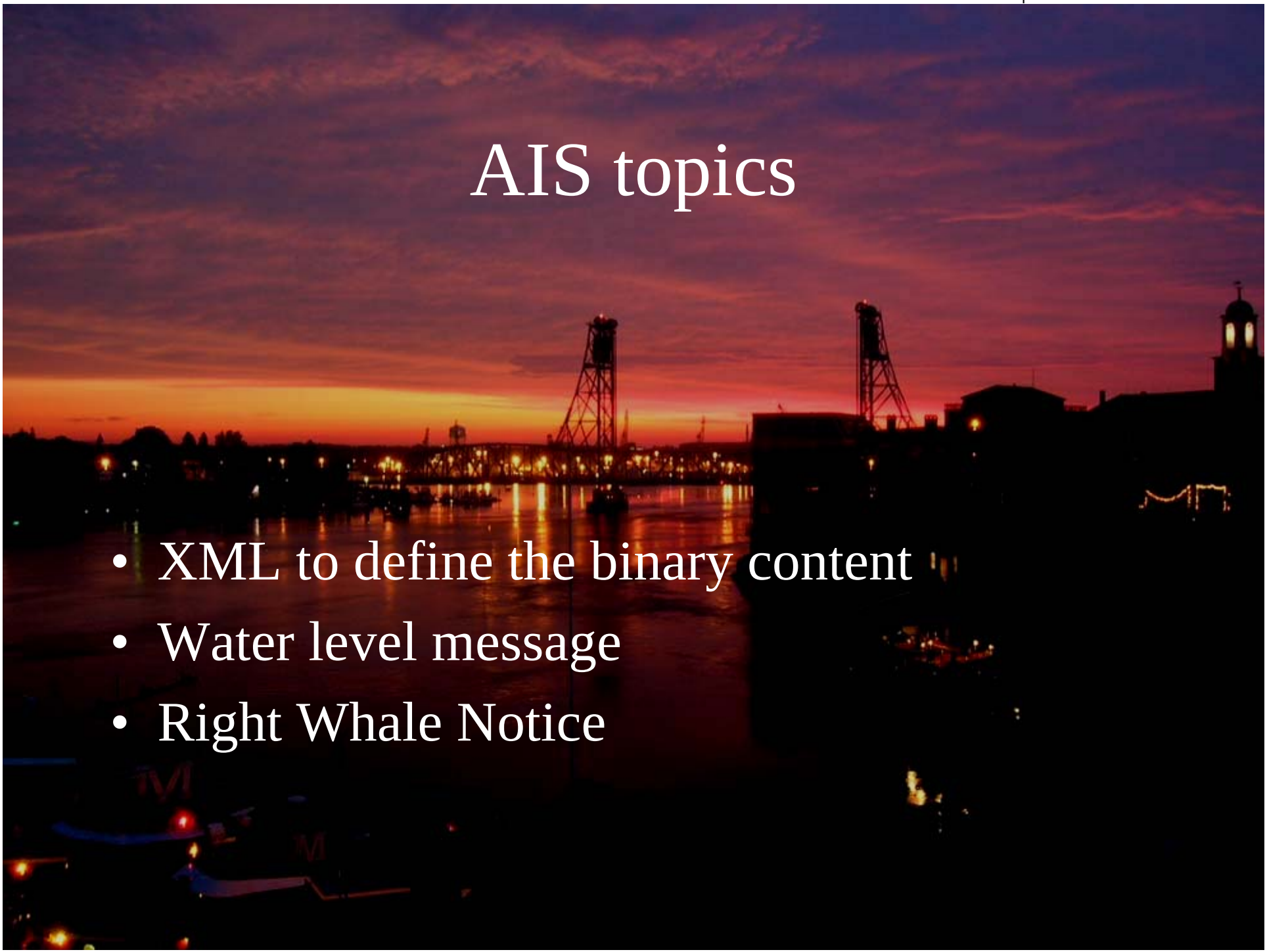
University of New Hampshire



AIS topics

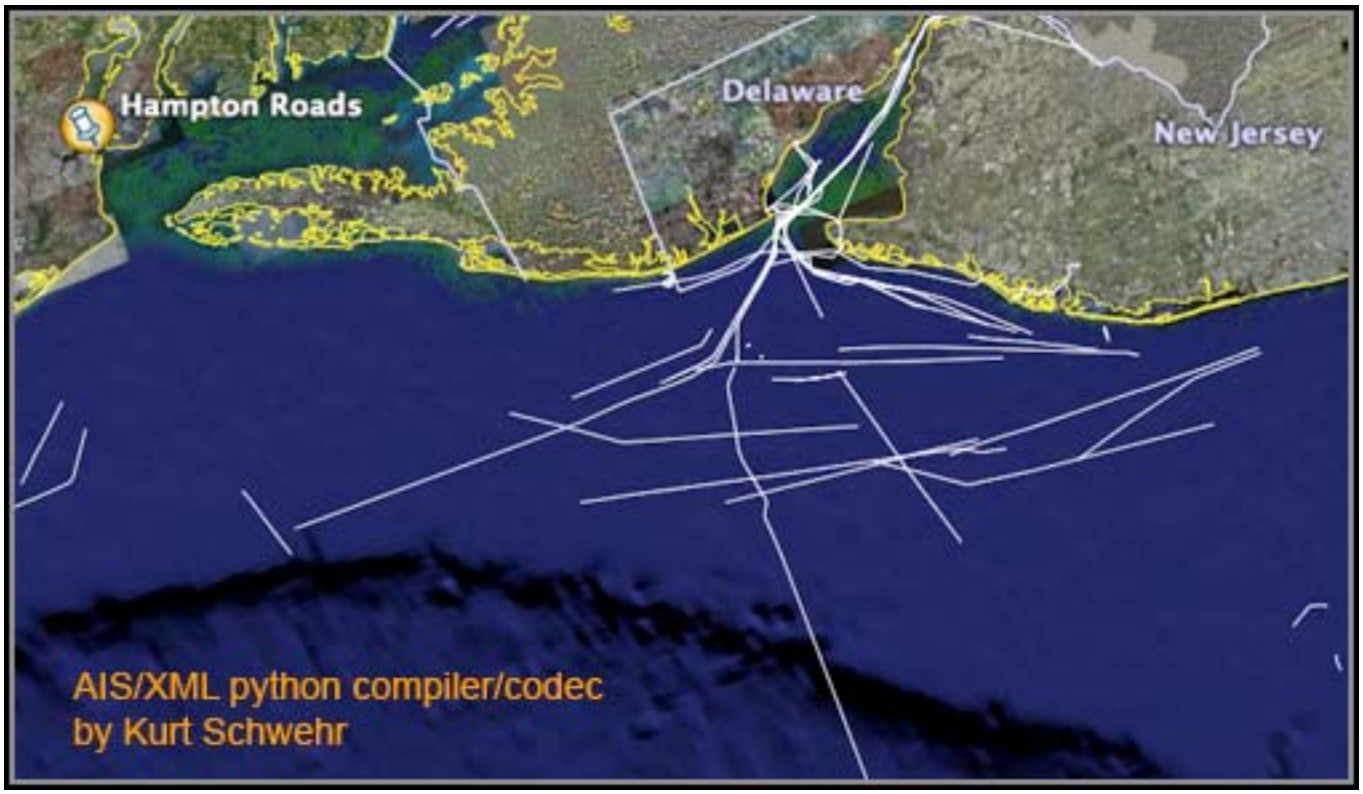
- XML to define the binary content
- Water level message
- Right Whale Notice

Credits

- This talk represents the work of a large number of people
- CCOM/JHC
- NOAA SBNMS, PORTS/COOPS, HSTP
- USCG
- Cornell's Bioaccoustic Lab

Reference implementation available online

- http://vislab-ccom.unh.edu/~schwehr/software/noaadata



XML to define the AIS binary messages

- This is NOT sending XML over the VDL
- Can also be used to describe the existing AIS messages

```
- <field name="UserID" numberofbits="30" type="uint">
    <description>Unique ship identification number (MMSI)</description>
    <testvalue>1193046</testvalue>
  </field>
- <field name="NavigationStatus" numberofbits="4" type="uint">
    <description>What is the vessel doing</description>
    <unavailable>15</unavailable>
   - <lookuptable>
      <entry key="0">under way using engine</entry>
      <entry key="1">at anchor</entry>
      <entry key="2">not under command</entry>
      <entry key="3">restricted maneuverability</entry>
      <entry key="4">constrained by her draught</entry>
      <entry key="5">moored</entry>
      <entry key="6">aground</entry>
      <entry key="7">engaged in fishing</entry>
      <entry key="8">under way sailing</entry>
      <entry key="9">reserved for future use (hazmat)</entry>
      <entry key="10">reserved for future use</entry>
      <entry key="11">reserved for future use</entry>
      <entry key="12">reserved for future use</entry>
      <entry key="13">reserved for future use</entry>
      <entry key="14">reserved for future use</entry>
      <entry key="15">not defined = default</entry>
    </lookuptable>
    <testvalue>3</testvalue>
  </field>
```

Name	NumberOfBits	ArrayLength	Type	Units	Description
MessageID	6		uint		AIS message number. Must be 1
RepeatIndicator	2		uint		Indicated how many times a message has been repeated **0**: default **3**: do not repeat any more
UserID	30		uint		Unique ship identification number (MMSI)
NavigationStatus	4		uint		What is the vessel doing **0**: under way using engine **1**: at anchor **2**: not under command **3**: restricted maneuverability **4**: constrained by her draught **5**: moored **6**: aground **7**: engaged in fishing **8**: under way sailing **9**: reserved for future use (hazmat) **10**: reserved for future use **11**: reserved for future use **12**: reserved for future use **13**: reserved for future use **14**: reserved for future use **15**: not defined = default

An XML definition of an AIS message can be automatically turned into

- Human readable documentation similar to the existing AIS standard documents
- Message analysis statements
- Source code for converting values into AIS NMEA strings and NMEA strings to decoded values
- SQL database creation and insertion commands
- KML/KMZ for display in Google Earth
- A master list of ALL AIS standard and binary messages
- etc

“The AIS Decoder Ring”

MDA COI DMWG Agenda

The Johns Hopkins University/Applied Physics Laboratory (8-351)

April 12, 2006

0830	Administration Remarks	Eric Tollefson, JHU/APL
0845	Objectives and Opening Remarks	CDR Matt Zamary, USCG Mark Andress, ONI

Review of Previous Action Items

0900	Pilot WG and DMWG Interface Plan	Michael Margolis, OASD/NII
0915	Draft POA&M	Eric Ausen, HSOC
0930	Review of UML, XML Draft Docs	Eric and Brian
1030	Break	

MDA COI MDWG (Working Session)

1045	Update Diagrams	
1200	Working Lunch (delivered)	
1300	Update Diagrams	
1530	Adjourn	

This group is looking at passing AIS data as XML messages. If you know more, please pass along any updates!

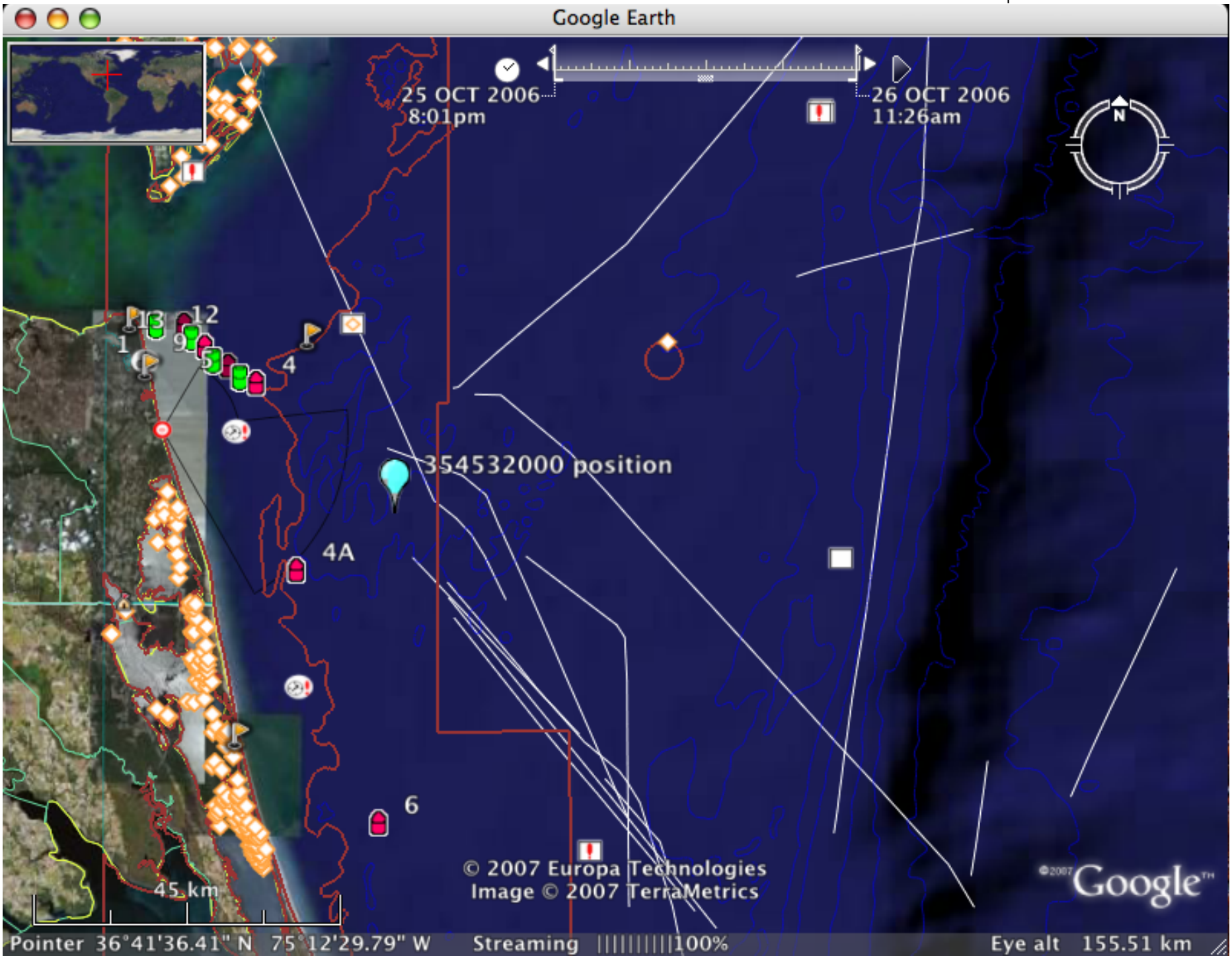
MDA XML

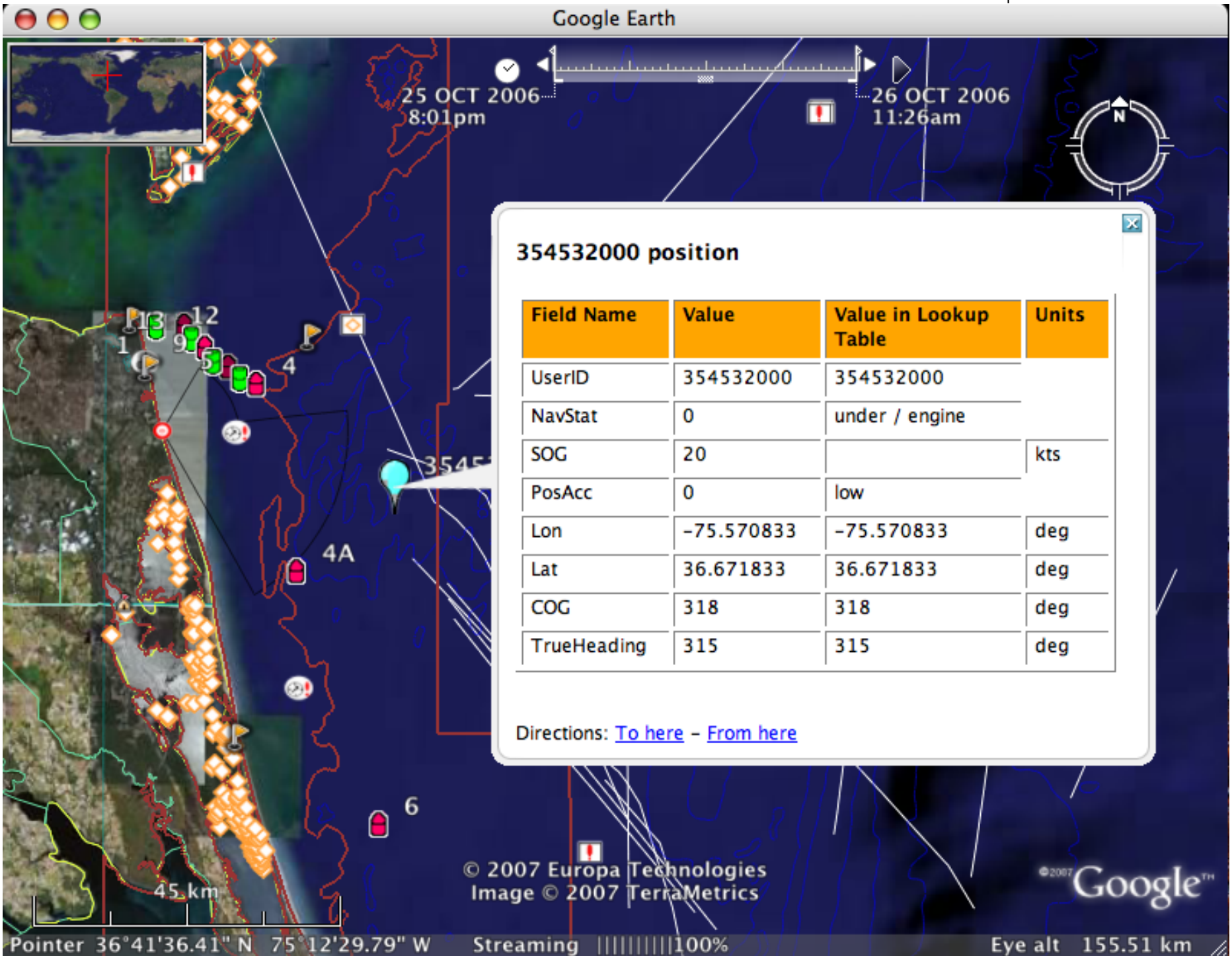
Example of putting the AIS *data* in XML

ANNEX H: XML Example

AIS Messages 1, 2, and 3

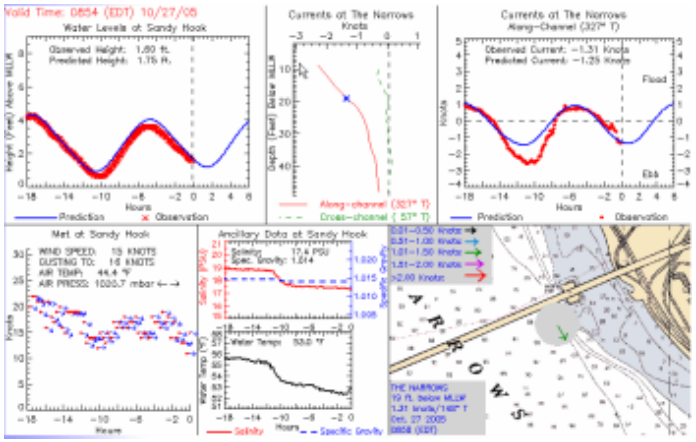
```
<?xml version="1.0" encoding="UTF-8"?>
<!--Sample XML file generated by XMLSpy v2005 U (http://www.xmlspy.com)-->
<dmwg:Message xmlns:dmwg="http://some-dod-dhs-namespace.mil/"
xmlns:ism="urn:us:gov:ic:ism:v2" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://some-dod-dhs-
namespace.mil/:\DOCUME~1\bfreeman\Desktop\shared\workspace\MDA_COI_Pilot\schema\Me
ssage.xsd" ism:releasableTo="USA" ism:classification="U" ism:ownerProducer="GBR"
ism:disseminationControls="FOUO" releasableToDepartment="DHS">
        <version>0.1</version>
        <timeOrigin>2001-12-17T09:30:47.0Z</timeOrigin>
        <timeReceipt>2001-12-17T09:30:49.0Z</timeReceipt>
        <collector>
                <DataSource>AMRS</DataSource>
                <reportStationID>54a2</reportStationID>
        </collector>
        <conveyance xsi:type="dmwg:Vessel">
                <time>
                        <startTime>2001-12-17T09:30:47.0Z</startTime>
                        <endTime>2001-12-17T09:30:47.0Z</endTime>
                </time>
                <location locationAttribute="isAtLocation">
                        <latitude>26.158</latitude>
                        <longitude>80.1835</longitude>
                        <s-minor>10</s-minor>
                        <s-major>10</s-major>
                <orientation>0</orientation>
                        <hae>3.1</hae>
                        <haeRange>3.1</haeRange>
                </location>
                <vector>
                        <courseOverGround>270</courseOverGround>
                        <speedOverGround>4.0</speedOverGround>
                </vector>
                <trueHeading>
                        <heading>182</heading>
                </trueHeading>
                <rateOfTurn>
                        <rate>0.0</rate>
                </rateOfTurn>
                <UID>https://www.notional-amrs.mil/MMSI/304244000</UID>
                <mmsi>304244000</mmsi>
                <transponder xsi:type="dmwg:AIS_Transponder">
                        <signal>
                                <SignalStrength>3</SignalStrength>
                        </signal>
                        <navigationalStatus>0</navigationalStatus>
                </transponder>
```

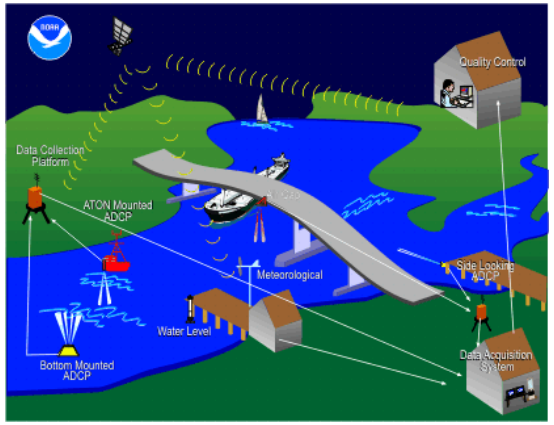

Google Earth
25 OCT 2006
8:01pm
26 OCT 2006
11:26am
N
354532000 position
4A
6
4
1
3
12
9
5
45 km
© 2007 Europa Technologies
Image © 2007 TerraMetrics
©2007 Google™
Pointer 36°41'36.41" N 75°12'29.79" W
Streaming 100%
Eye alt 155.51 km


Google Earth
25 OCT 2006
8:01pm
26 OCT 2006
11:26am
N
354532000 position
Field Name
Value
Value in Lookup Table
Units
UserID
354532000
354532000
NavStat
0
under / engine
SOG
20
kts
PosAcc
0
low
Lon
-75.570833
-75.570833
deg
Lat
36.671833
36.671833
deg
COG
318
318
deg
TrueHeading
315
315
deg
Directions: To here - From here
4A
6
45 km
© 2007 Europa Technologies
Image © 2007 TerraMetrics
Google
Pointer 36°41'36.41" N 75°12'29.79" W
Streaming
100%
Eye alt 155.51 km

Binary Message Application Use Case Water Levels

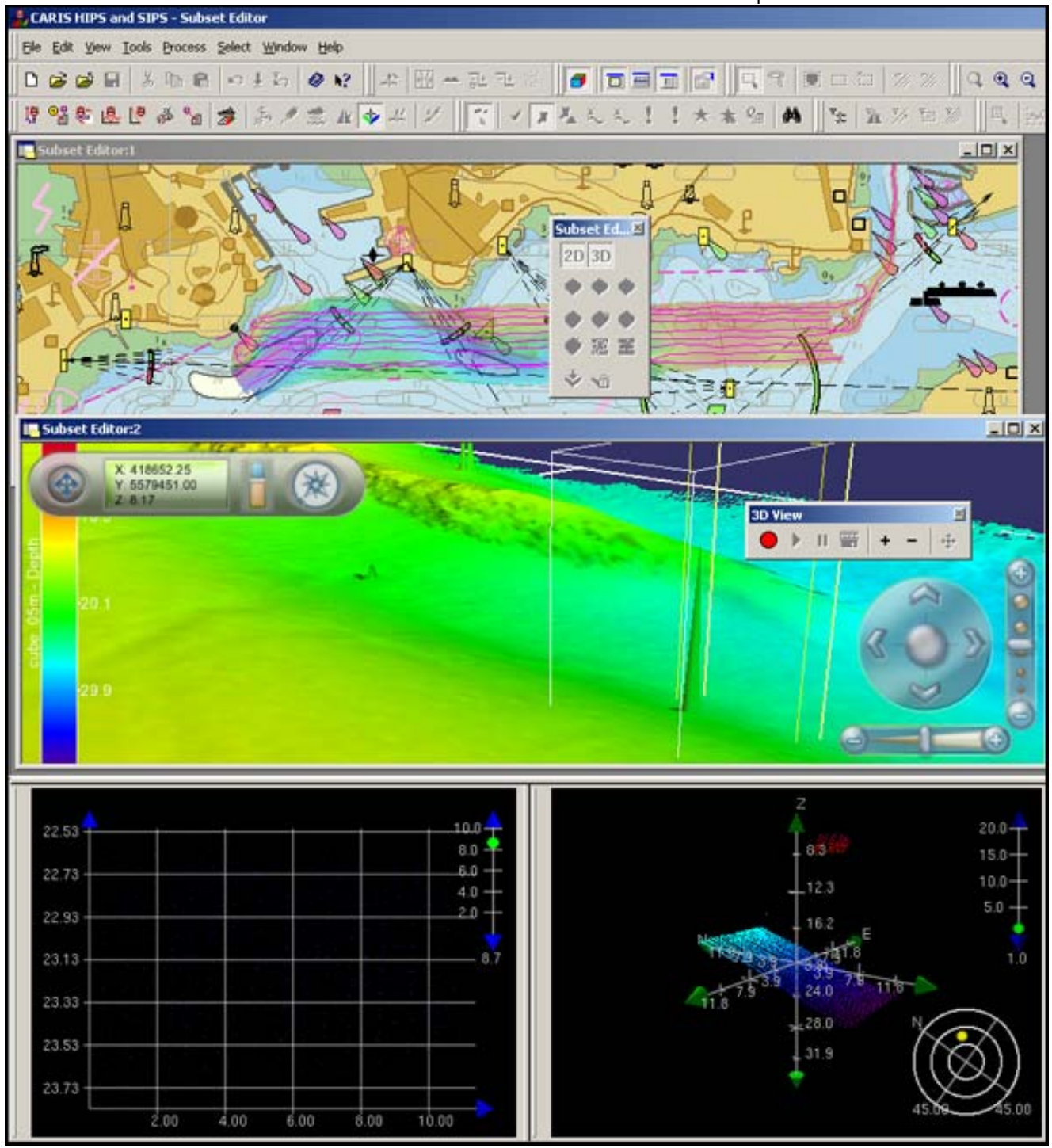
- Realtime water levels to hydrographic surveys will greatly increase NOAA chart productivity
- Realtime water levels to vessels for tide aware planning





Hydrographic Surveys

We need more surveys completed in less time. Post processing misses problems causing areas to be resurveyed and delays the time to a useable gridding bathymetry product.



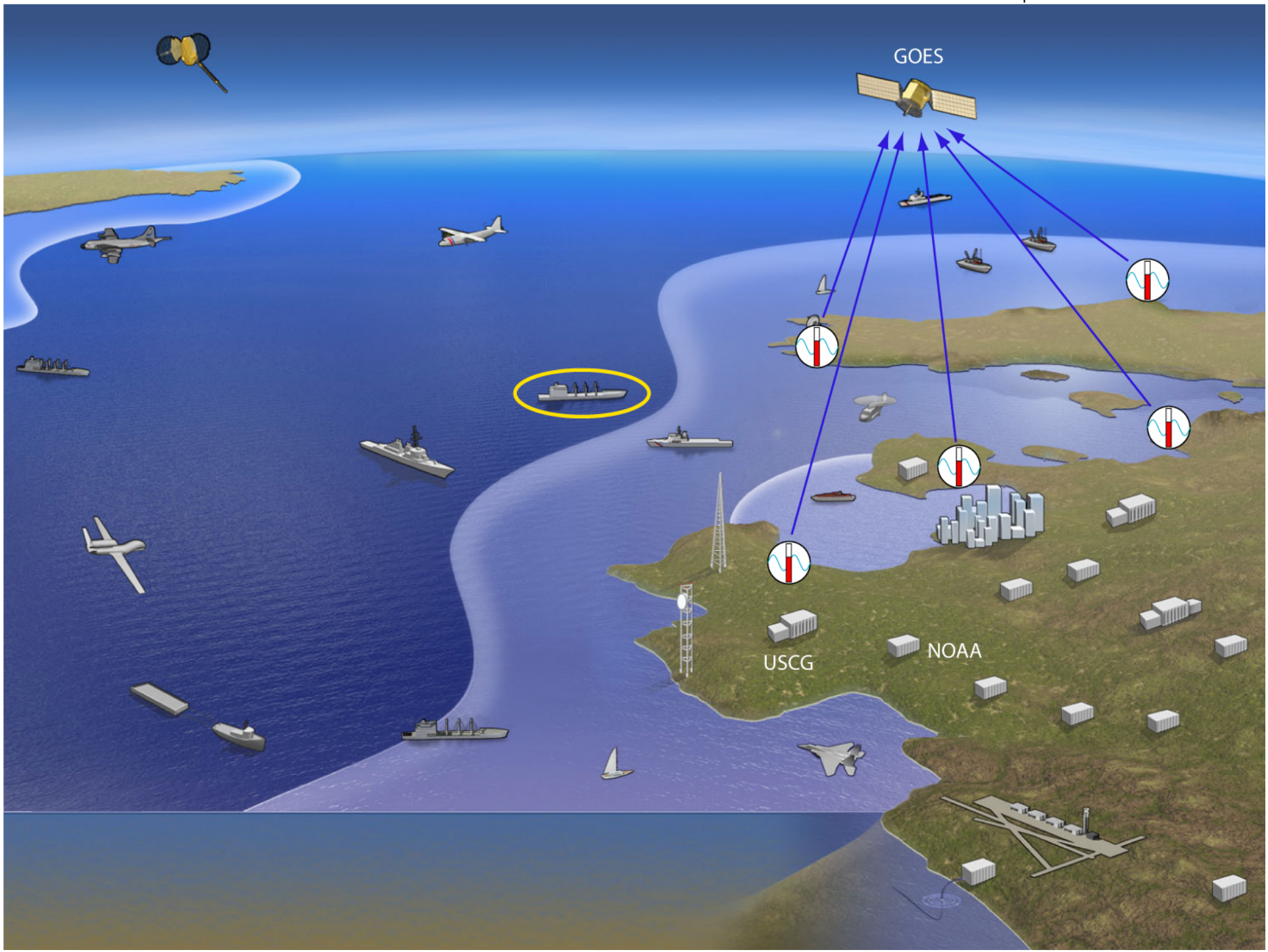
NOAA Water Level Messages CO-OPS/PORTS/OCS

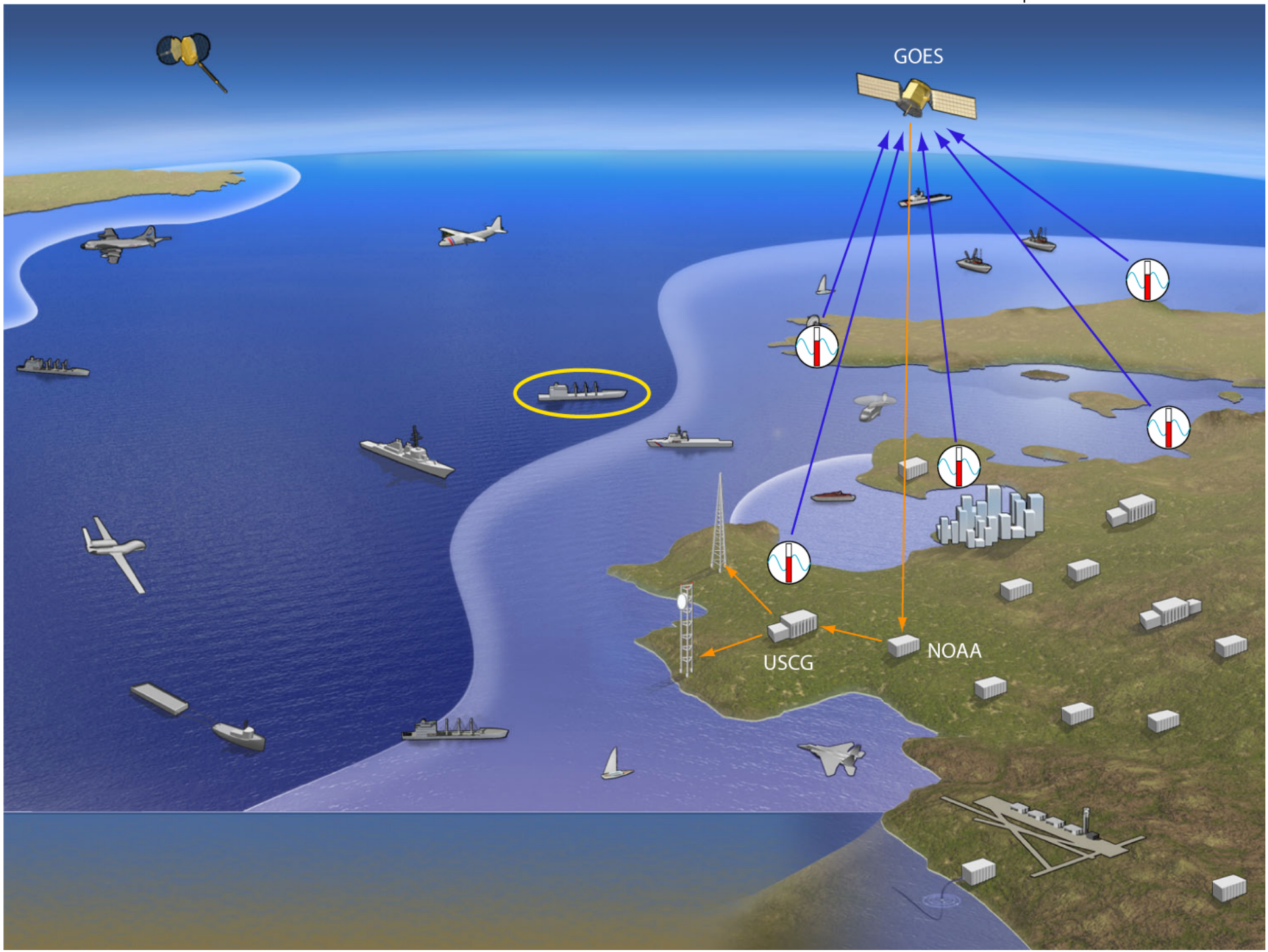
- Transmit real time water level reports for all available stations
- Use finite element model to calculate water surface (TCARI)
- Generate safe water contour for a particular draft (e.g. Pydro or GeoNav)

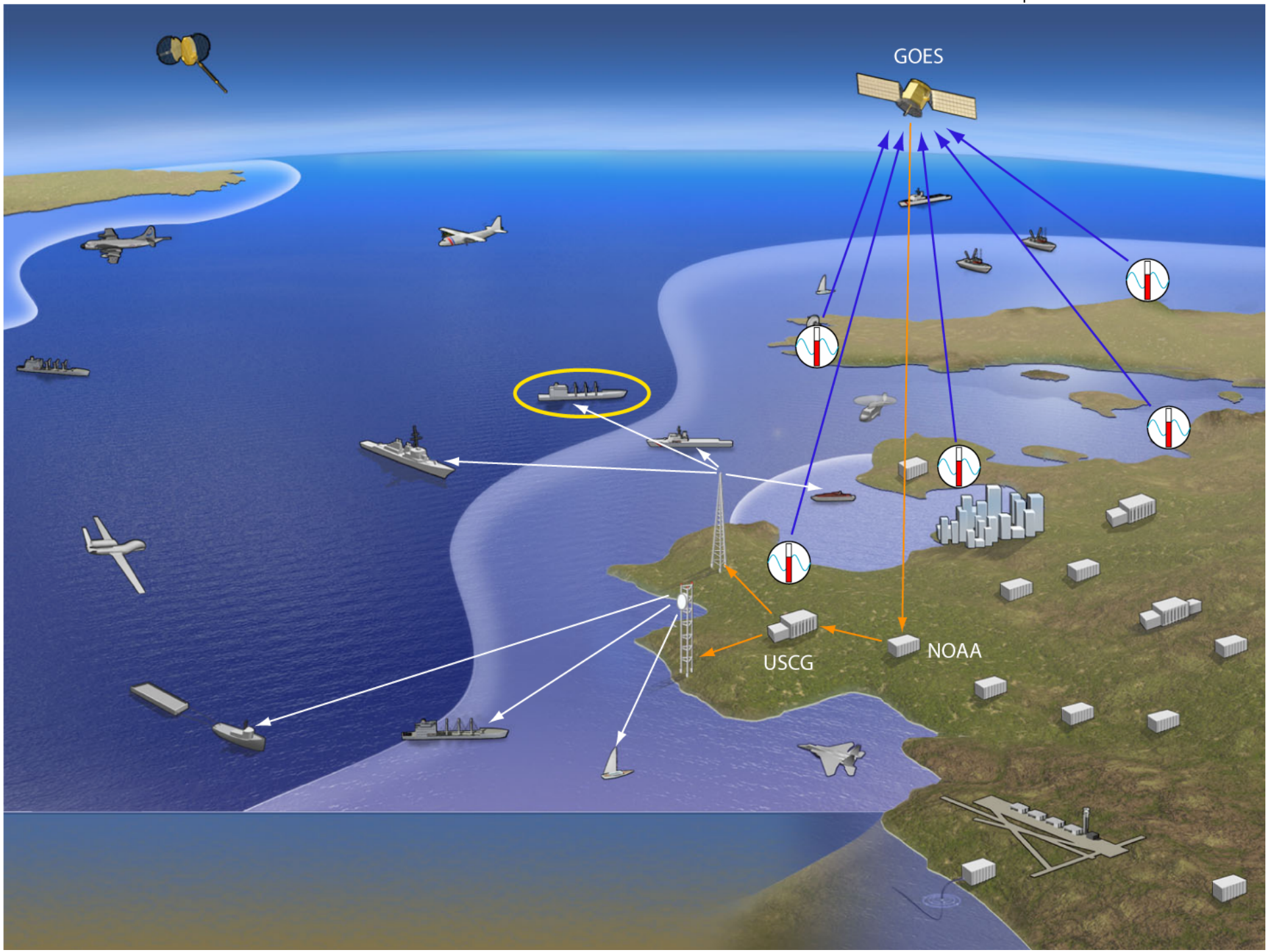

GOES
USCG
NOAA

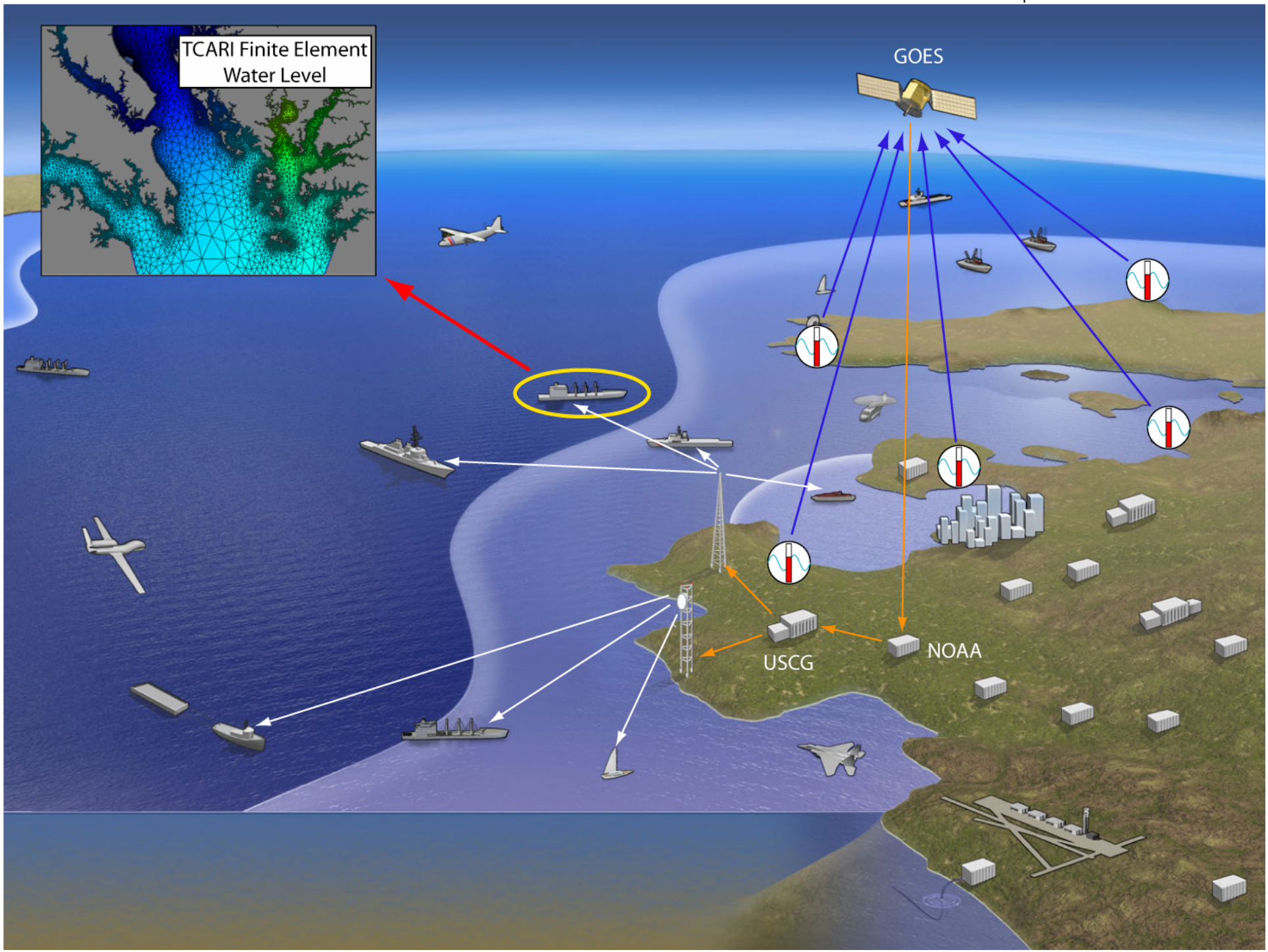

GOES
USCG
NOAA

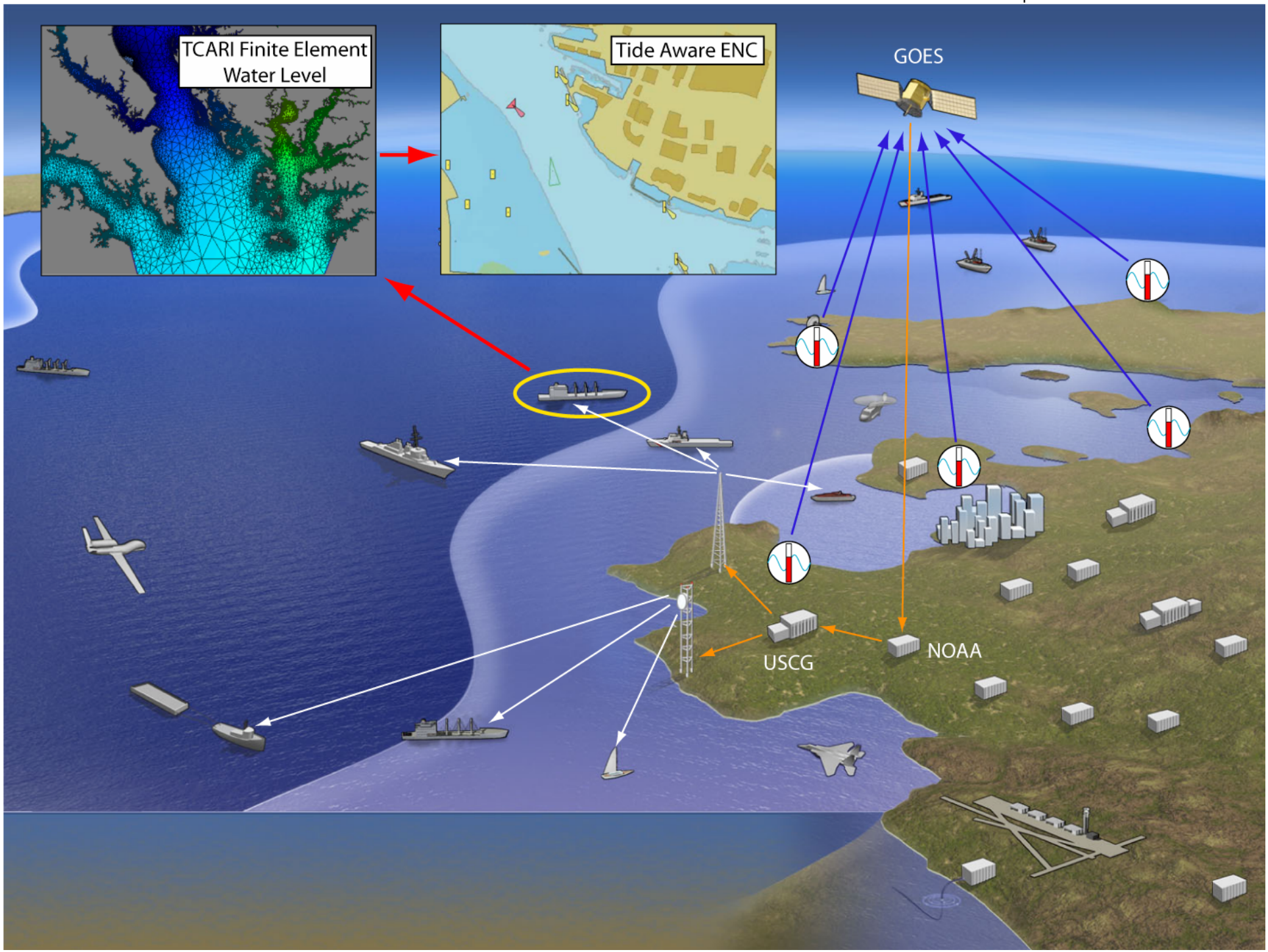

GOES
USCG
NOAA

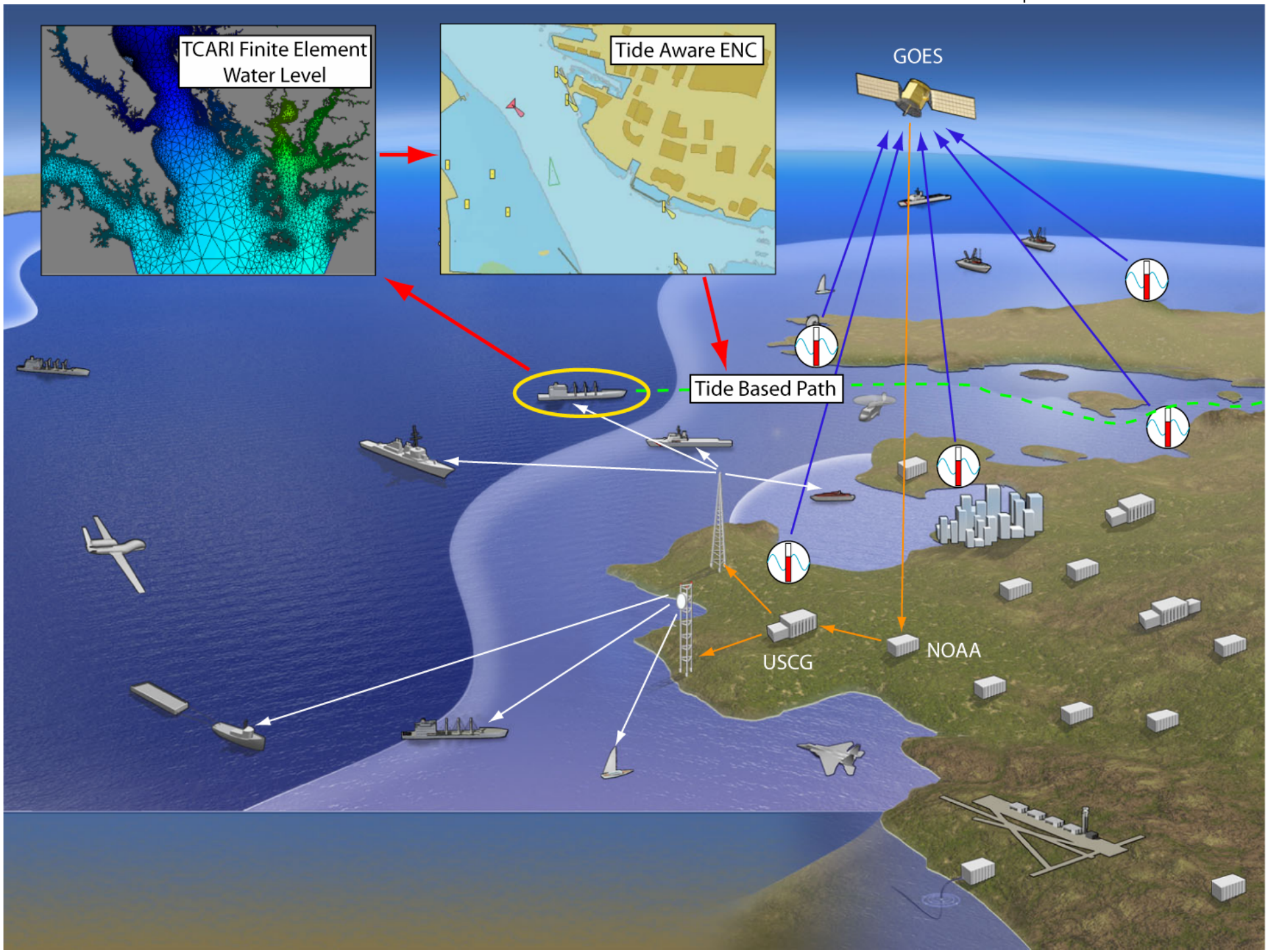

GOES
USCG
NOAA


GOES
USCG
NOAA

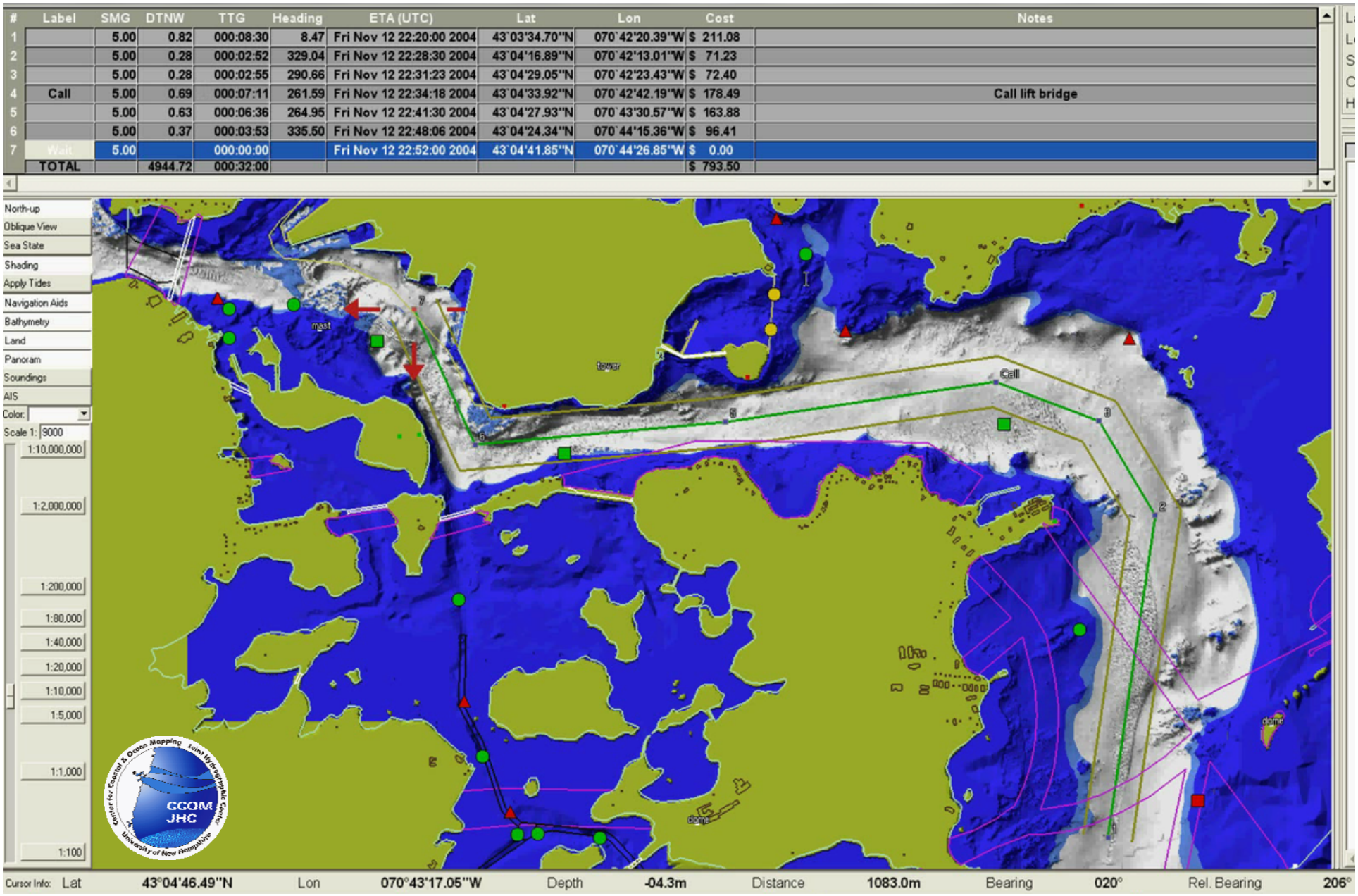

GOES
USCG
NOAA


TCARI Finite Element
Water Level
GOES
USCG
NOAA

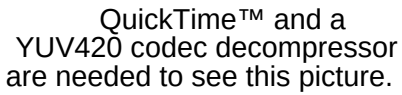

TCARI Finite Element
Water Level
Tide Aware ENC
GOES
USCG
NOAA


TCARI Finite Element
Water Level
Tide Aware ENC
GOES
Tide Based Path
USCG
NOAA

Tide Aware ENC - GeoNav



Tide Aware ENC



AIS Water Level Binary Broadcast Messages

- For surveying and realtime tide aware ENC, we need the *water level* and *quality factors* to be sent automatically to the vessel
- Established related binary messages:
  - St. Lawrence Seaway Waterlevel MSG (DAC/FID: 366:1-3)
  - IMO Met/Hydro (DAC/FID 1:11)
  - European RIS has one too
- Proposed water level message - the above messages are lacking critical information

SLS Water Level Message

AIS Message Definitions

- sls_waterlevel (366 316:1:3): St Lawrance Seaway water level message

AIS Message: sls_waterlevel (366 316:1:3)

Description:

St Lawrance Seaway water level message

Name	NumberOfBits	ArrayLength	Type	Units	Description
time_month	4		uint		Time tag of measurement month 1..12
time_day	5		uint		Time tag of measurement day of the month 1..31
time_hour	5		uint		Time tag of measurement UTC hours 0..23
time_min	6		uint		Time tag of measurement minutes
stationid	6	7	aisstr6		Character identifier of the station. Usually a number.
pos_longitude	25		decimal	degrees	Location of measurement East West location
pos_latitude	24		decimal	degrees	Location of measurement North South location
type	1		uint		How to interpret the water level **0**: Relative to datum **1**: Water depth
waterlevel	16		int	cm	Water level in centimeters
datum	2		uint		What reference datum applies to the value **0**: MLLW **1**: IGLD-85 **2**: Reserved **3**: Reserved
reserved	14		uint		Reserved bits for future use

INTERNATIONAL MARITIME ORGANIZATION
4 ALBERT EMBANKMENT
LONDON SE1 7SR

Telephone: 020 7735 7611
Fax: 020 7587 3210

IMO

E

Ref.

SN/Circ.236
28 May 2004

GUIDANCE ON THE APPLICATION OF AIS BINARY MESSAGES

3 The Sub-Committee on Safety of Navigation, at its forty-ninth session selected seven (7) binary messages as shown in annex 2 to this circular to be used as a trial set of messages. The idea is to use this set of 7 messages for a trial period of 4 years with no change. It should be noted that 4 additional system-related messages identified in Recommendation ITU-R M.1371 are needed for the operation of the system.

4 The criteria for selecting the 7 trial messages were:

.1 demonstrated operational need;

.2 a cross-section of users, including ships, VTS, pilots, and port authorities; and

.3 messages already developed for format and content.

IMO Met/Hydro DAC=001 FID=11

APPLICATION 1
Message "METEOROLOGICAL AND HYDROLOGICAL DATA"

Parameter	No. of bits	Description
Message ID	6	Identifier for Message 8; always 8
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated.
Source ID	30	MMSI number of source station
Spare	2	Not used. Should be set to zero.
IAI	16	DAC = 001; FI = 11
Latitude	24	Measuring position, 0 to + /- 90 degrees, 1/1000th minute
Longitude	25	Measuring position, 0 to + /- 180 degrees, 1/1000th minute
Date and time	16	Time of transmission, Day, hour, minute, (ddhhmm in UTC)
Average wind speed	7	Average of wind speed values for the last 10 minutes. 0-120 kts, 1 kt
Wind gust	7	Wind gust is the maximum wind speed value reading during the last 10 minutes, 0 - 120 kts, 1 kt
Wind direction	9	0 - 359 degrees ,1 degree
Wind gust direction	9	0 – 359 degrees, 1 degree
Air temperature	11	Dry bulb temperature - 60.0 to + 60.0 degrees Celsius 0.1 of a degree
Relative humidity	7	0 – 100%, 1%
Dew point	10	- 20.0 - + 50.0 degrees, 0.1 degree
Air pressure	9	800 – 1200 hPa, 1 hPa
Air pressure tendency	2	0 = steady, 1 = decreasing, 2 = increasing
Horizontal visibility	8	0.0 – 25.0 NM, 0.1 NM
Water level (incl. tide)	9	Deviation from local chart datum, . –10.0 to + 30.0 m 0.1 m
Water level trend	2	0 = steady, 1 = decreasing, 2 = increasing
Surface current speed (incl. tide)	8	0.0 – 25.0 kts 0.1 kt
Surface current direction	9	0 – 359 degrees, 1 degree
Current speed, #2	8	Cu kt
Current direction, #2	9	0 –
Current measuring level, #2	5	Me 1 m
Current speed, #3	8	0.0
Current direction, #3	9	0 –
Current measuring level, #3	5	Me 1 m
Significant wave height	8	0.0
Wave period	6	Per
Wave direction	9	0 –
Swell height	8	0.0
Swell period	6	Per
Swell direction	9	0 –
Sea state	4	Ac
Water temperature	10	-10
Precipitation (type)	3	According to WMO
Salinity	9	0.0 – 50.0 ‰, 0.1‰
Ice	2	Yes/No
Spare	6	
Total Number of bits	352	Occupies 2 slots

horizvis	8	udecimal	nm	Horizontal visibility
waterlevel	9	decimal	m	Water level (incl. tide)
waterleveltrend	2	uint		Water level trend **0**: steady **1**: decreasing **2**: increasing **3**: unavailable
surfcurspeed	8	udecimal	knots	Surface current speed
surfcurdir	9	uint	degrees	Surface current direction

Tidal Window

Really does not match the requirements for either surveying or Tide Aware ENC

APPLICATION 4
Message "TIDAL WINDOW"

Parameter	No. of bits	Description
Message ID	6	Identifier for Message 6; always 6
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. 0-3; 0 = default; 3 = do not repeat anymore
Source ID	30	MMSI number of source station
Sequence Number	2	0-3.
Destination ID	30	MMSI number of destination station
Retransmit Flag	1	Retransmit Flag should be set upon retransmission: 0 = no retransmission = default; 1 = retransmitted.
Spare	1	Not used. Should be zero.
IAI	16	DAC = 001; FI = 14
UTC month	4	1-12; 0 = UTC month not available = default; 13-15 not used
UTC day	5	1-31; 0 = UTC day not available = default
Position #1 Lat	27	1/10 000 min (±90 degrees, North = positive, South = negative; 91 degrees = not available = default).
Position #1 Lon	28	1/10 000 min (±180 degrees, East = positive, West = negative; 181 degrees = not available = default).
From UTC hour	5	0-23; 24 = UTC hour not available = default; 25-31not used
From UTC minute	6	0-59; 60 = UTC minute not available = default; 61-63 unused
To UTC hour	5	0-23; 24 = UTC hour not available = default; 25-31not used
To UTC minute	6	0-59; 60 = UTC minute not available = default; 61-63 unused
		0-359, 360 = not available =
		0-126; 127 = not available =
		itive, South = negative; 91
		itive, West = negative; 181
		ult; 25-31not used
		efault; 61-63 unused
		ult; 25-31not used
		efault; 61-63 unused
		0-359, 360 = not available =
		0-126; 127 = not available =
		itive, South = negative; 91
		itive, West = negative; 181
		ult; 25-31not used
		efault; 61-63 unused
		ult; 25-31not used
To UTC minute	6	0-59; 60 = UTC minute not available = default; 61-63 unused
Current direction predicted #3	9	Current direction in degrees. (valid range 0-359, 360 = not available = default).
Current speed predicted #3	7	Current speed in 0,1 knots. (valid range 0-126; 127 = not available = default).
Total number of bits	376	occupies 3 slots

UTC month	4	1-12; 0 = UTC month not available = default; 13-15 not used
UTC day	5	1-31; 0 = UTC day not available = default
Position #1 Lat	27	1/10 000 min (±90 degrees, North = positive, South = negative; 91 degrees = not available = default).
Position #1 Lon	28	1/10 000 min (±180 degrees, East = positive, West = negative; 181 degrees = not available = default).
From UTC hour	5	0-23; 24 = UTC hour not available = default; 25-31not used
From UTC minute	6	0-59; 60 = UTC minute not available = default; 61-63 unused
To UTC hour	5	0-23; 24 = UTC hour not available = default; 25-31not used
To UTC minute	6	0-59; 60 = UTC minute not available = default; 61-63 unused
Current direction predicted #1	9	Current direction in degrees. (valid range 0-359, 360 = not available = default).
Current speed predicted #1	7	Current speed in 0,1 knots. (valid range 0-126; 127 = not available = default).

Water Level Message Based on the NOAA CO-OPS/PORTS realtime database

efid	12		uint		extended functional identifier
month	4		uint		Time the measurement represents month 1..12
day	5		uint		Time the measurement represents day of the month 1..31
hour	5		uint		Time the measurement represents UTC hours 0..23
min	6		uint		Time the measurement represents minutes
sec	6		uint		Time the measurement represents seconds
stationid	6	7	aisstr6		Character identifier of the station. Usually a number.
longitude	28		decimal	degrees	Location of the sensor taking the water level measurement or position of prediction. East West location
latitude	27		decimal	degrees	Location of the sensor taking the water level measurement or position of prediction. North South location
waterlevel	16		int	cm	Water level in centimeters
datum	5		uint		What reference datum applies to the value **0**: MLLW **1**: IGLD-85 **2**: WaterDepth **3**: STND **4**: MHW **5**: MSL **6**: NGVD **7**: NAVD **8**: WGS-84 **9**: LAT
sigma	32		float	m	Standard deviation of 1 second samples used to compute the water level height
o	8		uint		Count of number of samples that fall outside a 3-sigma band about the mean
levelinferred	1		bool		indicates that the water level value has been inferred
flat_tolerance_exceeded	1		bool		flat tolerance limit was exceeded. Need better descr
rate_tolerance_exceeded	1		bool		rate of change tolerance limit was exceeded
temp_tolerance_exceeded	1		bool		temperature difference tolerance limit was exceeded
expected_height_exceeded	1		bool		either the maximum or minimum expected water level height limit was exceeded
link_down	1		bool		Unable to communicate with the tide system. All data invalid
timeLastMeasured	12		udecimal	hours	Time relative since the timetag that the station actually measured a value.

Right Whale Notifications for the Stellwagen Bank National Marine Sanctuary (SBNMS)

Image Credit: SBNMS

Ship strikes are the biggest threat to the right whale species

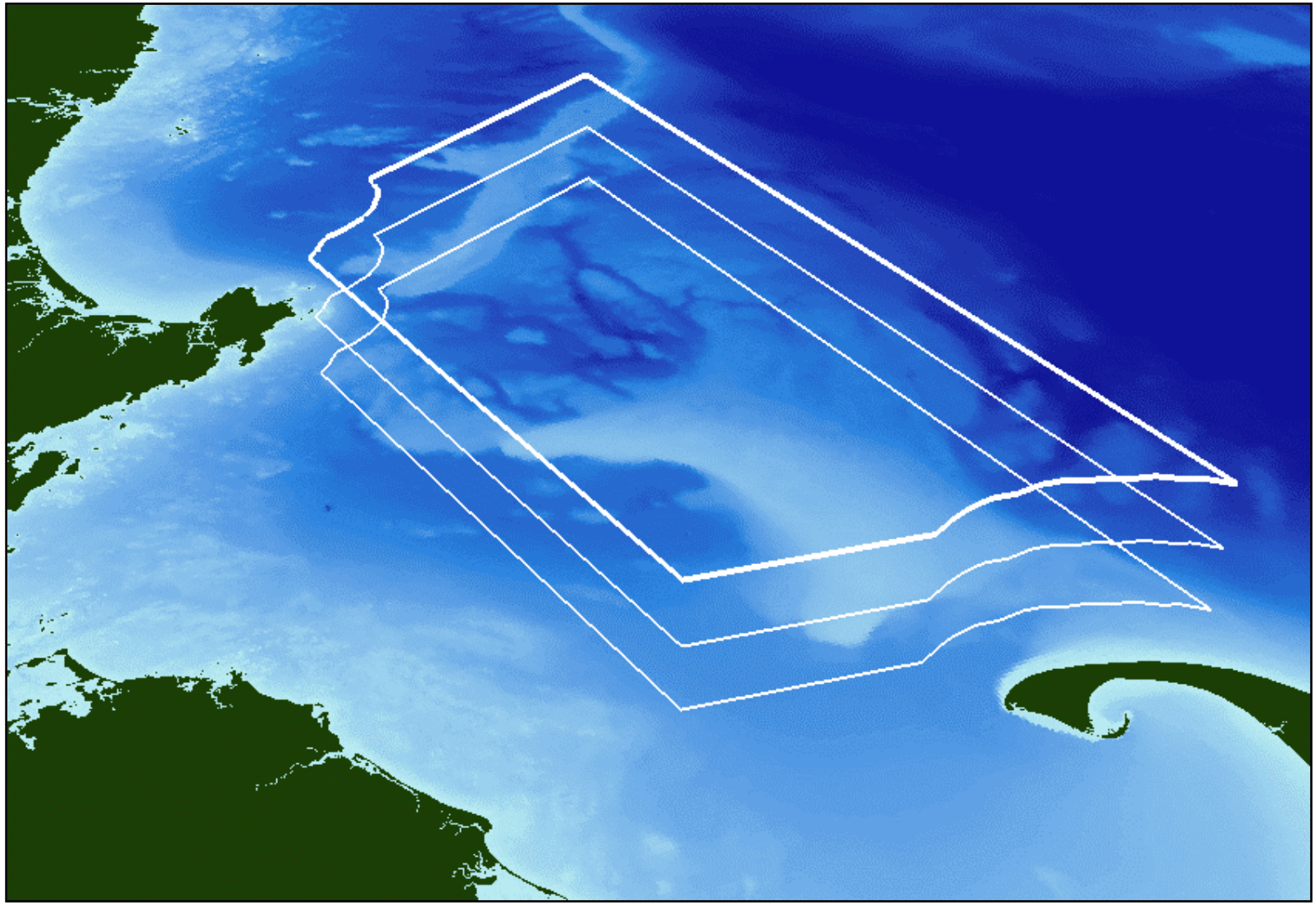


Image Source: Mike Thompson/SBNMS

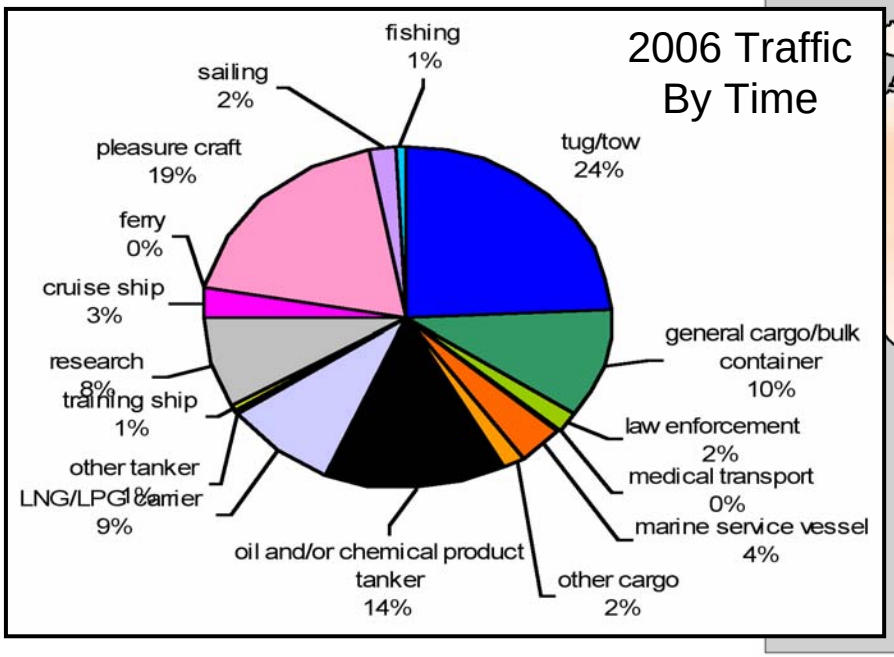
LNG Rules for SBNMS

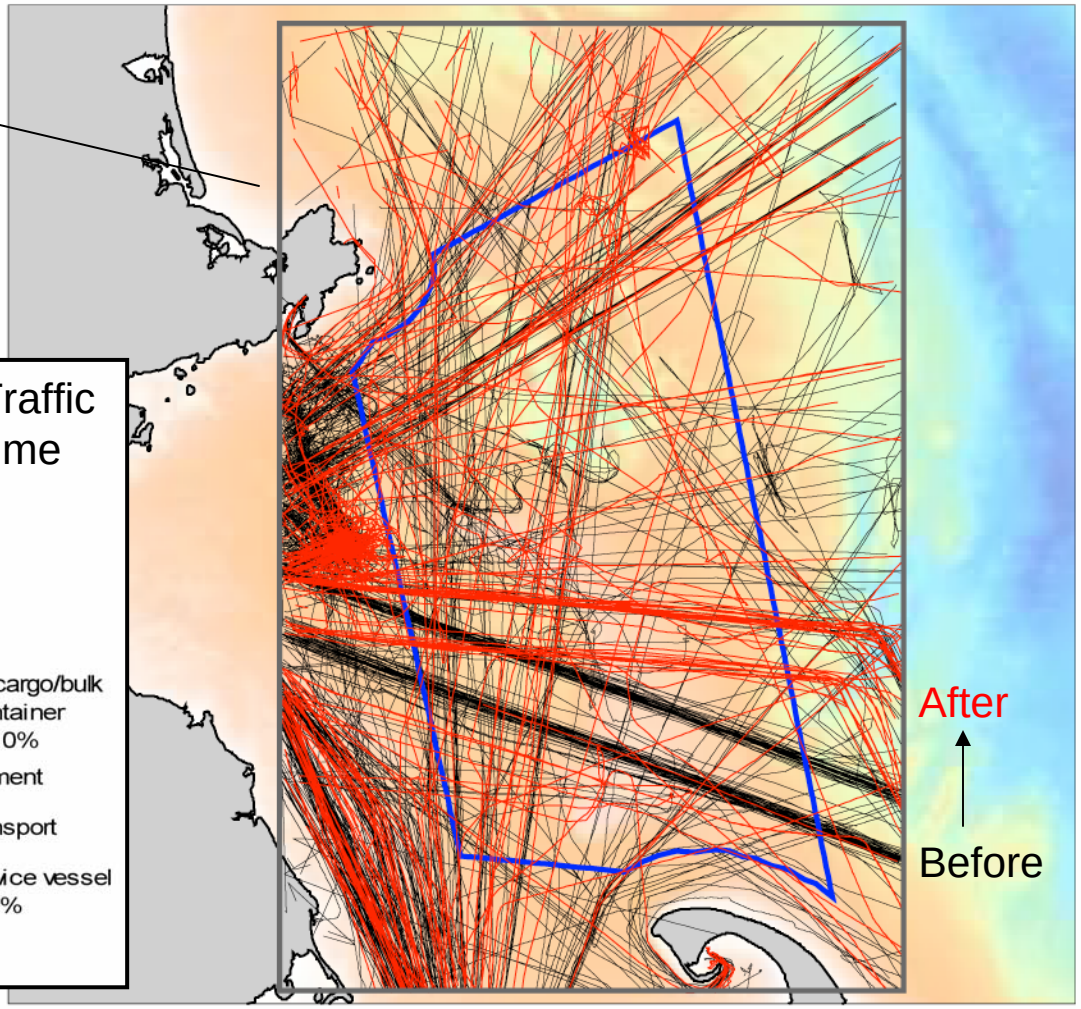
- Must remain in the TSS lanes
- If a right whale is acoustically detected:
  - Slow to 10 knots or less within dection zone
  - Zone is 5 nm radius around buoy
  - Restriction in place for 24 after detection
- Is NOT a requirement for non-LNG vessels
- Having vessels leave the TSS is a “bad idea”

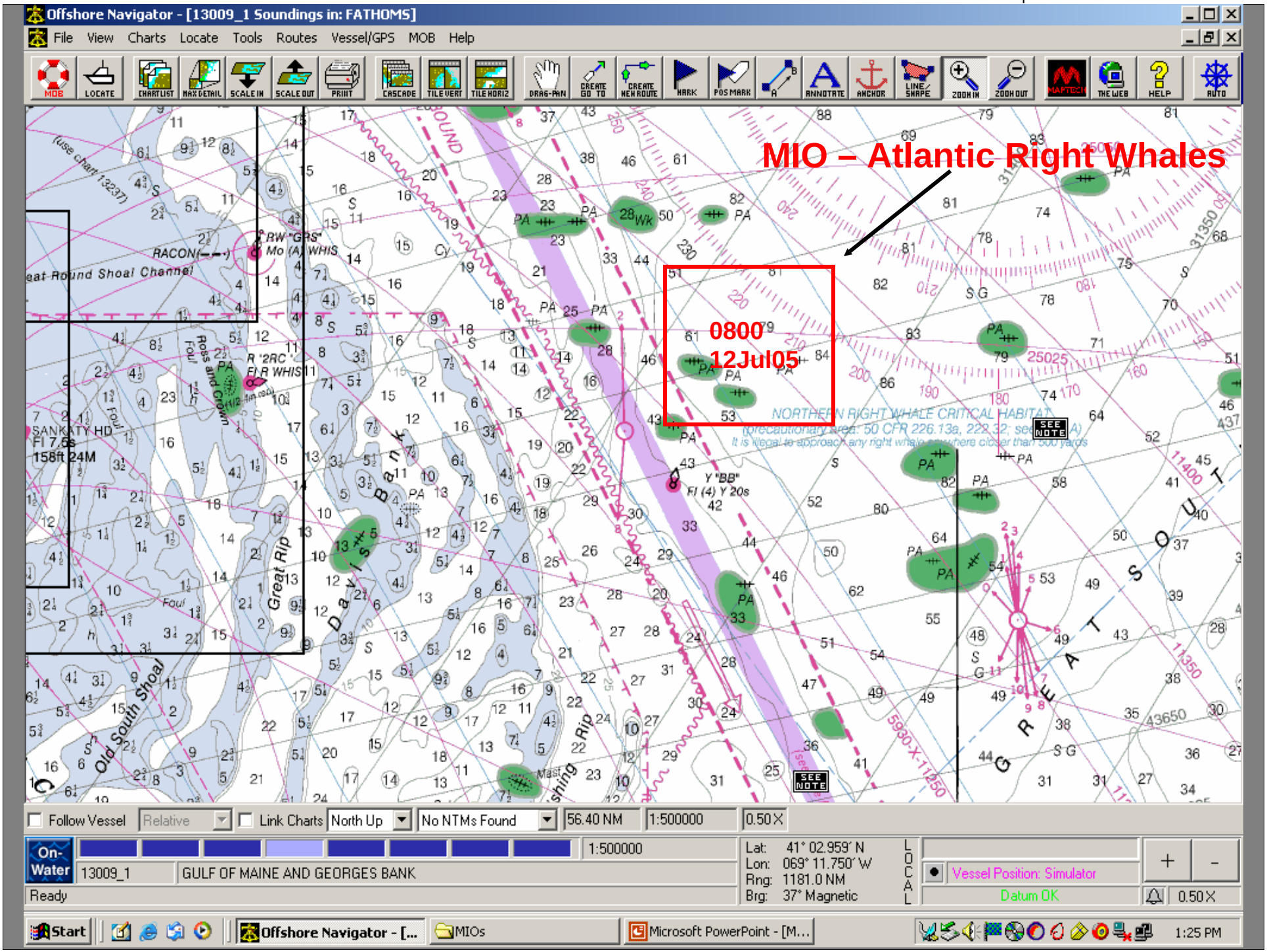
Automatic Identification System
Analysis of Ship Traffic - July 2007 TSS Switch

Collaboration with Stellwagen Bank National Marine Sanctuary
Schwehr, Hatch, Thompson, Wiley

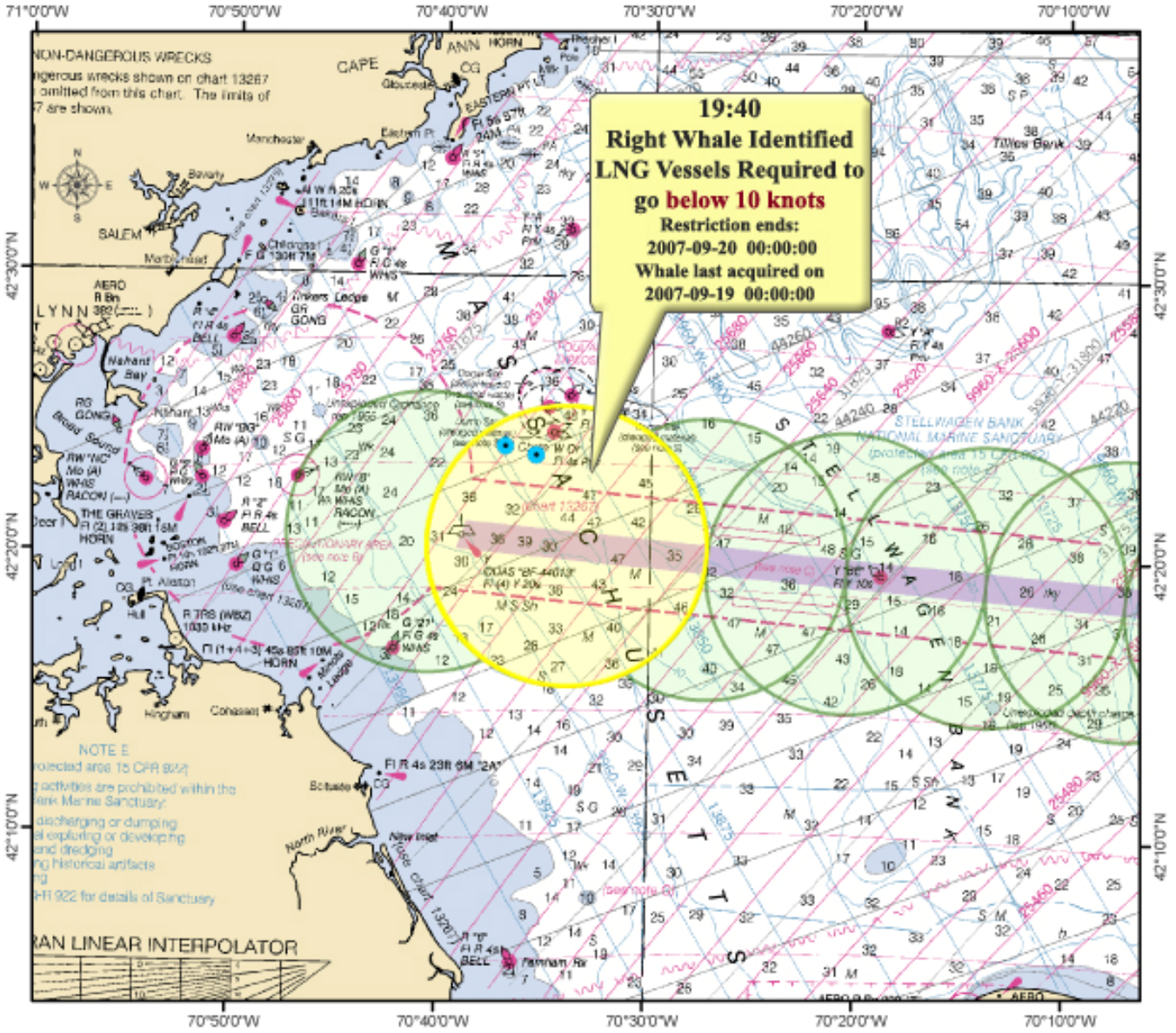
Traffic Separation Scheme Change

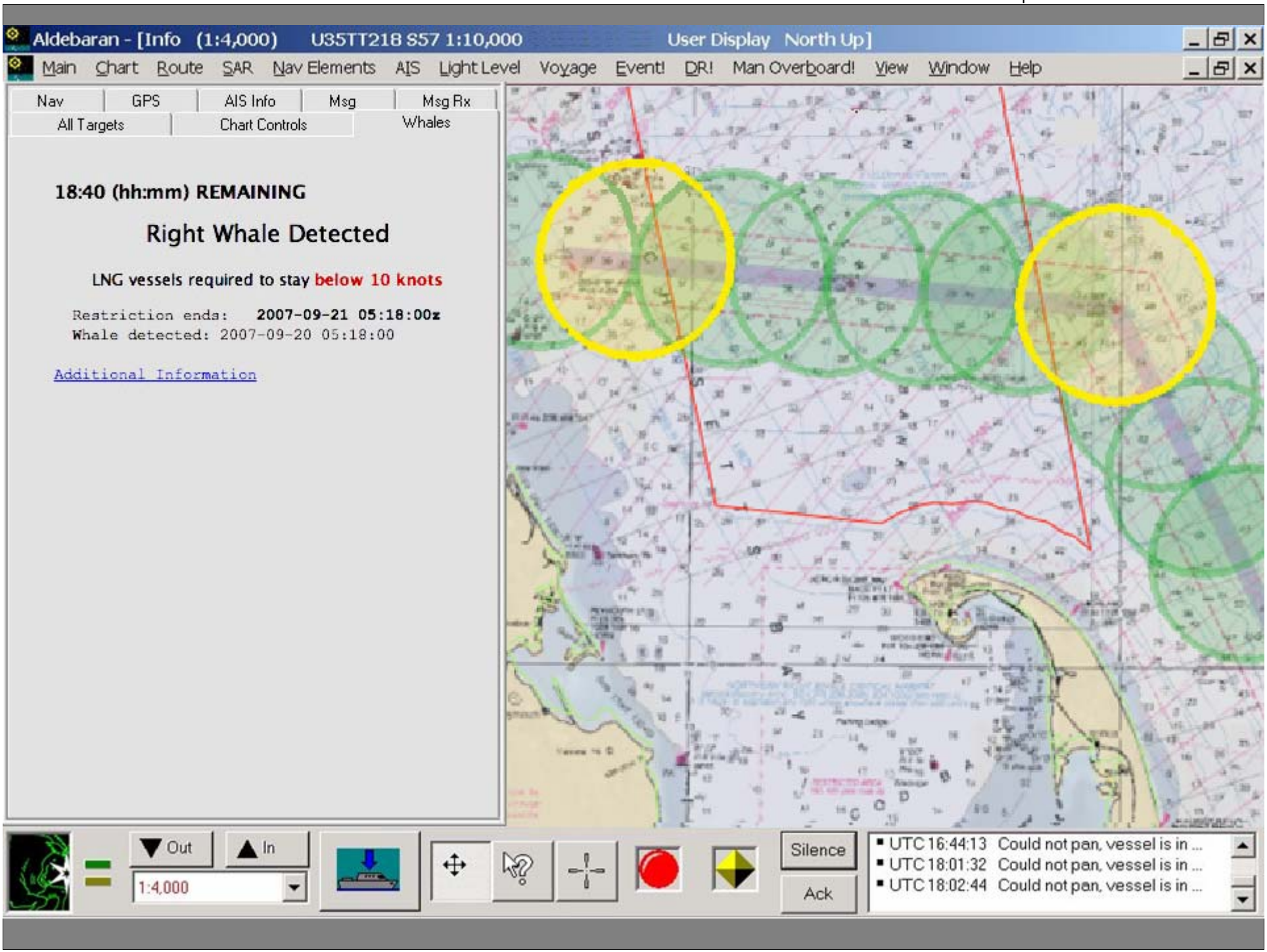




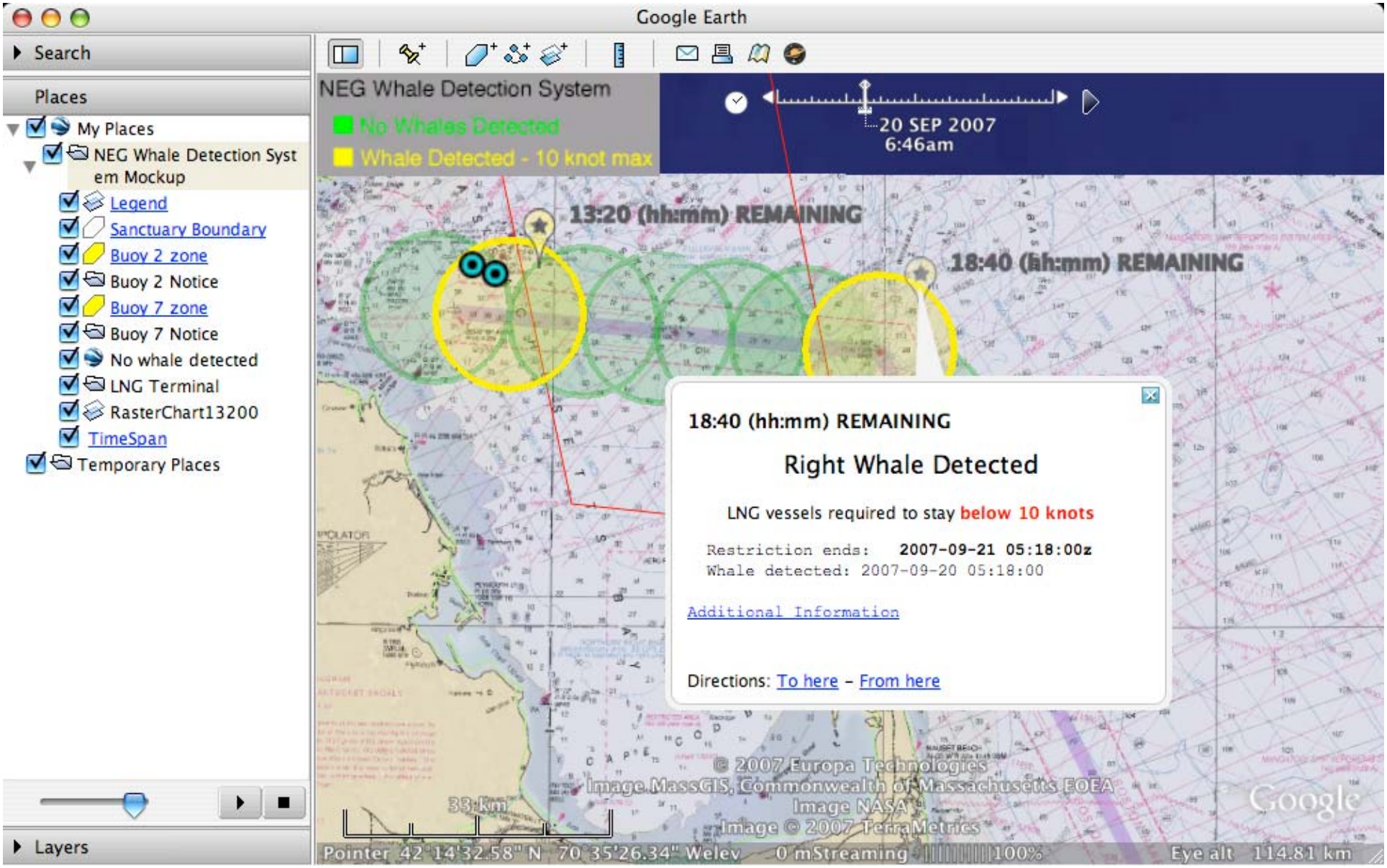

Offshore Navigator - [13009_1 Soundings in: FATHOMS]
File View Charts Locate Tools Routes Vessel/GPS MOB Help
MIO – Atlantic Right Whales
0800
12Jul05
NORTHERN RIGHT WHALE CRITICAL HABITAT
Great Round Shoal Channel
Great Rip
Davis Bank
Old South Shoal
SANKATY HD
Fl 7.5s
158ft 24M
Follow Vessel
Relative
Link Charts
North Up
No NTMs Found
56.40 NM
1:500000
0.50X
On-Water
13009_1
GULF OF MAINE AND GEORGES BANK
Lat: 41° 02.959' N
Lon: 069° 11.750' W
Rng: 1181.0 NM
Brg: 37° Magnetic
LOCAL
Vessel Position: Simulator
Datum OK
Ready
Start
Offshore Navigator - [...
MIOs
Microsoft PowerPoint - [M...
1:25 PM

An alternative look




Aldebaran - [Info (1:4,000) U35TT218 S57 1:10,000 User Display North Up]
Main Chart Route SAR Nav Elements AIS Light Level Voyage Event! DR! Man Overboard! View Window Help
Nav GPS AIS Info Msg Msg Rx
All Targets Chart Controls Whales
18:40 (hh:mm) REMAINING
Right Whale Detected
LNG vessels required to stay below 10 knots
Restriction ends: 2007-09-21 05:18:00z
Whale detected: 2007-09-20 05:18:00
Additional Information
Out
In
1:4,000
Silence
Ack
UTC 16:44:13 Could not pan, vessel is in ...
UTC 18:01:32 Could not pan, vessel is in ...
UTC 18:02:44 Could not pan, vessel is in ...

Basic Layout



Description:

IMO Fairway Message

IMO fairway closed. Specified in SN/Circ.236 Annex 2, page 4, Application 3. Also defined in IALA Guidelines on AIS, Vol 1, Part 1, Ed. 1.3. Guildeline No 1028. This message should be used to inform ships, in particular to give guidance to large vessels about temporary closed fairways or sections in ports. Attributes: broadcast, shore station transmitting, no acknowledgement.

Name	NumberOfBits	ArrayLength	Type	Units	Description
MessageID	6		uint		AIS message number. Must be 8
RepeatIndicator	2		uint		Indicated how many times a message has been repeated **0**: default **3**: do not repeat any more
UserID	30		uint		MMSI number of transmitter broadcasting the message
Spare	2		uint		Reserved for definition by a regional authority.
dac	10		uint		Designated Area Code - part 1 of the IAI
fid	6		uint		Functional Identifier - part 2 of the IAI
reason	6	20	aisstr6		Reason for closing
from	6	20	aisstr6		Location of closing from
to	6	20	aisstr6		Location of closing To
radius	10		uint	See unit field	Extention of closed area
unit	2		uint		Unit of extension value for range field **0**: m **1**: km **2**: nm **3**: cbl
closingday	5		uint		Closing from day
closingmonth	4		uint		Closing from month
fromhour	5		uint		From LT hour (appr)
frommin	6		uint		From LT minute (appr)
today	5		uint		To day
tomonth	4		uint		To month
tohour	5		uint		To LT hour (appr)
tomin	6		uint		To LT minute (appr)
spare2	4		uint		Padding out the slot

Proposed 2-slot right whale notice

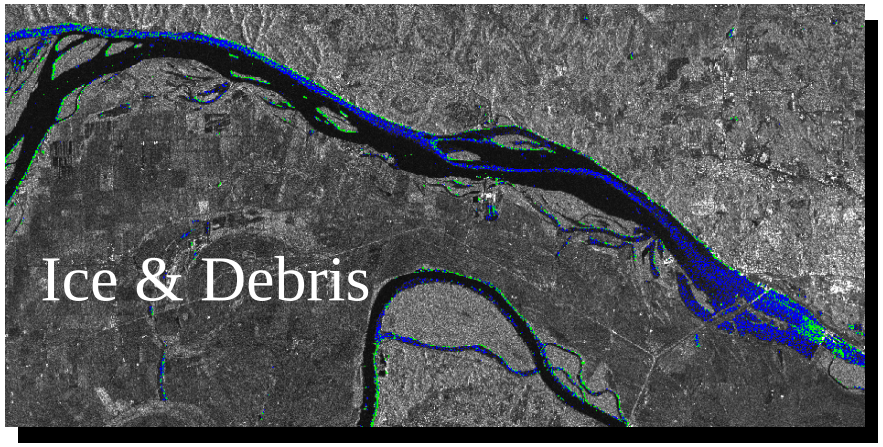
Name	NumberOfBits	ArrayLength	Type	Units	Description
MessageID	6		uint		AIS message number. Must be 8
RepeatIndicator	2		uint		Indicated how many times a message has been repeated **0**: default **3**: do not repeat any more
UserID	30		uint		Unique ship identification number (MMSI)
Spare	2		uint		Reserved for definition by a regional authority.
dac	10		uint		Designated Area Code - 366 for the United States
fid	6		uint		Functional IDentifier - 63 for the Whale Notice
efid	12		uint		Extended Functional IDentifier. 1 for the Whale Notice (dac+fid+efid defines the exact message type)
numreports	2		uint		Number of detection reports filled out in this message
stationid1	8		uint		Identifier of the station that recorded the whale. Usually a number.
time1_day	5		uint		Time of most recent whale detection. UTC day of the month 1..31
time1_hour	5		uint		Time of most recent whale detection. UTC hours 0..23
time1_min	6		uint		Time of most recent whale detection. UTC minutes
center1_longitude	28		decimal	degrees	Center of the detection zone. East West location
center1_latitude	27		decimal	degrees	Center of the detection zone. North South location
timetoexpire1	16		uint	seconds	Seconds from the detection time until the notice expires **0**: No detection/notice active in region
radius1	16		uint	m	Distance from center of detection zone (lat/lon above)
stationid2	8		uint		Identifier of the station that recorded the whale. Usually a number.
time2_day	5		uint		Time of most recent whale detection. UTC day of the month 1..31
time2_hour	5		uint		Time of most recent whale detection. UTC hours 0..23

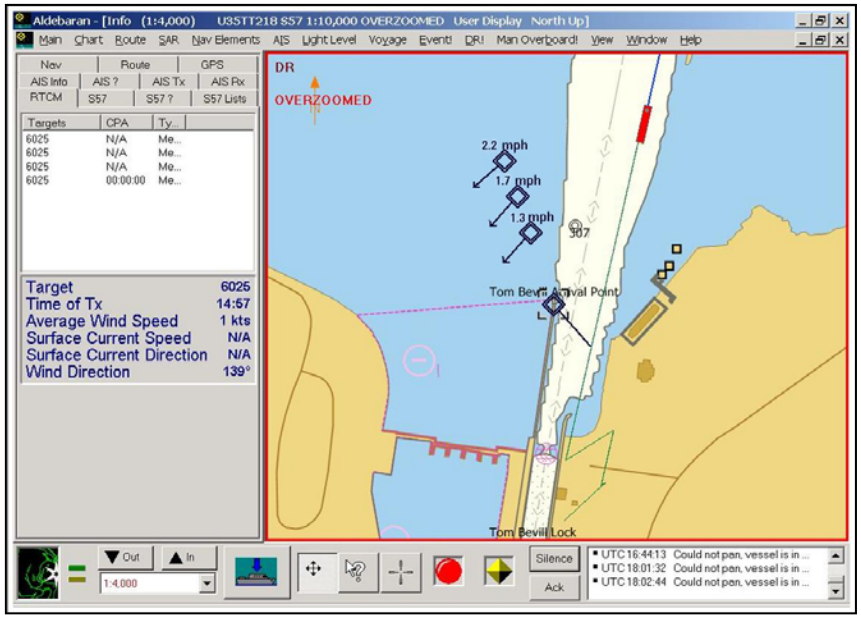
stationid1	8		uint		Identifier of the station that recorded the whale. Usually a number.
time1_day	5		uint		Time of most recent whale detection. UTC day of the month 1..31
time1_hour	5		uint		Time of most recent whale detection. UTC hours 0..23
time1_min	6		uint		Time of most recent whale detection. UTC minutes
center1_longitude	28		decimal	degrees	Center of the detection zone. East West location
center1_latitude	27		decimal	degrees	Center of the detection zone. North South location
timetoexpire1	16		uint	seconds	Seconds from the detection time until the notice expires **0**: No detection/notice active in region

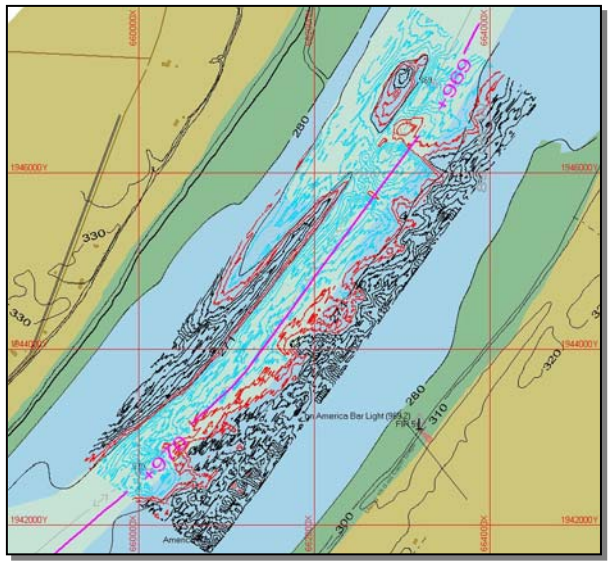
center3_longitude	28		decimal	degrees	Center of the detection zone. East West location
center3_latitude	27		decimal	degrees	Center of the detection zone. North South location
timetoexpire3	16		uint	seconds	Seconds from the detection time until the notice expires **0**: No detection/notice active in region
radius3	16		uint	m	Distance from center of detection zone (lat/lon above)
Spare2	21		uint		Not used. Should be set to zero.

Many new application area are waiting in the wings

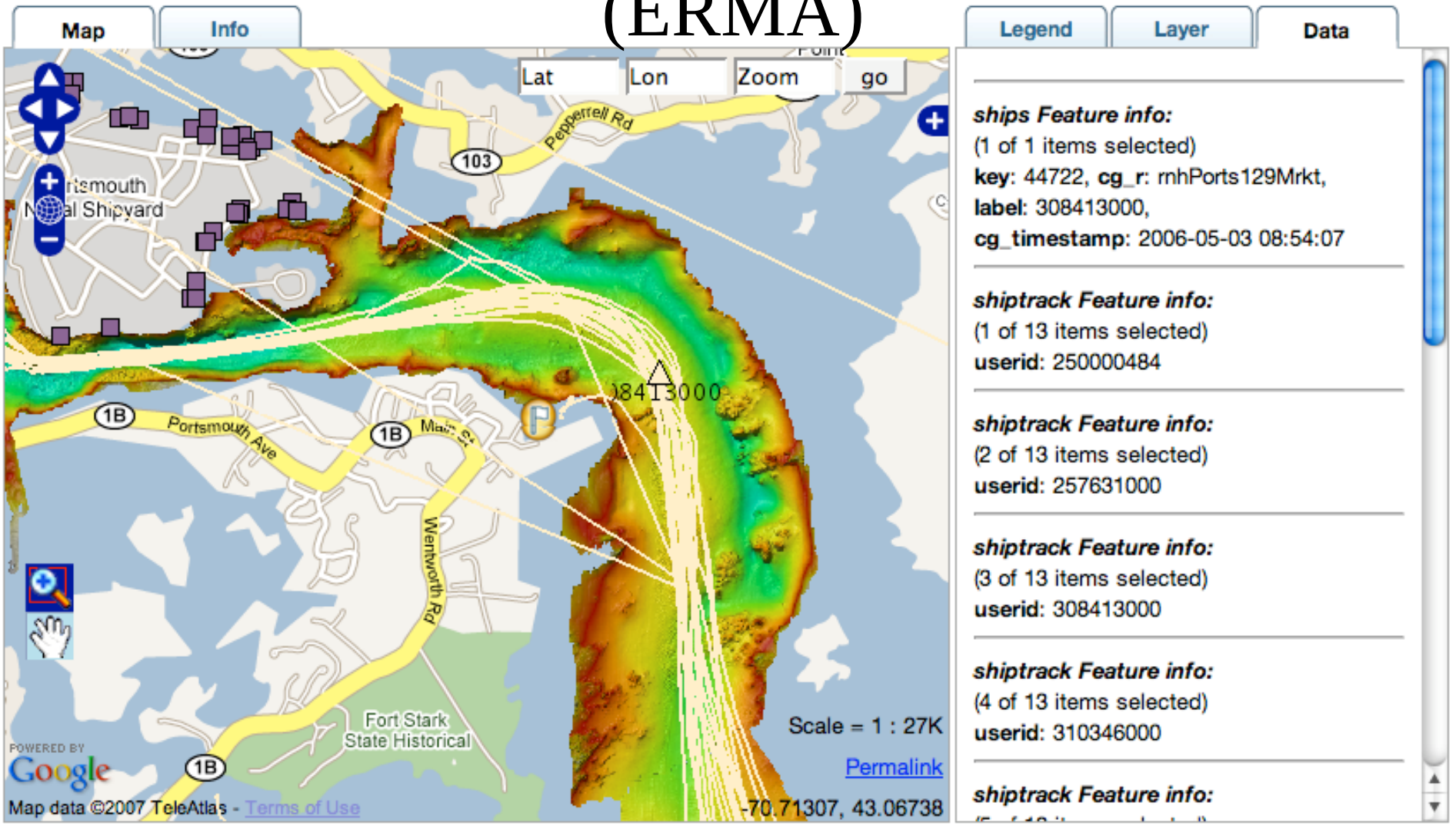
ACOE / CRIS


Ice & Debris


Aldebaran - [Info (1:4,000) U35TT218 S57 1:10,000 OVERZOOMED User Display North Up]
Main Chart Route SAR Nav Elements AIS Light Level Voyage Event! DR! Man Overboard! View Window Help
Nav Route GPS
AIS Info AIS ? AIS Tx AIS Rx
RTCM S57 S57 ? S57 Lists
Targets CPA Ty...
6025 N/A Me...
6025 N/A Me...
6025 N/A Me...
6025 00:00:00 Me...
Target 6025
Time of Tx 14:57
Average Wind Speed 1 kts
Surface Current Speed N/A
Surface Current Direction N/A
Wind Direction 139°
DR
OVERZOOMED
2.2 mph
1.7 mph
1.3 mph
307
Tom Bevill Arrival Point
Tom Bevill Lock
Out In
1:4,000
Silence
Ack
UTC 16:44:13 Could not pan, vessel is in ...
UTC 18:01:32 Could not pan, vessel is in ...
UTC 18:02:44 Could not pan, vessel is in ...

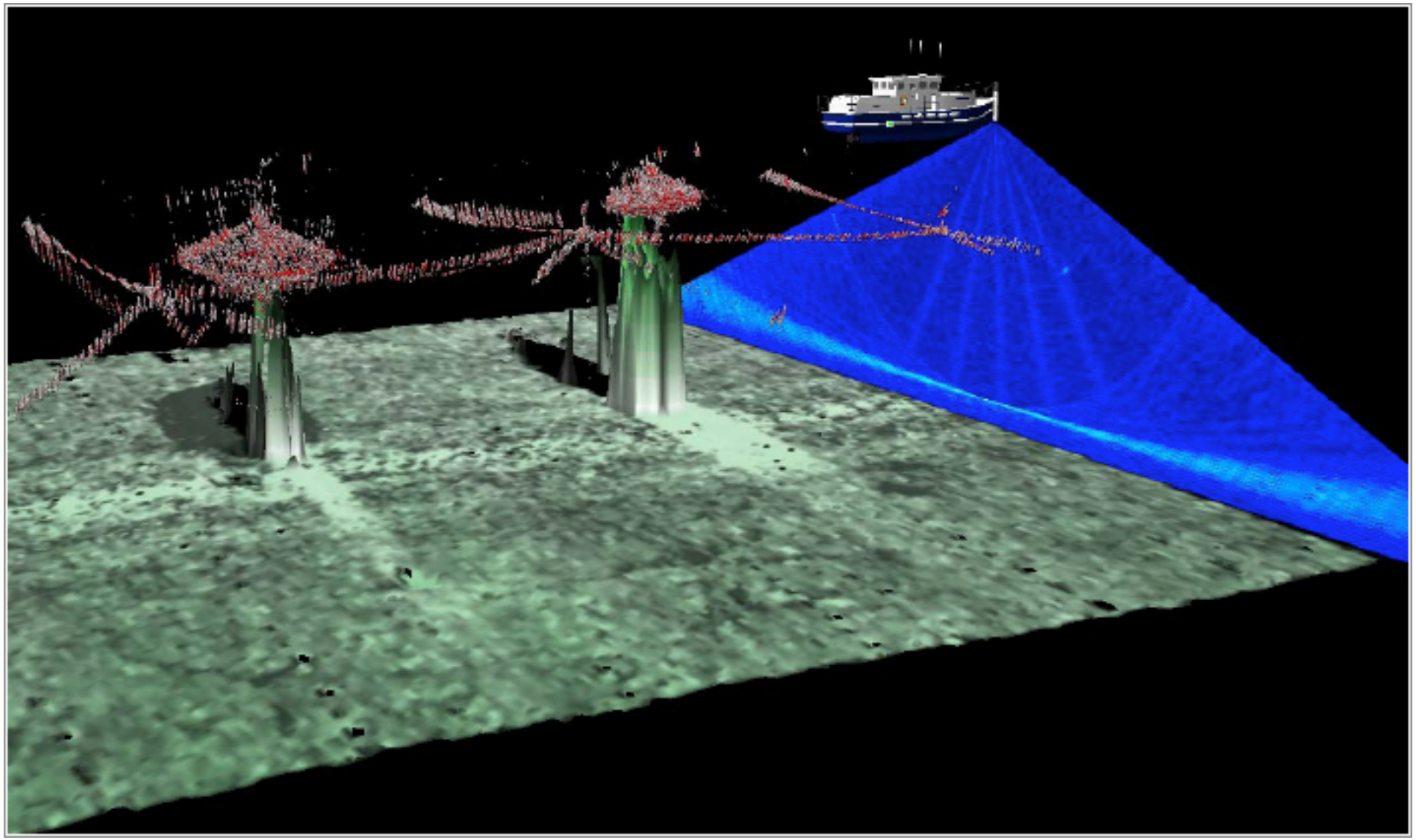

280
330
320
310
300
America Bar Light

Environmental Response Management Tool (ERMA)

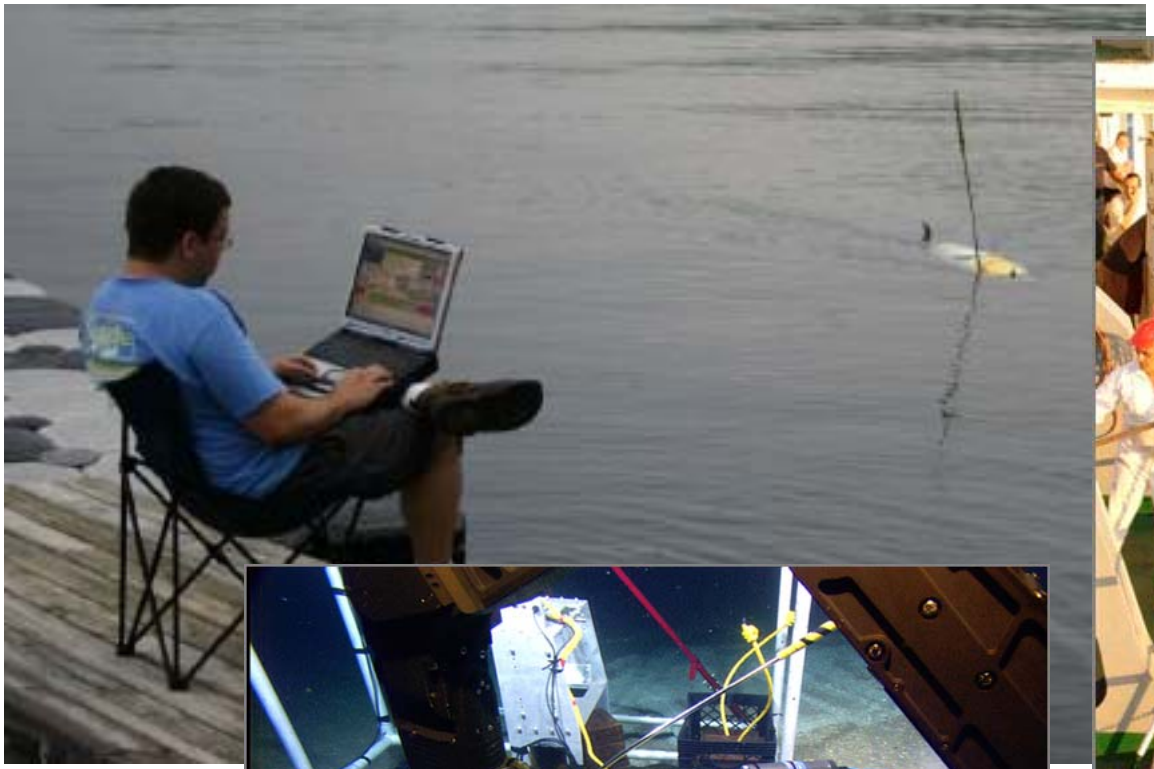


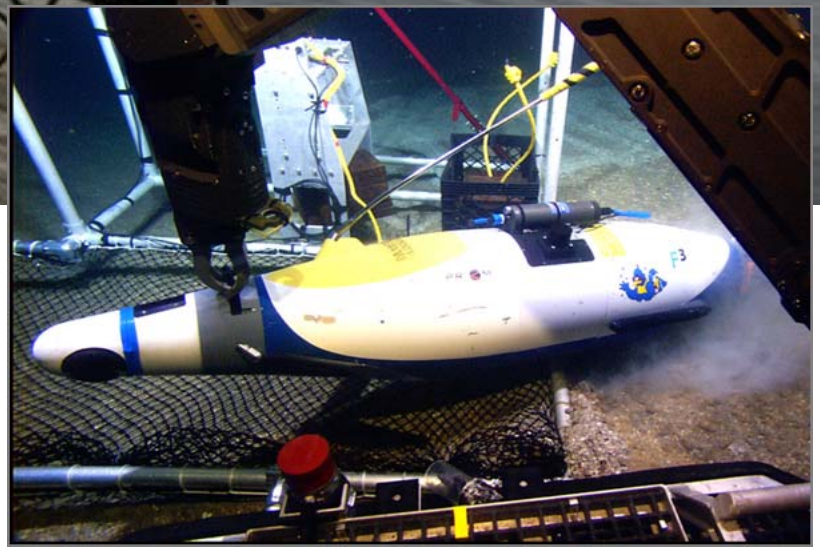
NOAA
University of New Hampshire
Coastal Response Research Center
CCOM JHC
Institute for the Study of Earth, Oceans, and Space
Earth Systems Data Collaborative

Notice to Mariners, Chart Updates, MIO's



Autonomous Underwater Vehicles & Autonomous Surface Vehicles





New Gavia 200 AUV for coastal and ocean mapping efforts

From DOERRI to DORA

Objective:

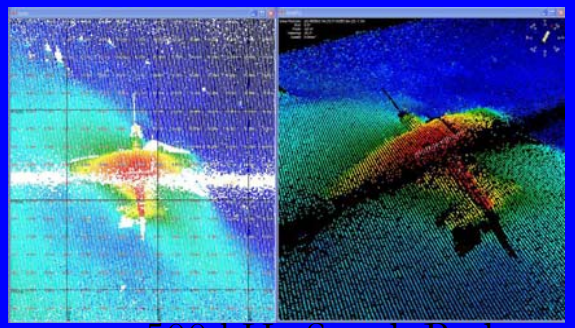
- New replacement vessel for DOERRI:

*Full instrumentation complement
*More reliable, more modular
*Continued development potential

Technical Approach:

- Hafmynd Gavia-200:

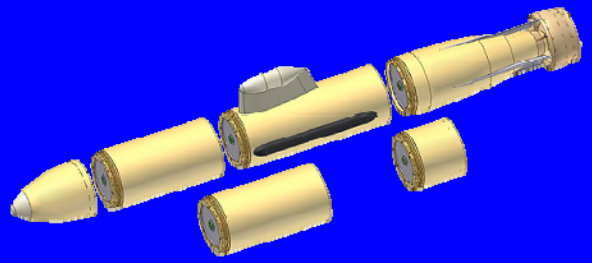
*77 kg; 200 m rating; 8 inch diameter
*Independent navigation system (GPS and DVL-aided INS)
*Wireless surface comms (Iridium & WLAN)
*Dual-frequency (900/1800KHz) side scan sonar
*Swath bathymetry sonar (GeoSwath Geoacoustics)-
*Digital Video Camera with Strobe
*Water Quality- Dissolved Oxygen; Turbidity/Chl-a; Temp/Density
*Modular payloads
*Flexible sofware/hardware systems

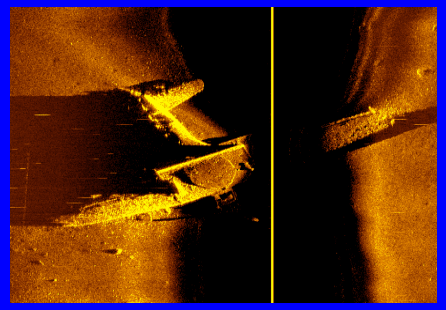


500 kHz Swath Bathy

Status:

- Contract: Awarded in October 2007
- Training January 2008
- Final Delivery April 2008





1800 kHz Side-scan sonar

Thanks for listening

Feedback is critical!

Questions/comments?

Kurt Schwehr
kurt@ccom.unh.edu
http://schwehr.org