Marine Information Overlays (MIOs): Concept and Practice

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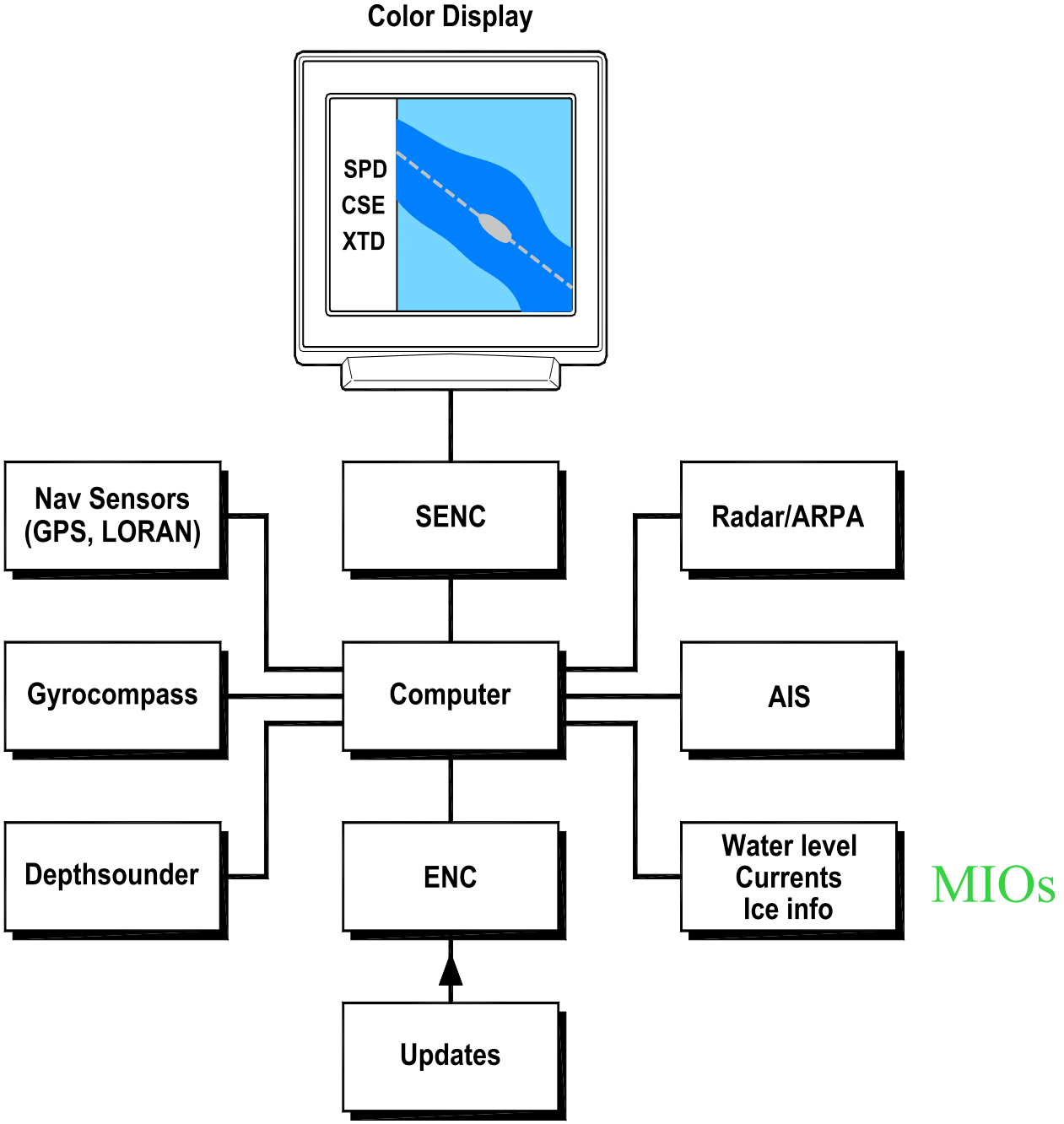
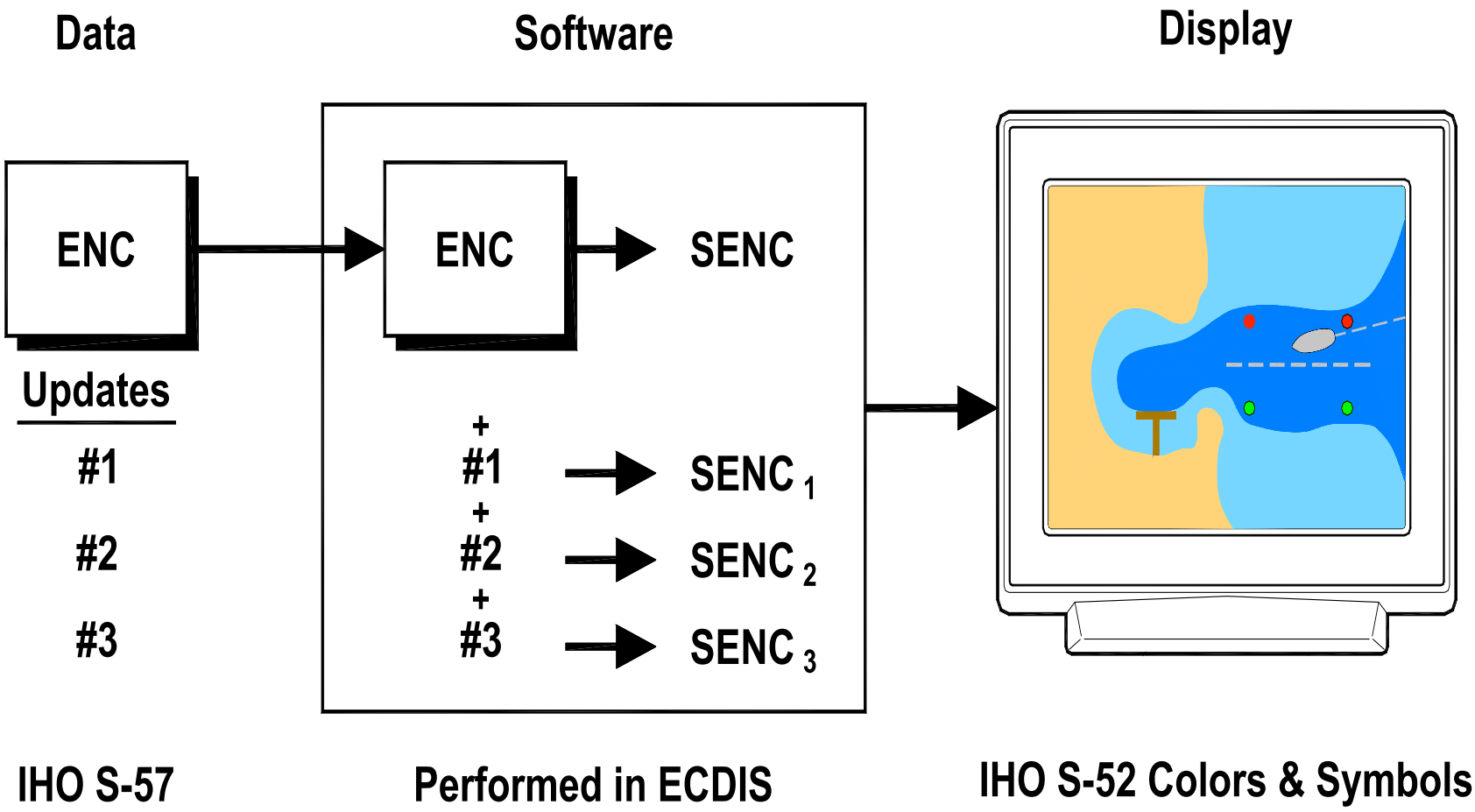
Marine Information Overlays (MIOs)

- Chart and navigation-related information that supplement the minimum information required by IMO ECDIS
  - Supplemental, non-mandatory
  - Not covered by existing standards (e.g., IHO S-57 or IHO S-52)
  - The “everything else”
  - Points, lines, areas, features, objects

ECDIS COMPONENTS




Data
Software
Display
ENC
ENC
SENC
Updates
#1
#2
#3
+
#1
+
#2
+
#3
SENC 1
SENC 2
SENC 3
IHO S-57
Performed in ECDIS
IHO S-52 Colors & Symbols

ECDIS Performance Standards

- ENC Definition:

"*all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart which may be considered necessary for safe navigation.*"

Types of MIOs

Tides / water levels
Ice coverage
Meteorological
Oceanographic
Marine Habitats
Environmental Protection
Archeological
Vessel Traffic Services (VTS)

Display Standards/Specifications

IMO Performance Standards for ECDIS:

1. Chart-related

"IHO recommended colours and symbols (IHO S-52) should be used to display SENC information"

2. Navigation-related

"other navigational information may be added to the ECDIS display. However it should not degrade …and be clearly distinguishable from SENC information."

"the colours and symbols used to describe navigational elements and parameters …are published in IEC 61174"

Chart-related

Colours and Symbols
(IHO S-52, Appendix 2)

Radar/ARPA (IEC 60872)

AIS (IMO NAV Circ/217)

Terms, abbrev & symbols (ISO/DIS 19018)

Being Developed:

Navigation Display (IEC 62288, Annex B)

VTS-related (IALA VTS Committee)

Chart-related

ECDIS (IEC 61174, Annex E)

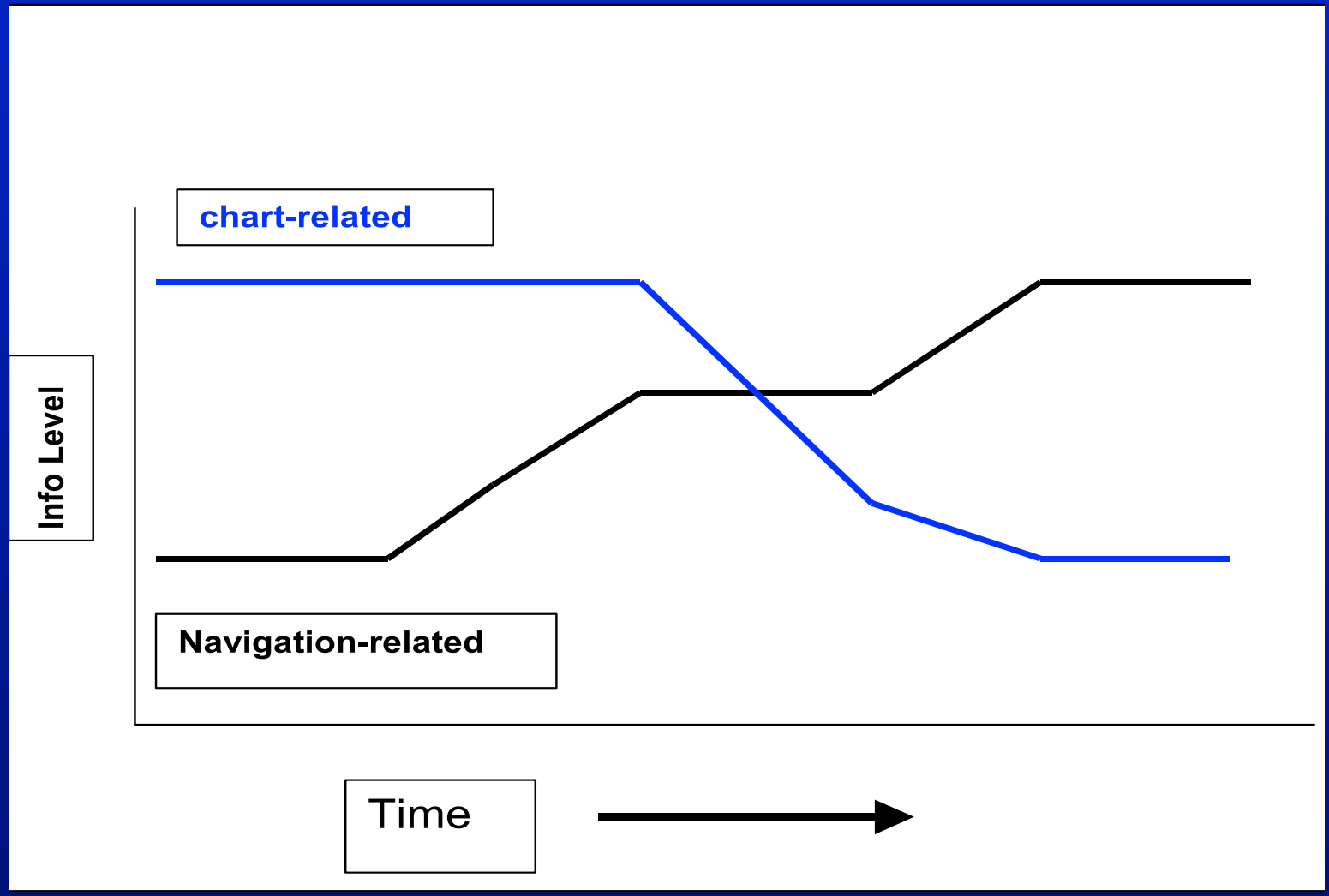
Navigation-related

Radar (IEC 60936, Annex E)

IHO ← **Harmonization Group on MIO** → **IEC**

ice coverage
tides/water levels
currents
oceanographic
weather
search and rescue
marine mammals/critical habitats

Trend for Information Display for Shipboard Navigation Systems



IHO – IEC HGMIO

- Harmonization Group on Marine Information Objects
- Subsidiary of Two Committees:

  IHO CHRIS

  TSMAD (S-57 objects/attributes, ENC Prod Spec)

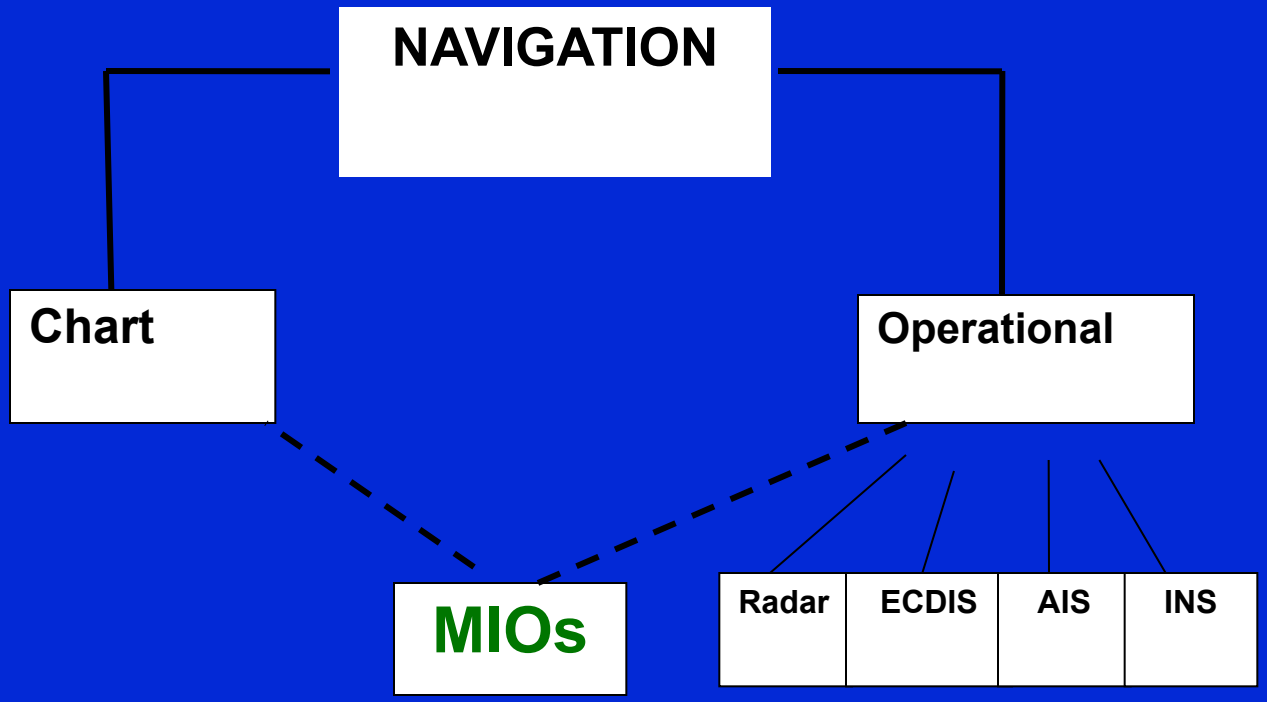
  C&SMWG (Colours and Symbols)

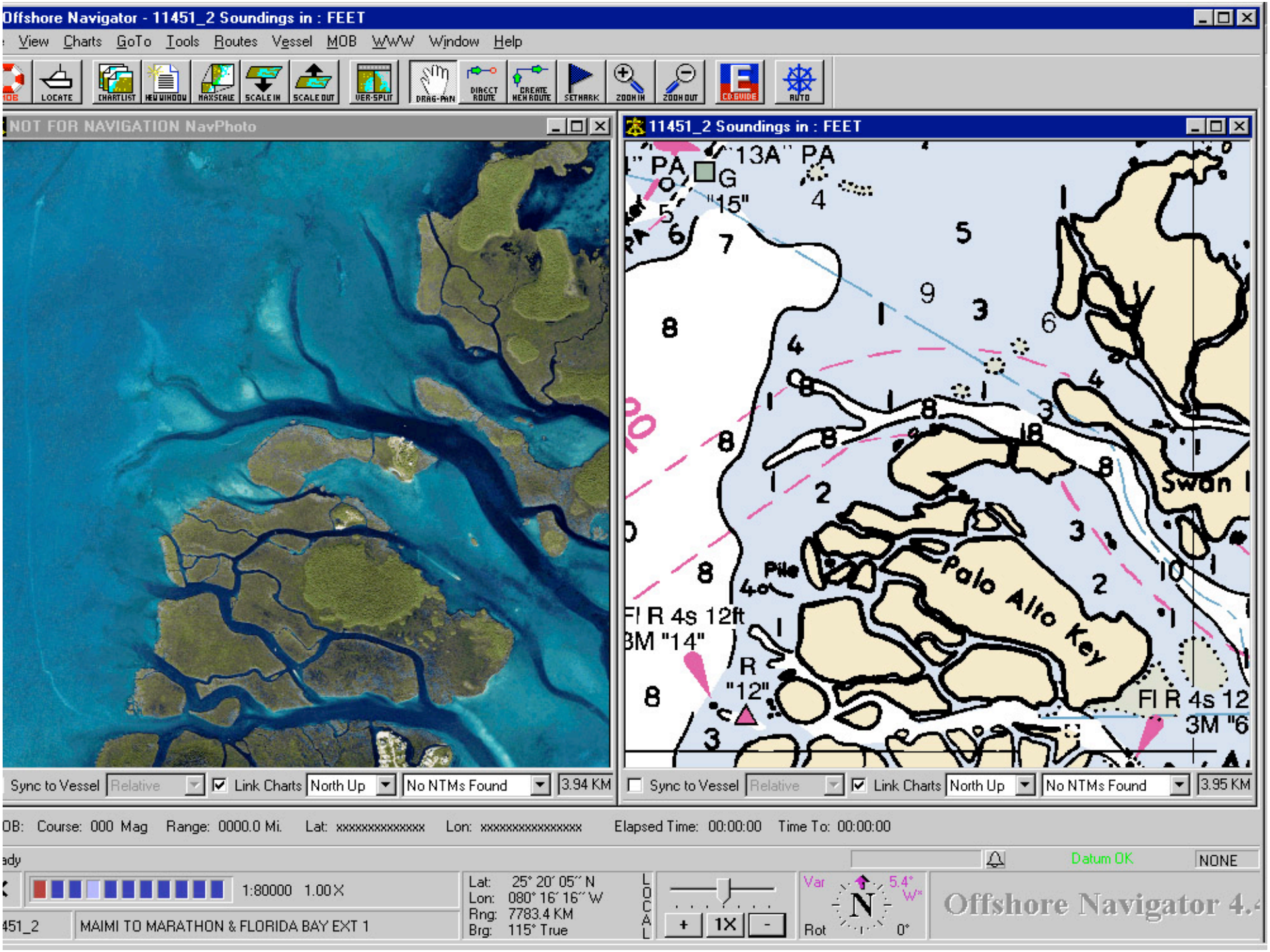
  IEC TC80

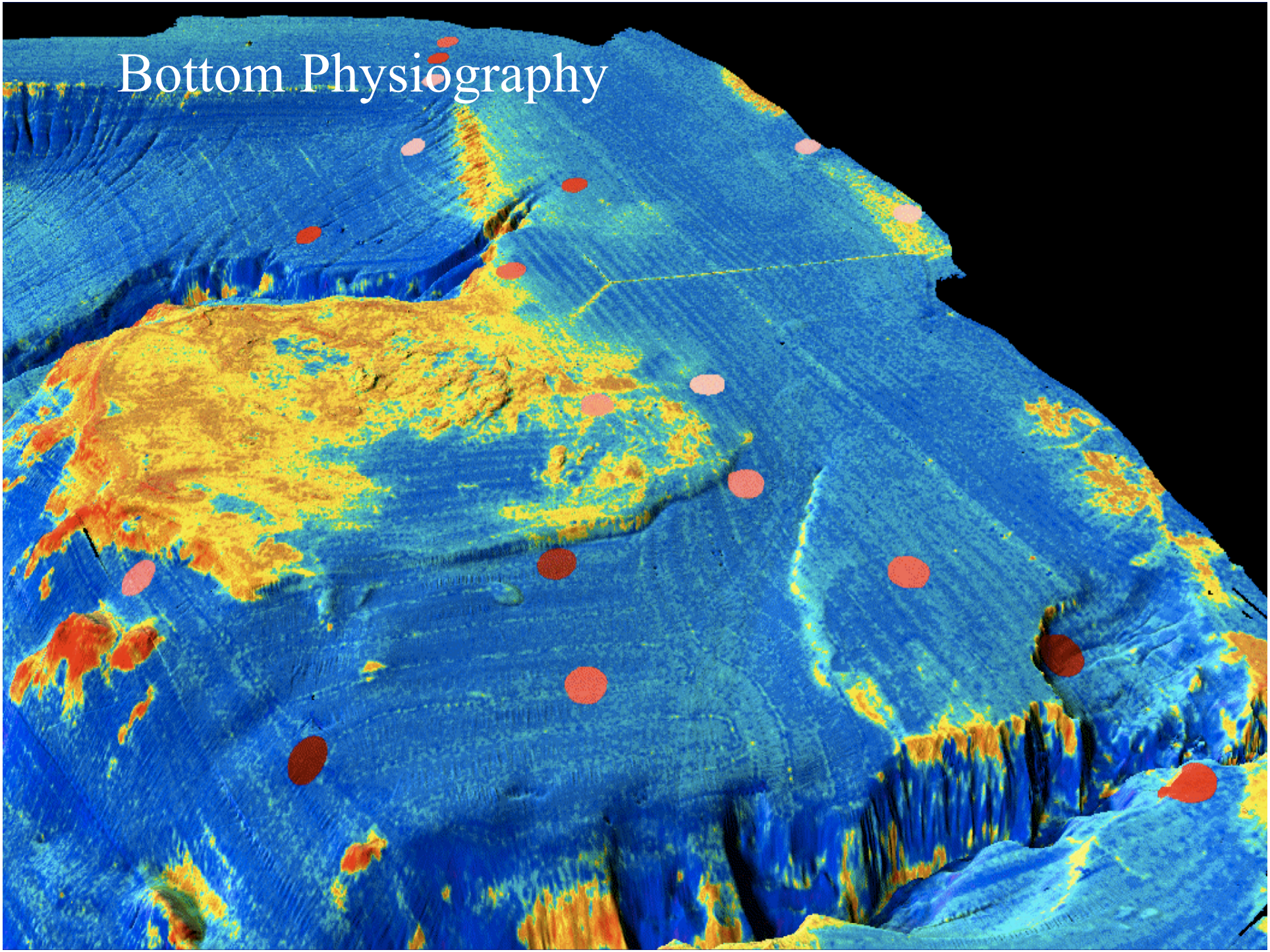
  WG7 (ECDIS)

  WG13 (Navigation Display)

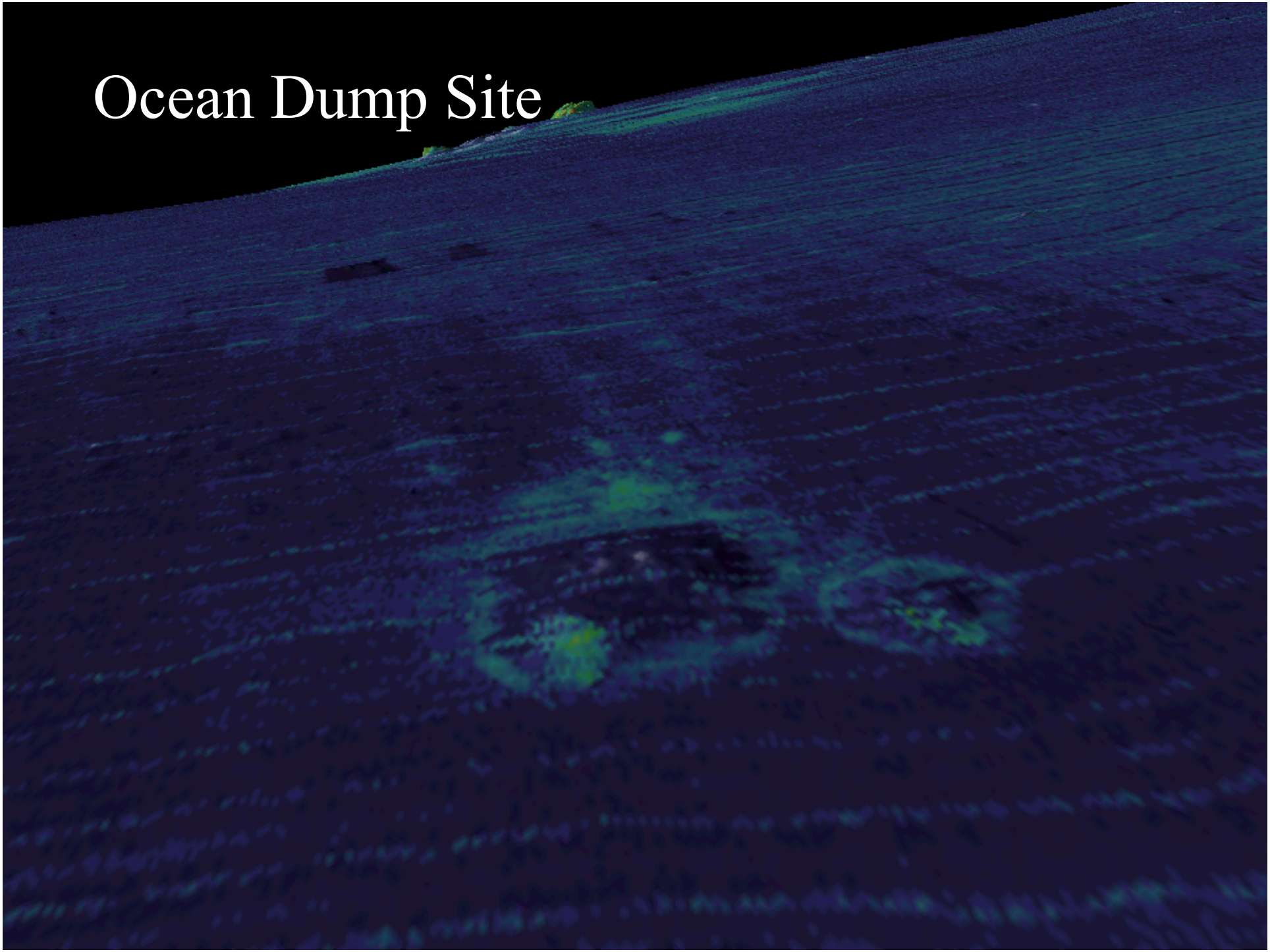
Relationship of MIOs to Navigation-related Information




Offshore Navigator - 11451_2 Soundings in : FEET
View Charts GoTo Tools Routes Vessel MOB WWW Window Help
LOCATE
CHARTLIST
NEW WINDOW
MAXSCALE
SCALE IN
SCALE OUT
VER-SPLIT
DRAG-PAN
DIRECT ROUTE
CREATE NEW ROUTE
SETMARK
ZOOM IN
ZOOM OUT
C-MAP GUIDE
AUTO
NOT FOR NAVIGATION NavPhoto
11451_2 Soundings in : FEET
13A
PA
"15"
"12"
Fl R 4s 12ft
3M "14"
Fl R 4s 12
3M "6
Palo Alto Key
Swan I
Pile
Sync to Vessel
Relative
Link Charts
North Up
No NTMs Found
3.94 KM
3.95 KM
OB: Course: 000 Mag Range: 0000.0 Mi. Lat: xxxxxxxxxxxxx Lon: xxxxxxxxxxxxxx Elapsed Time: 00:00:00 Time To: 00:00:00
Datum OK
NONE
1:80000 1.00X
Lat: 25° 20' 05" N
Lon: 080° 16' 16" W
Rng: 7783.4 KM
Brg: 115° True
LOCAL
+ 1X -
Var 5.4° W
Rot 0°
451_2
MAIMI TO MARATHON & FLORIDA BAY EXT 1
Offshore Navigator 4.

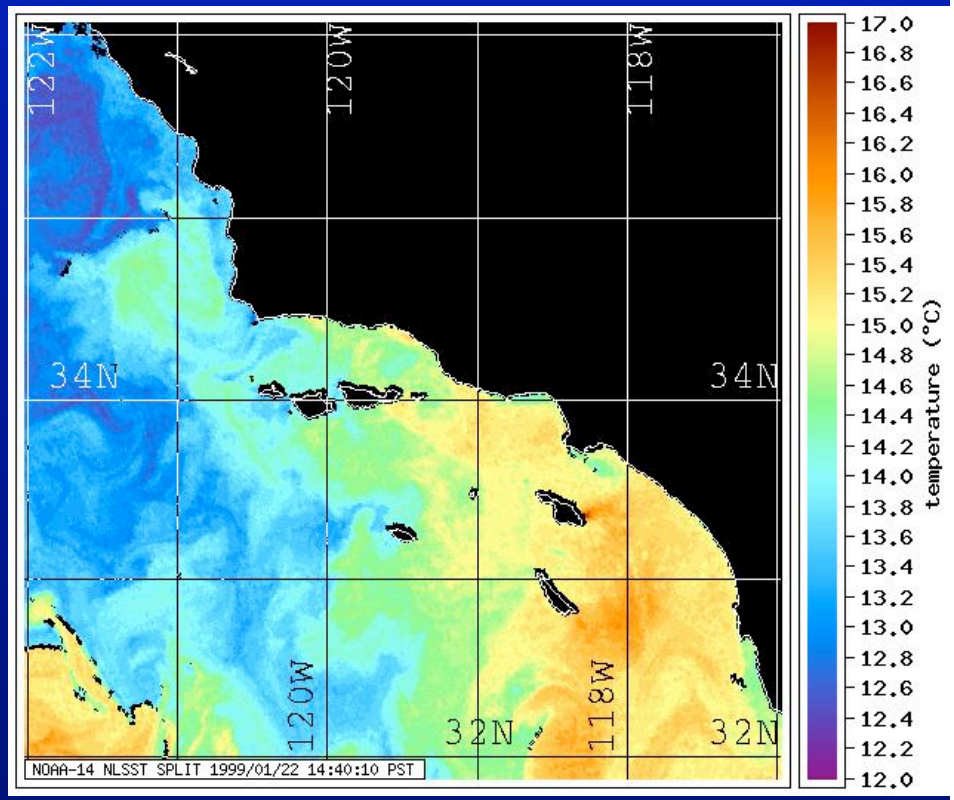

Bottom Physiography

Ocean Dump Site



Sea Surface Temperature

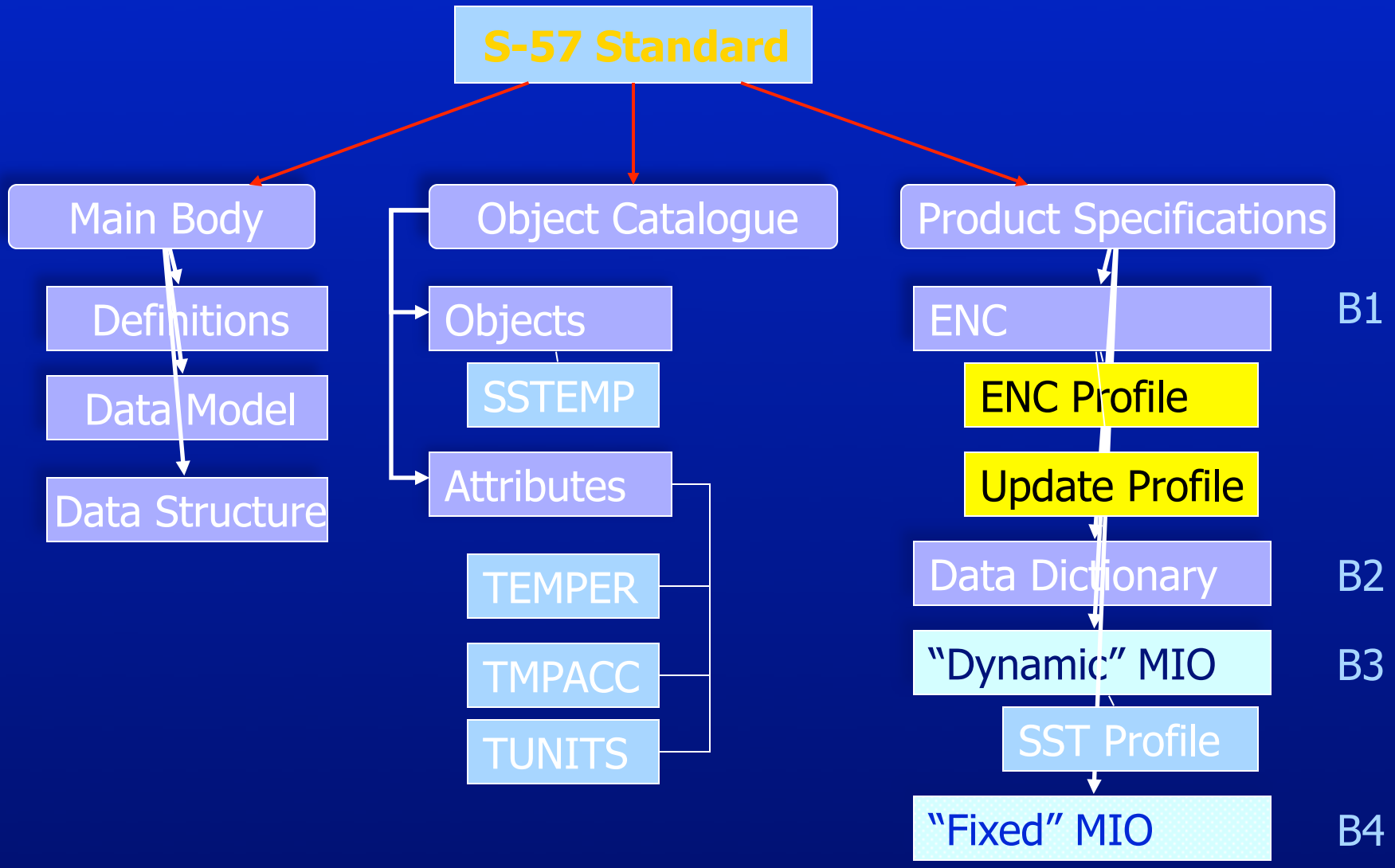
- Search and Rescue
- Fishing
- Scientific Cruises
- Ice accretion

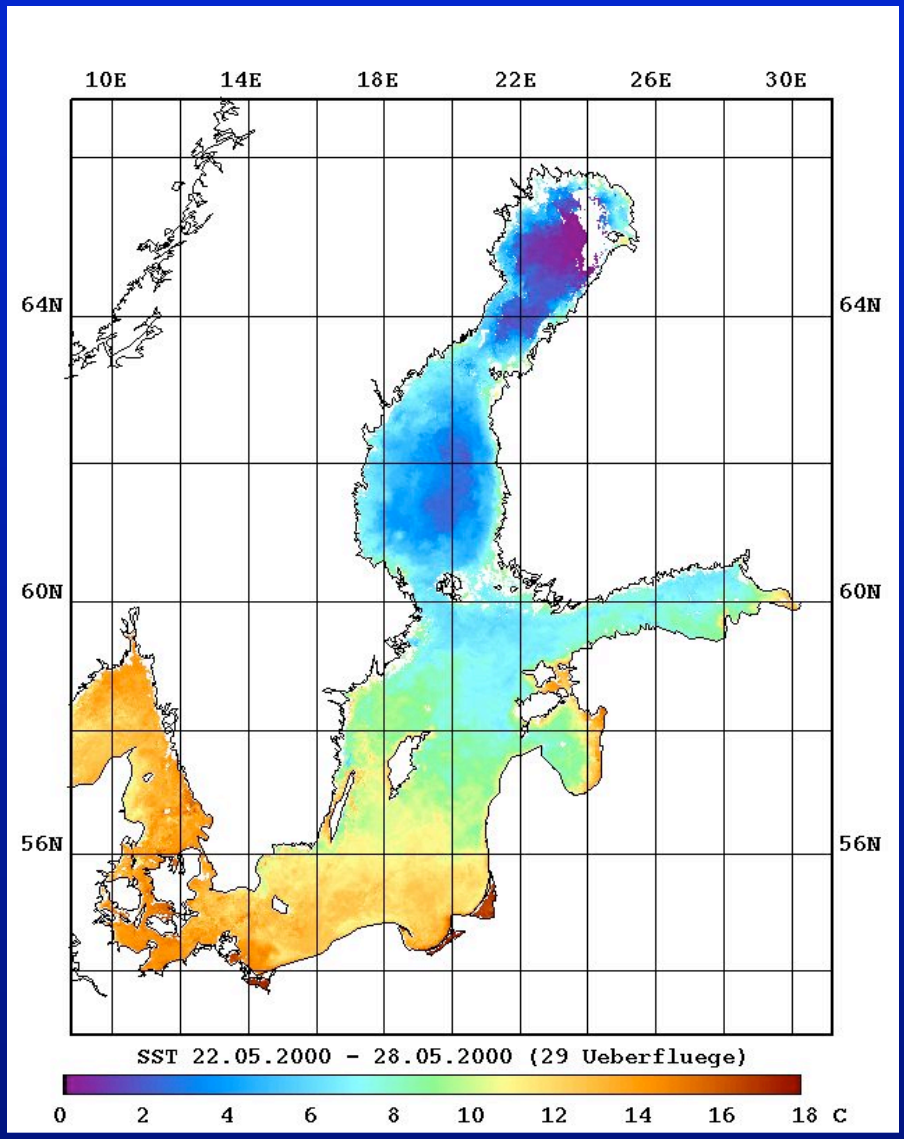


SST Profile

- Objects:
  - SSTEMP (point, line or polygon)
- Attributes:
  - TMPACC – Temperature accuracy
  - TEMPER – Temperature value

Possible Additions to S-100

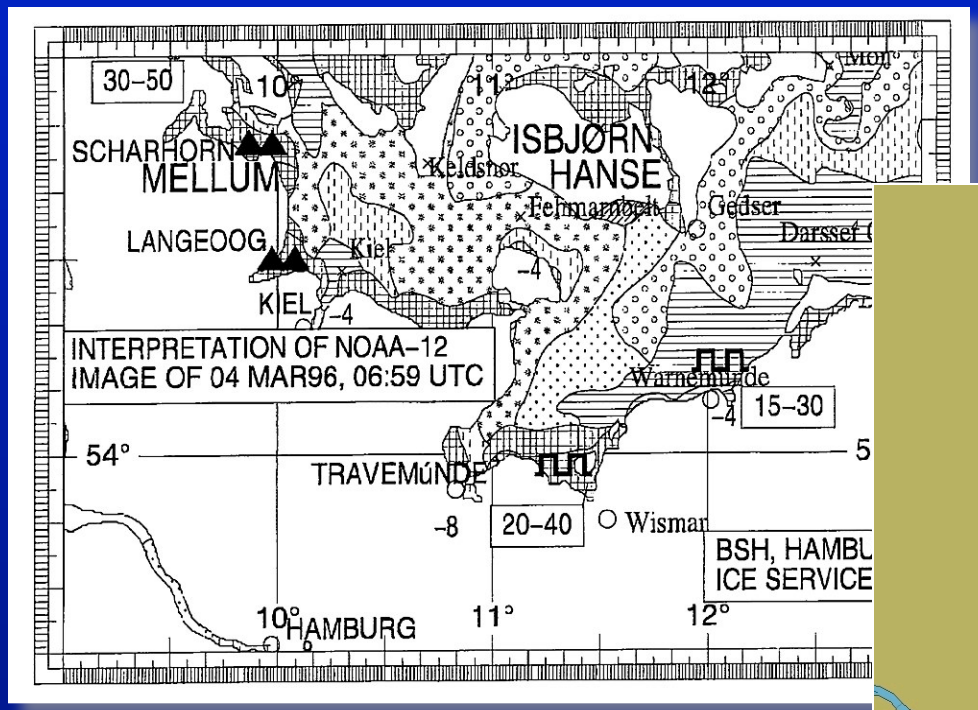




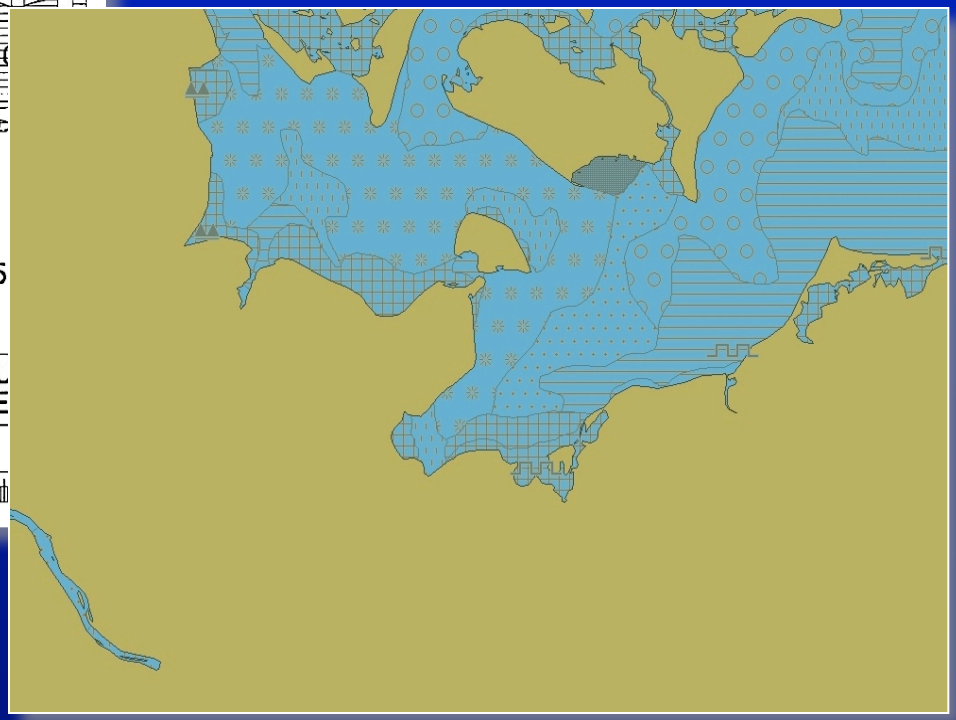
Temperature and ice chart from NOAA Source Data

Traditional Ice Chart versus ECDIS Presentation

Icebreaker Chart



Source: German Ice Service



Corresponding ECDIS presentation

Ice Object Classes

Description	Token
Iceberg	ICEBRG
Ice Drift	ICEDRF
Ice Dynamics	ICEDYN
Floeberg	ICEFLO
Ice Line	ICELIN
Land Ice	ICELND
Ice Openings	ICEOPN
Ice Ridge	ICERDG
Ice Route	ICERTE
Sea Ice	ICESEA
Ice Topography	ICETOP

plus 24 ice attributes

Description	Token
Iceberg Shape	ICEBSH
Coverage Type	ICECVT
Floe Size	ICEFSZ
Stage of Melt	ICEMLT
Snow Cover	ICESCV
Sea Ice Stage of dev.	ICESOD
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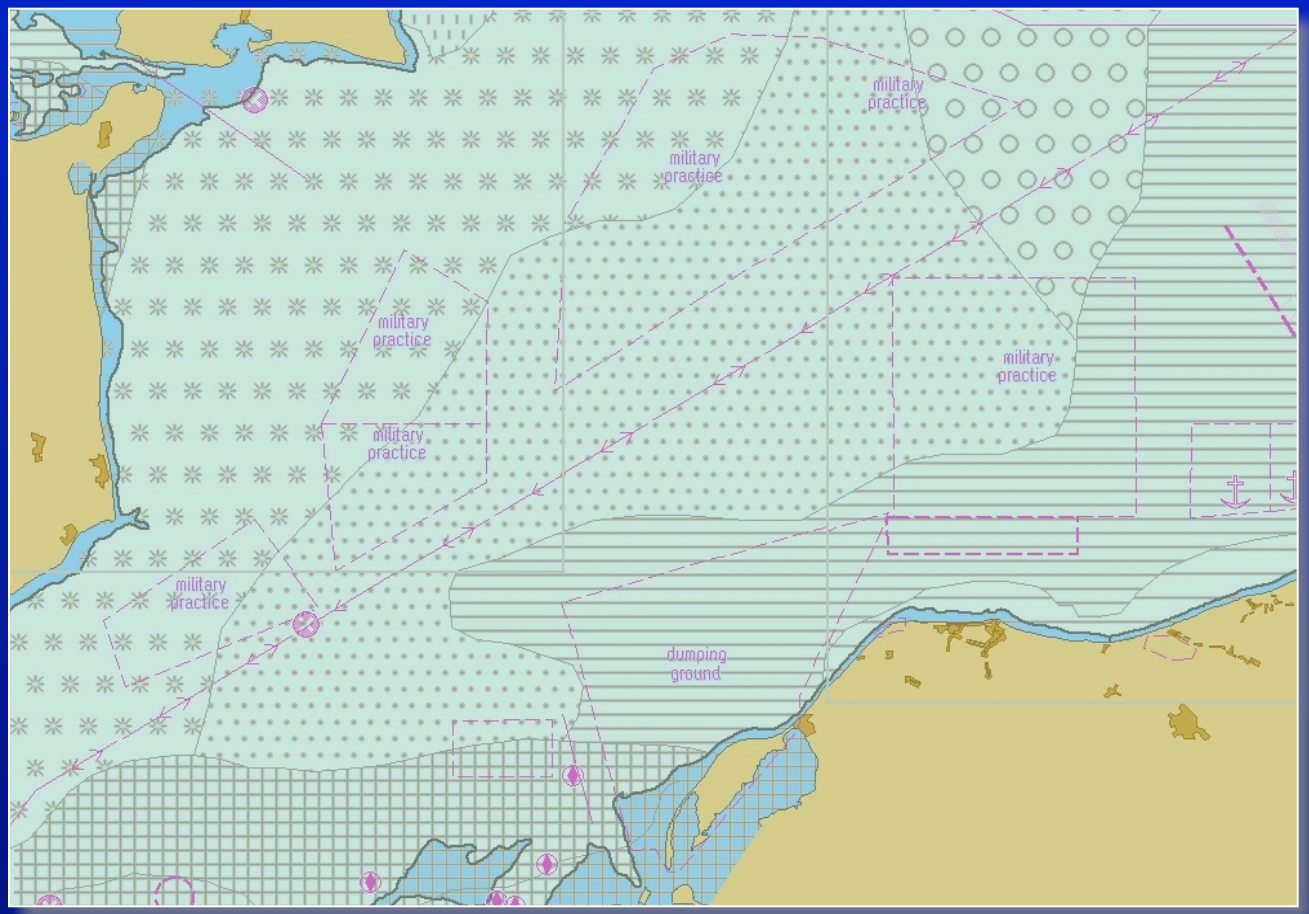
.	.
.	.

Example for presentation in ECDIS



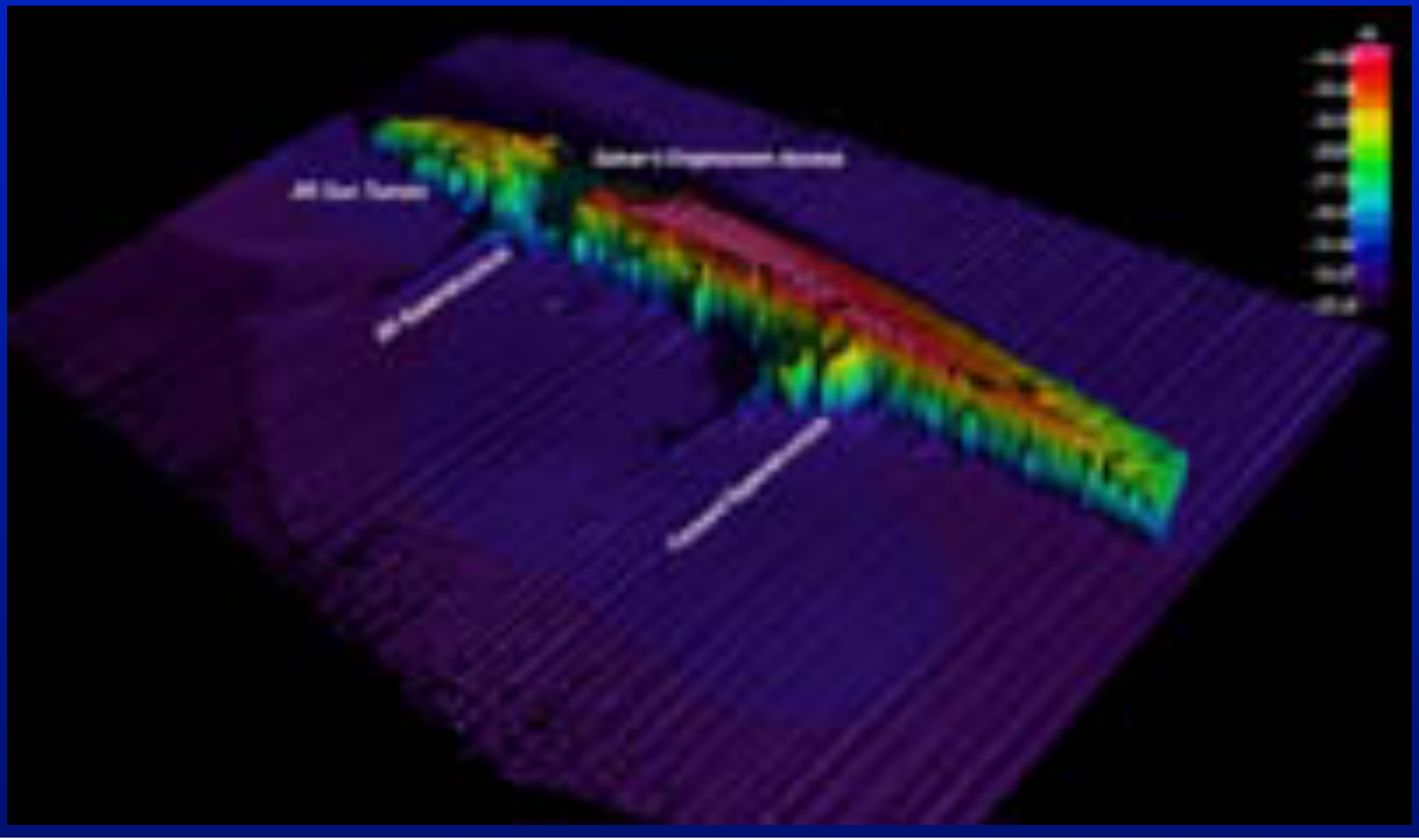
detailed base chart with ice overlay

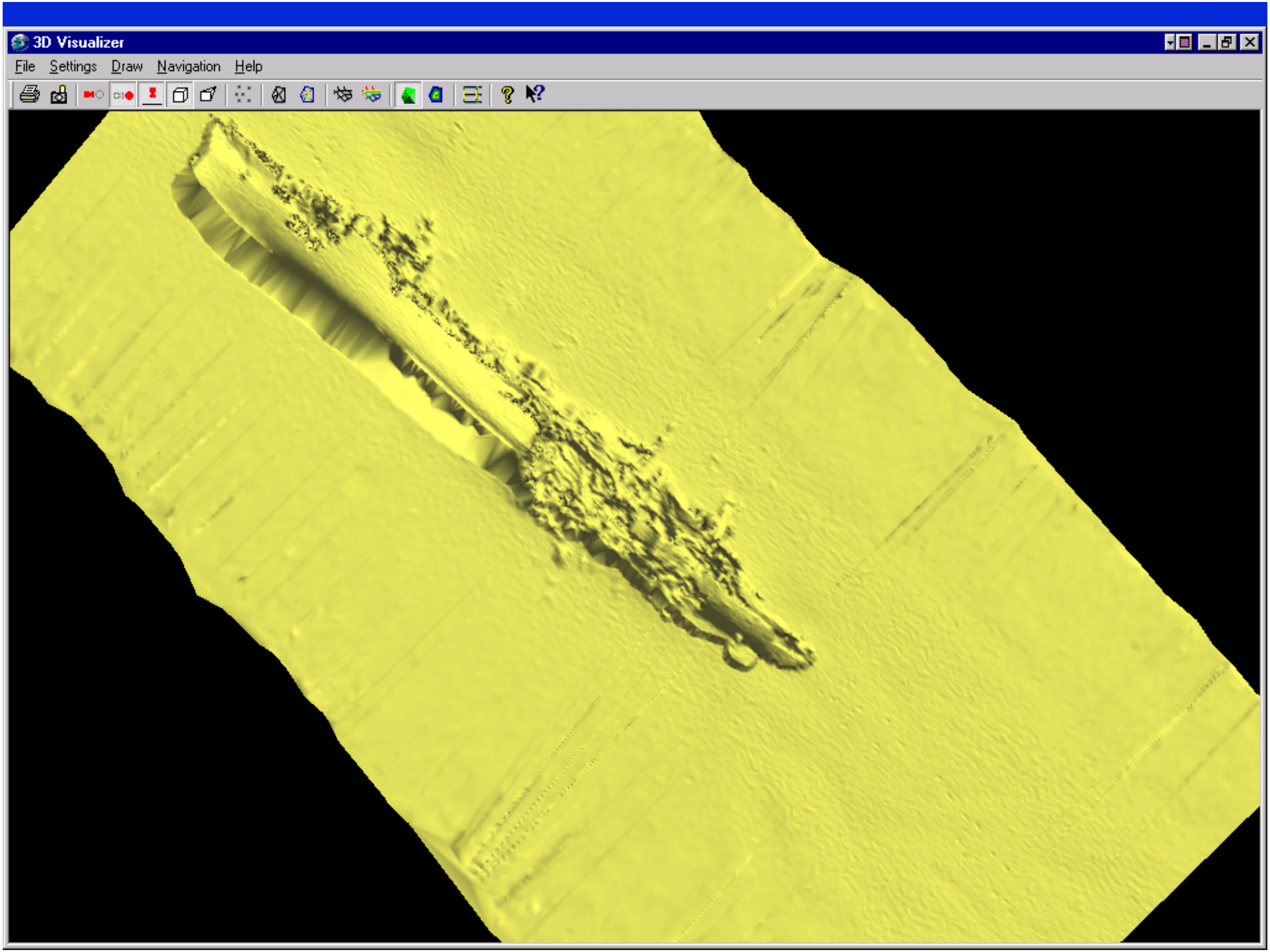
Displaying Ice Information on ECDIS

- similar to traditional ice charts
- can be displayed together with nautical chart data
- shown as overlay or integration of ice objects within base display
- the display is generated in ECDIS application
- depends on attribute combinations (special lookup tables)
- not all attribute values result in symbolization
- attributes that are not symbolized can be withdrawn via pick report
- conditional symbology procedure for ice thickness
- use typical ECDIS display features (night display, SCAMIN, conditional symbology)

Marine Archeology

Scapa Flow Project, Scotland




3D Visualizer
File
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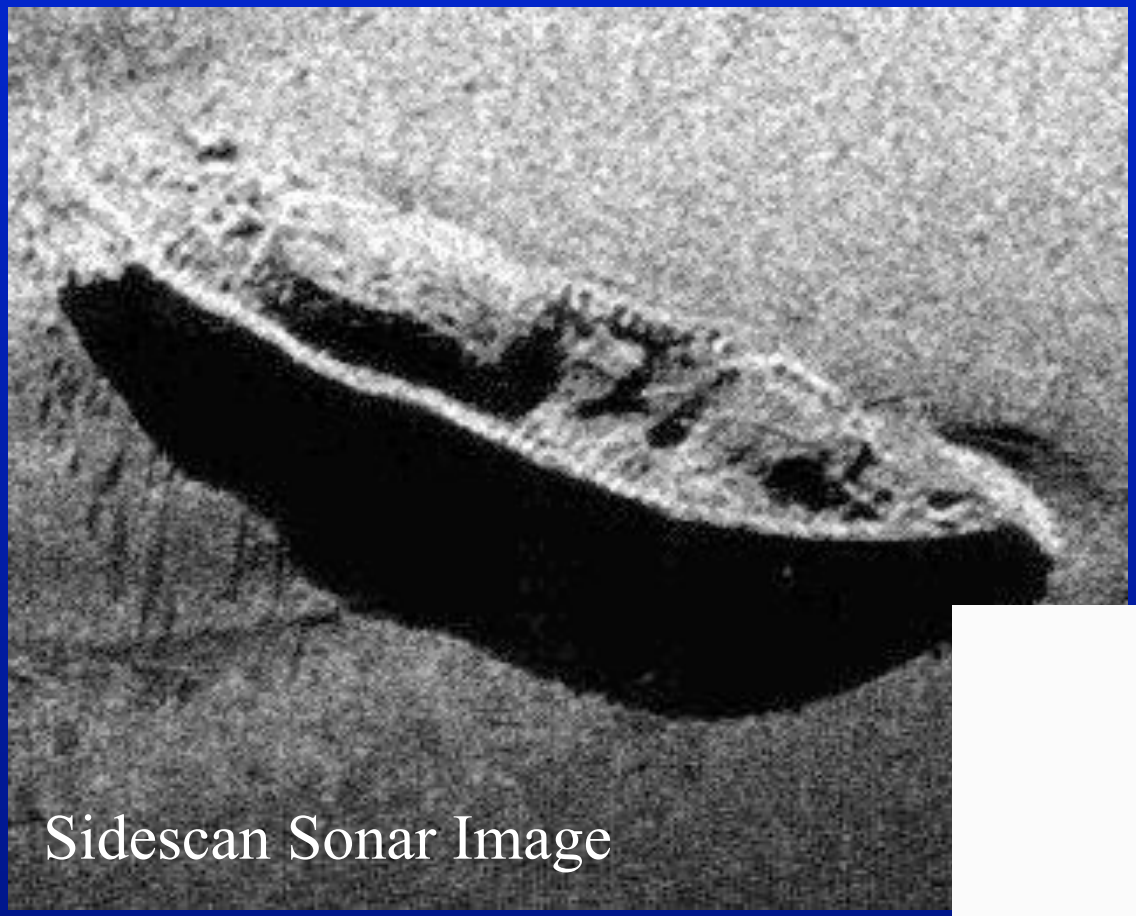
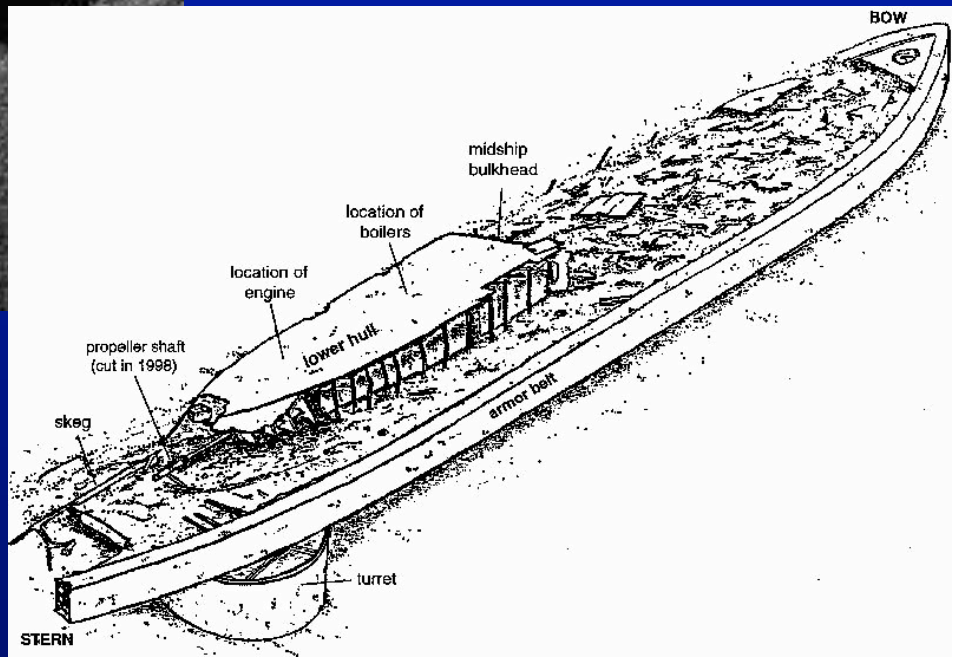
Help

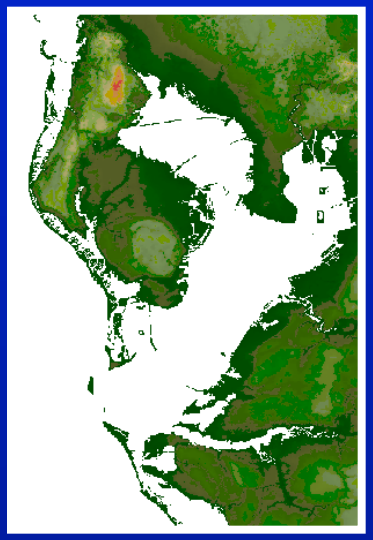
USS MONITOR



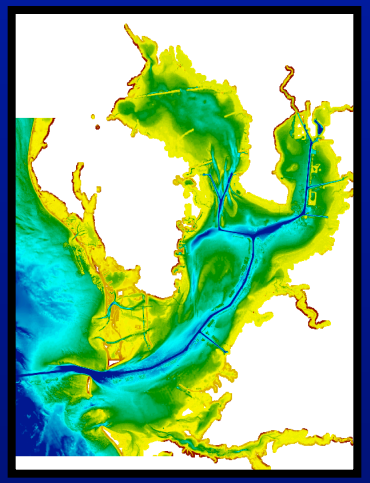
Sidescan Sonar Image



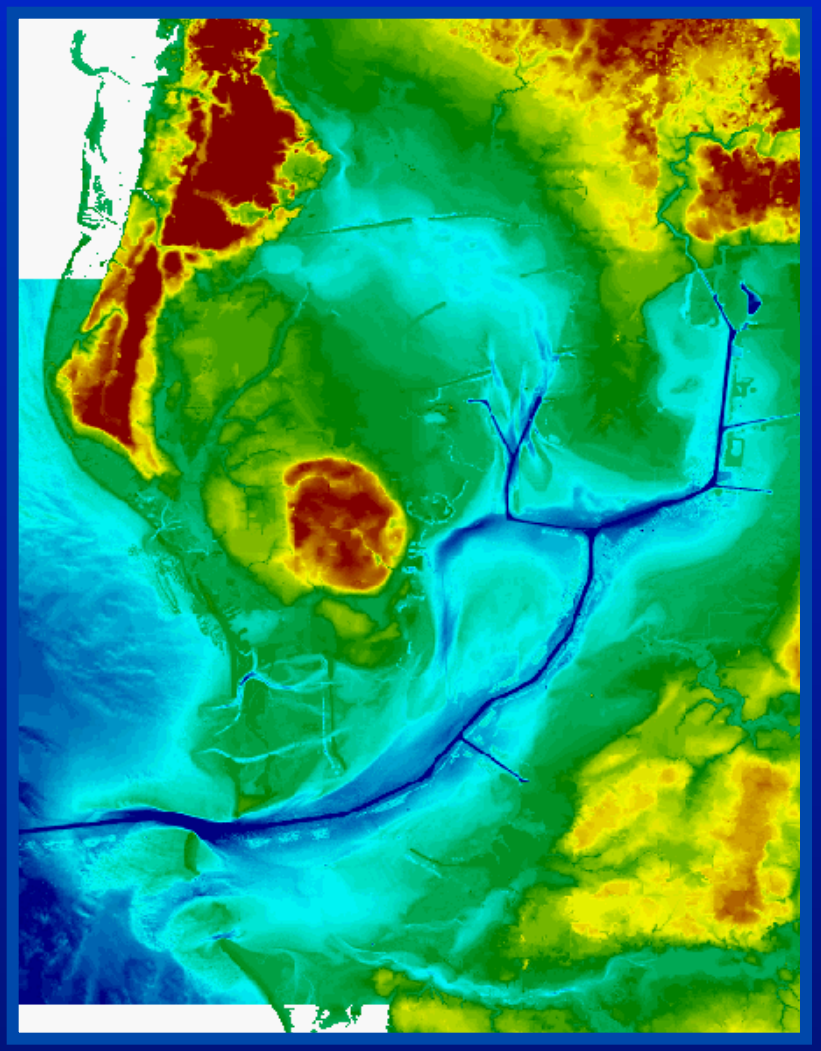
Integrated Topo-Bathy Database



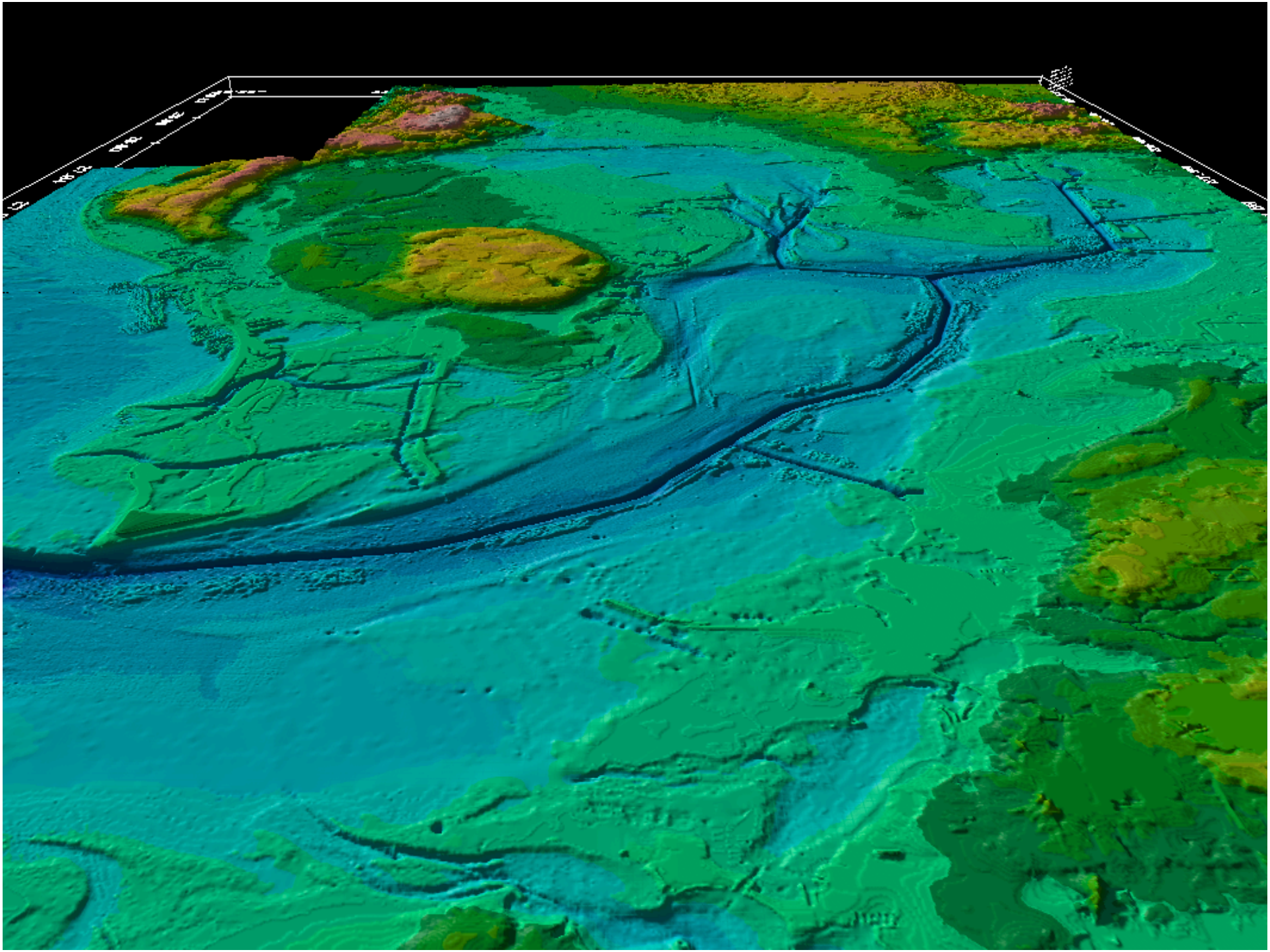
USGS Topography

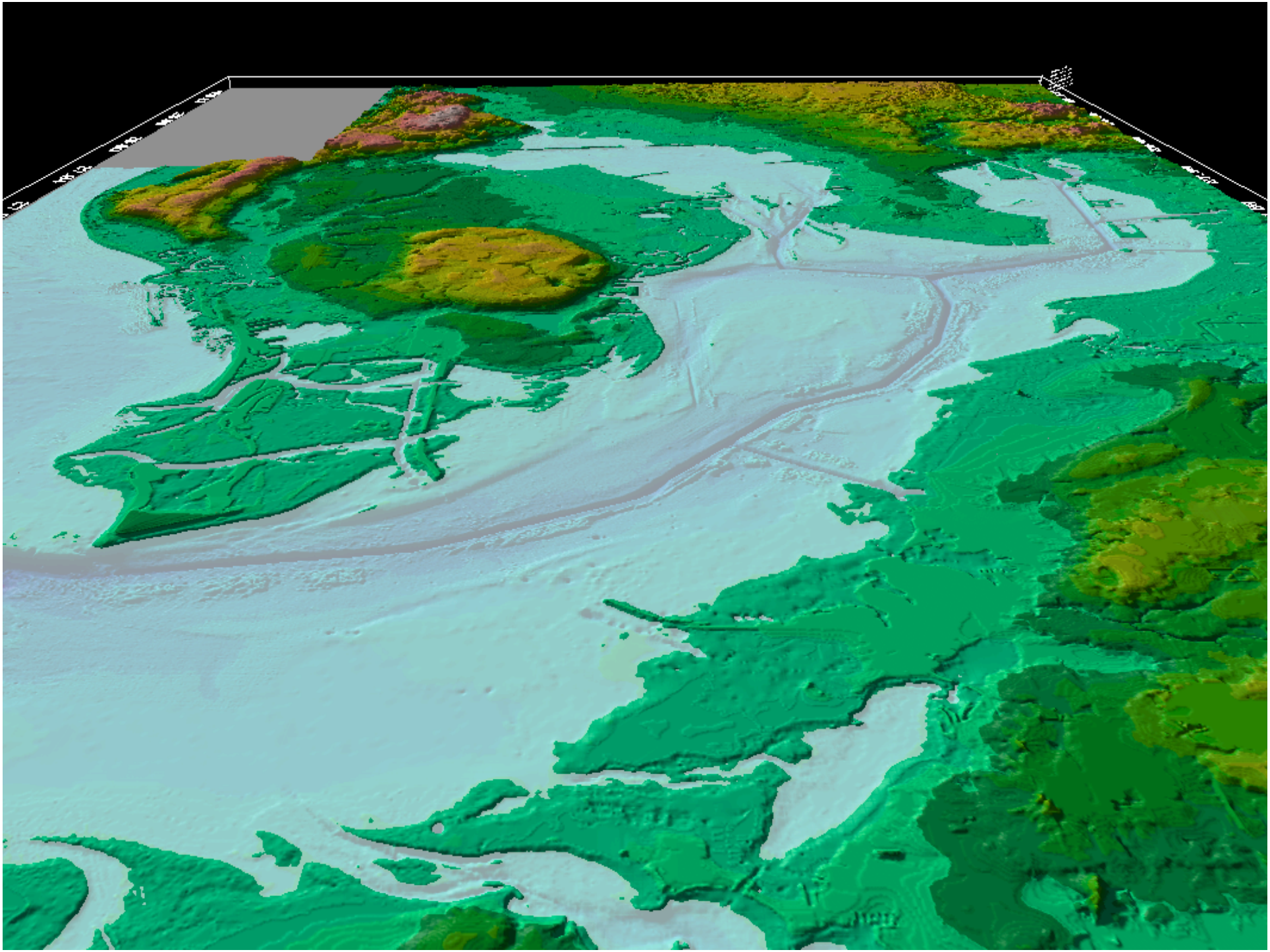


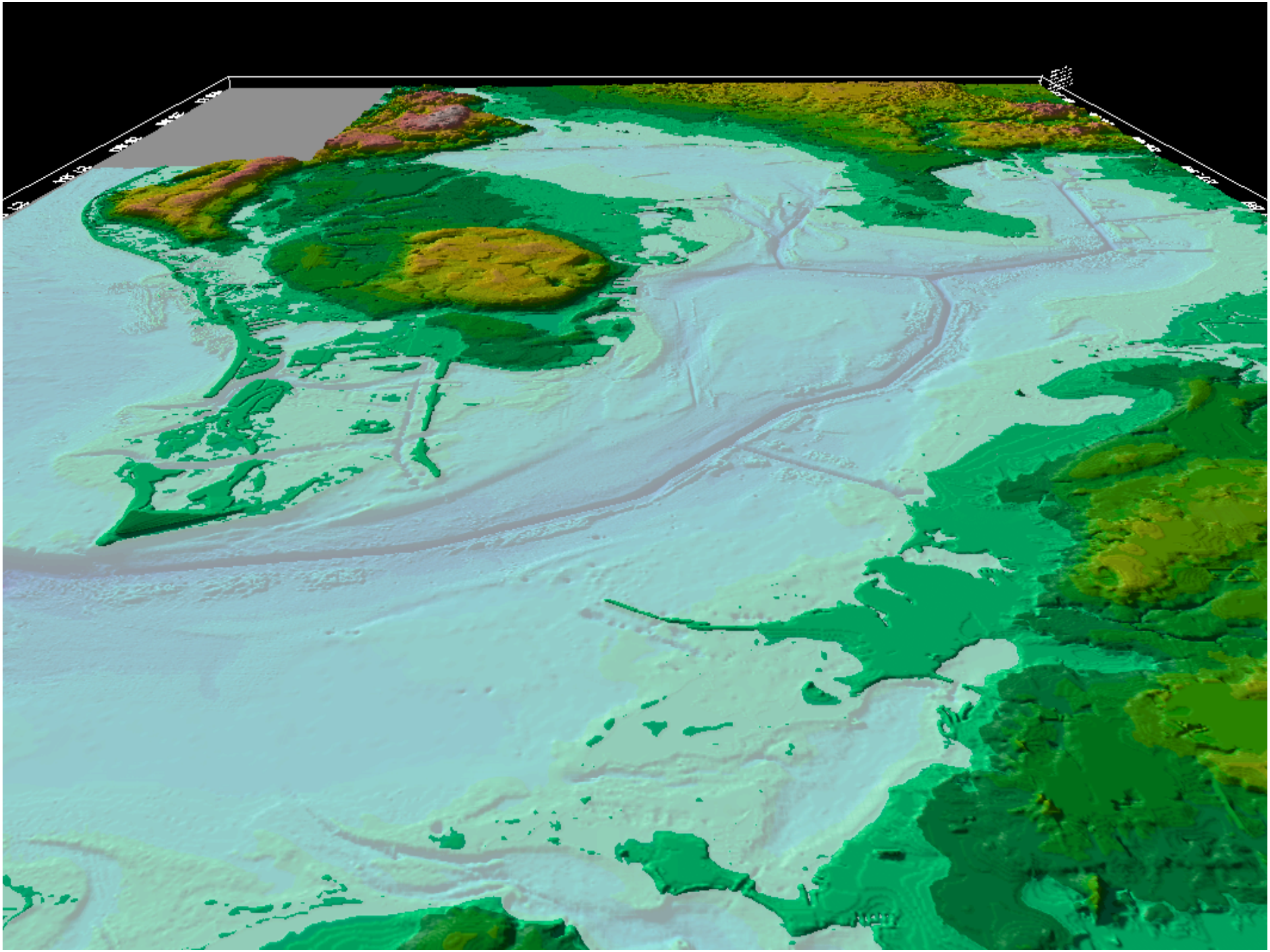
NOAA Bathymetry

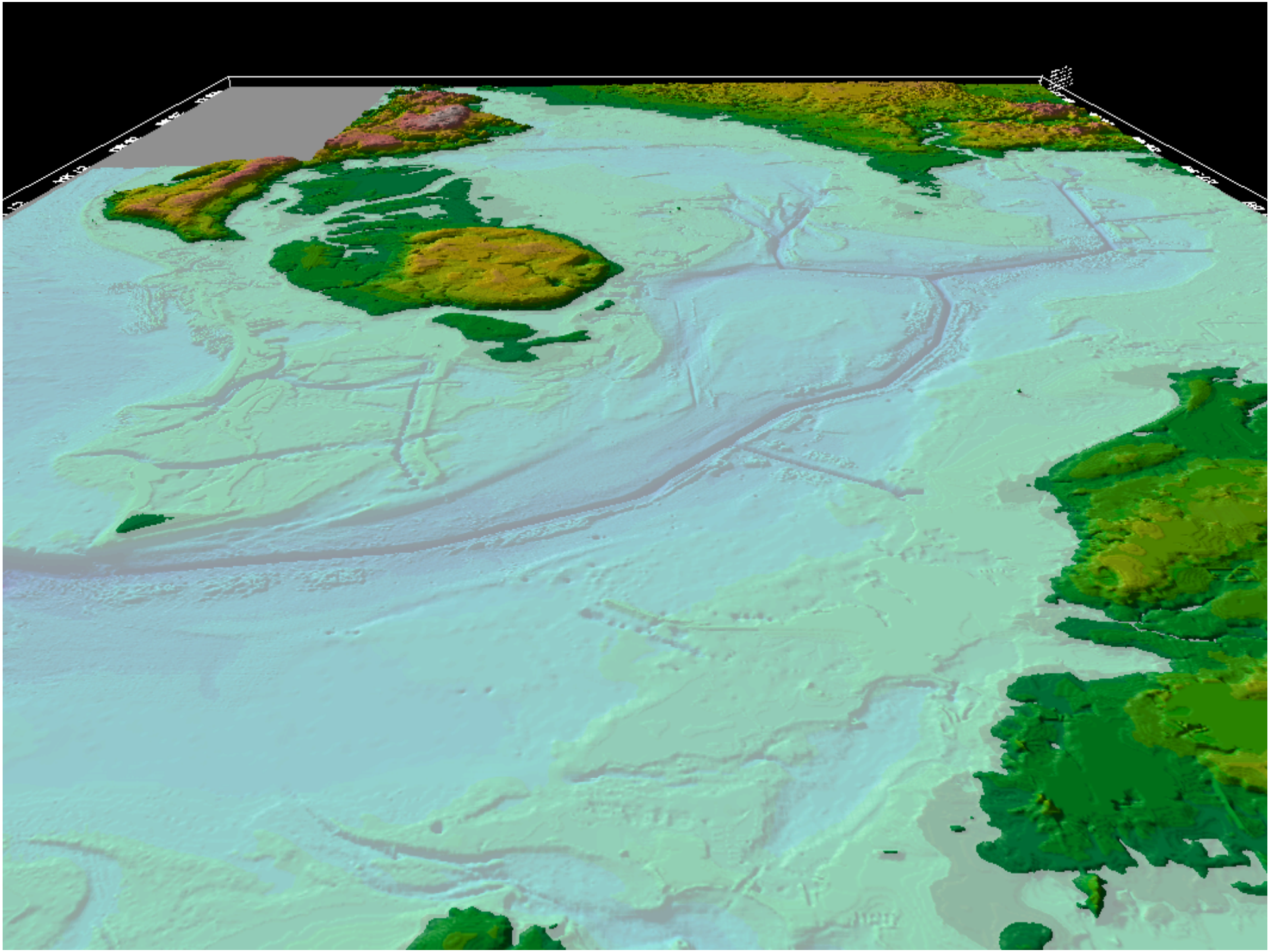


Integrated Topo-Bathy Model

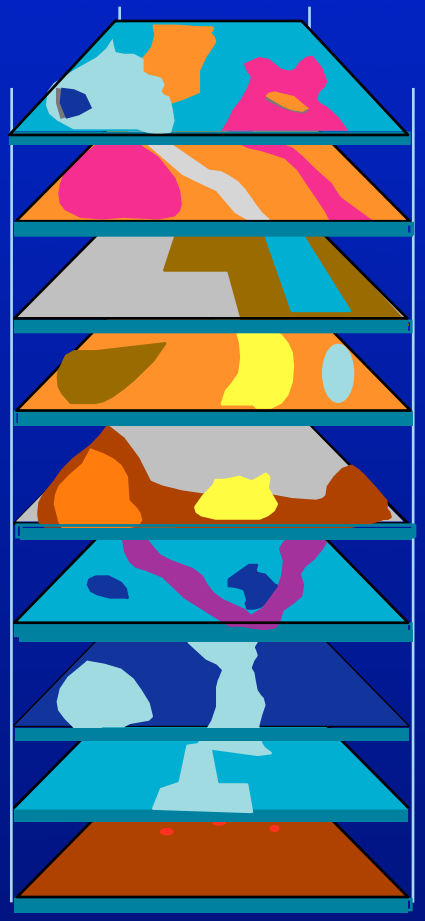








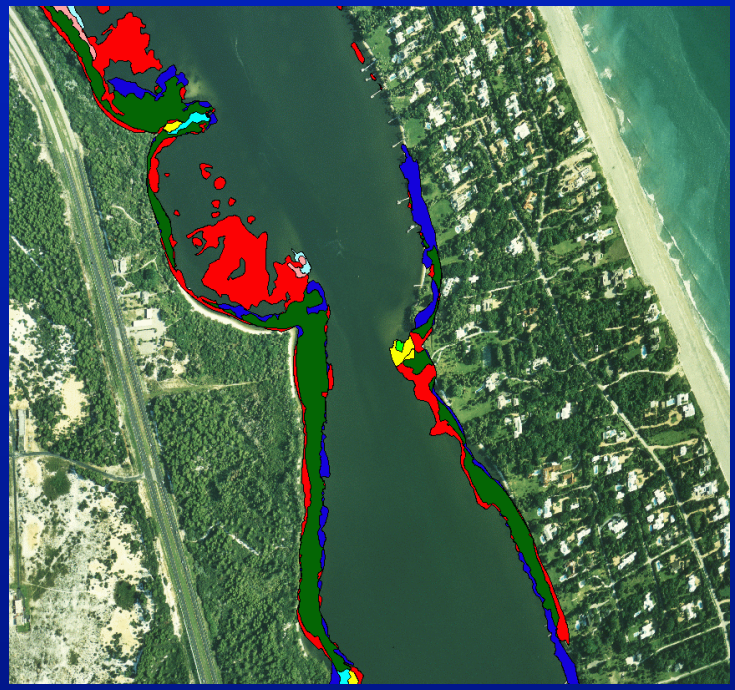
Foundation Data Layers for Marine GIS



- Shoreline
- Bathymetry
- Cadastral (boundary)
- Environmental Sensitivity Index
- Habitat and species location
- Benthic mapping (seagrass, corals, …)
- Ports and vessel traffic
- Geo-regulations

GIS in the Coastal Community

- Use of GIS is a basic skill in coastal management community.
- GIS used primarily for general or project specific mapping.



Seagrass gains (blue) and losses (red) from 1988-1996, Hobe Sound, FL

Planned / Future Efforts

MIOs → new S-57 Overlays?

- Participation in IHO TSMAD Ed.4 Sub WG
- Next Generation S-57 Open Development Forum

<u>Task Groups</u>

Time-varying & 3-D data

Bathymetric data Product Specification

Data Portrayal

Additional S-57 objects (?)

Static

Bathymetric (incl grid data)

Geophysical data (seismic, gravity, magnetic)

Bottom structure/physiography

Archeological (wrecks, heritage sites)

Satellite imagery

Aerial photography

Dynamic

Tides (predicted, real-time, forecast)

Current flow (speed, direction, time of occurrence)

Meteorological (wind speed/direction)

Three Rules on Information*

Rule #1 – What you need, you can't get.

Rule #2 – When you get it, you are unable to use it.

Rule #3 – When you can finally use it, it's now out of date.

* military intelligence, tax advice from IRS, MIOs, and AMLs.

Benefits of Informed Decision Making

- Under-keel clearance

  accurate gages + prediction models = "good" w/ l forecast

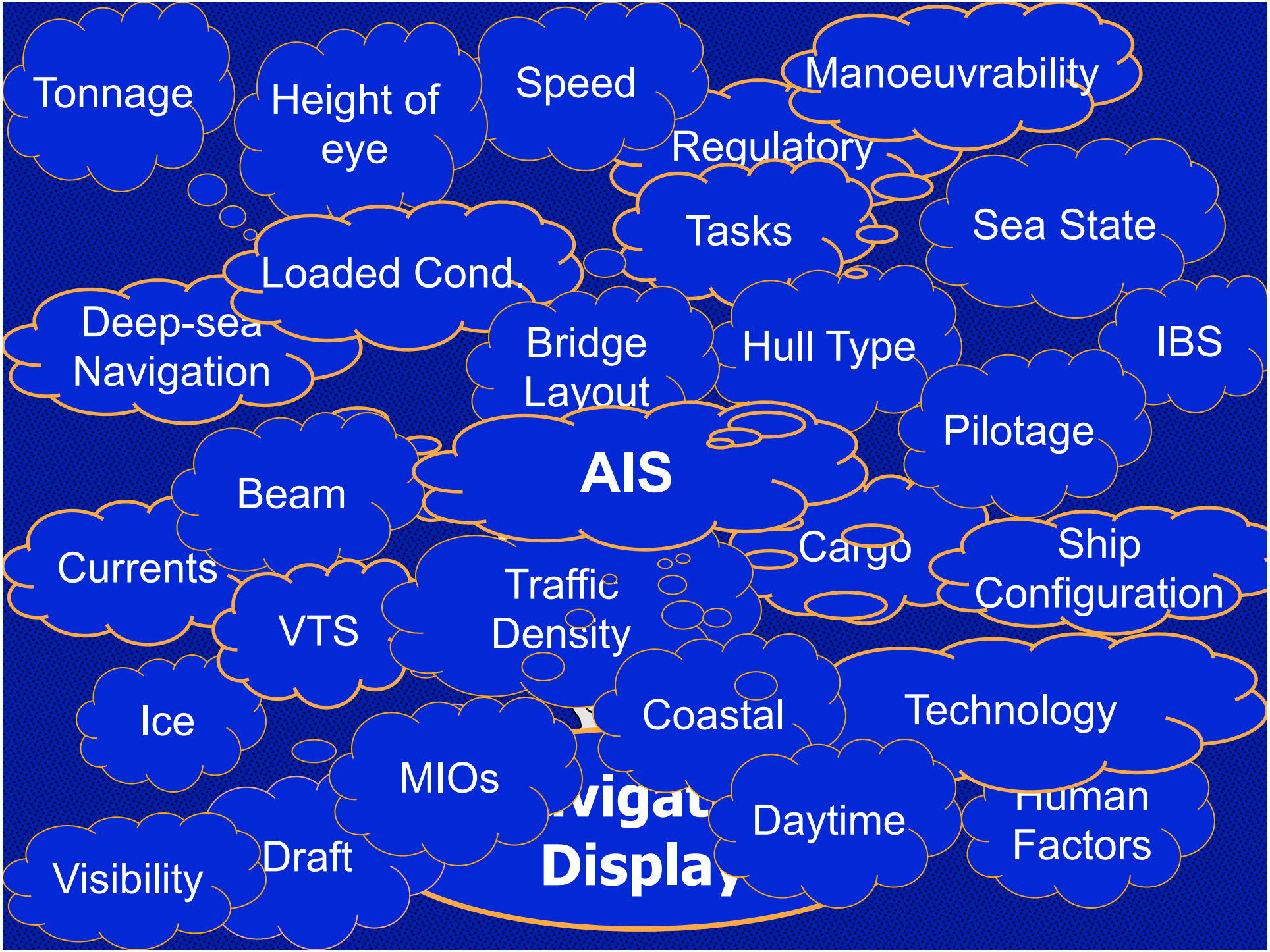
  w/l forecast + large-scale ENC + ship's safety contour = informed decision

- Ice coverage
  - not where it is, but where it is not
- Port Information Services
  - Internet and Website = 24hr service

ENCs of decimetre accuracy in conjunction with DGPS of sub-metre precision are used to manouvre large cruise vessels in the Ems river in Northern Germany

Goal for MIOs

- Supplemental information for "decision support"
  - The right information for task-at-hand
  - Planning vs. route monitoring
- How displayed less important than format and content
  - Accurate, timely, and useable


Tonnage
Height of eye
Speed
Manoeuvrability
Regulatory
Tasks
Sea State
Loaded Cond.
Deep-sea Navigation
Bridge Layout
Hull Type
IBS
Pilotage
AIS
Beam
Currents
VTS
Traffic Density
Cargo
Ship Configuration
Ice
Coastal
Technology
MIOs
Daytime
Human Factors
Draft
Visibility
Display