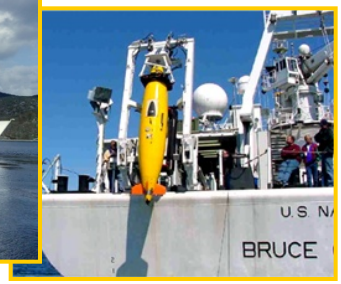
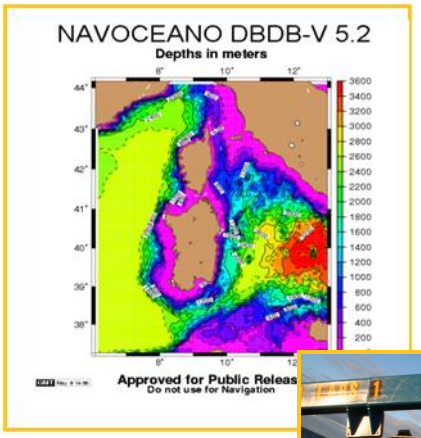
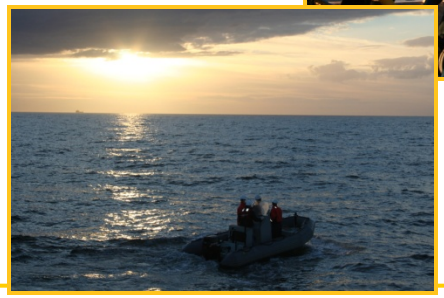
Naval Oceanographic Office





Spring WG/CSAB Update
29-30 March 2017



CAPT Greg Ireton Commanding Officer
Mr. Mark Jarrett, Technical Director
CAPT Nick Vincent, Executive Officer

Agenda

- Overview of NAVOCEANO's missions
- Structure within Navy
- Value of COPC and its related activities

NAVOCEANO Mission

To optimize sea power by applying relevant oceanographic knowledge in support of U.S. National Security

Core Competencies

MIW

SPECOPS

NSW

ISR

JOINT

PHYSICAL OCEANOGRAPHY

HYDROGRAPHY

BATHYMETRY

GEOPHYSICS

ACOUSTICS

GEOSPATIAL SCIENCES

Fleet OPS

CSG

ESG

USMC

ASW

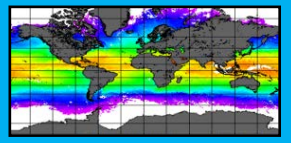
Tasking, Collection, Processing, Exploitation and Analysis, and Dissemination (TCPED)

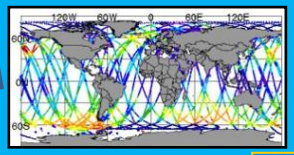
Dissemination
STAFF BRIEFING MATERIAL
ENVIRONMENTAL ASSESSMENTS
- OPS PLANNING
- AREA FAMILIARIZATION

POST OPS
- R & A
- LESSONS LEARNED

Tasking
COMMANDER TASK GROUP 80.7

Collection
Satellites
- SST
- SSH
- NHFLUX
- Ice





RTDHS

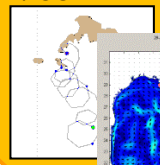
Buoys
- NODC
- EARS

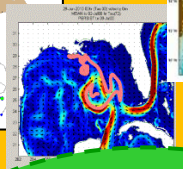
AUVs
- Gliders
- Profilers
- Drifters
- REMUS

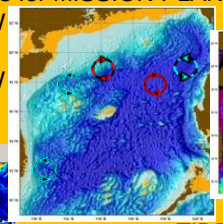
Ships & Aircraft
- XBTs
- CTDs
- BSPs
- MVPs

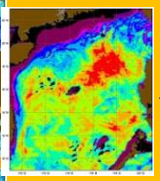
Exploitation and Analysis
TOFAs for MISSION PLANNING
- ASW
- MIW
- EXW

DRIFT FORECASTS
- LOST OBJECTS
- OIL / CONTAMINANTS





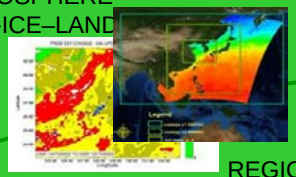




TIDE TIME SERIES

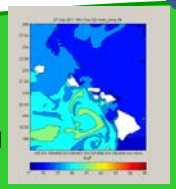
Future Processing
COUPLED ATMOSPHERE–OCEAN–WAVE-ICE–LAND
- COAMPS
- ESPC

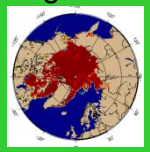
ENSEMBLES
- REGIONAL NCOM
- GLOBAL HYCOM
- UNCERTAINTY
- PROBABILISTIC



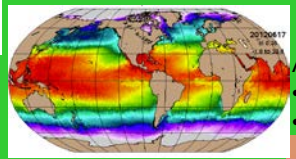
WAVES
- Multi-Scale WW3
- SWAN, SURF

REGIONAL CIRCULATION
- R-NCOM
- Coupled COAMPS

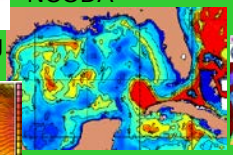


Processing


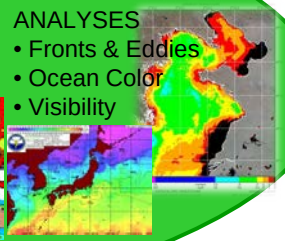
GLOBAL CIRCULATION
- HYCOM



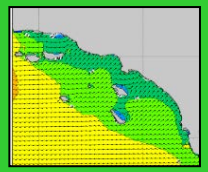
ASSIMILATION
- Ocean QC
- NCODA

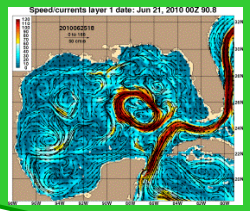


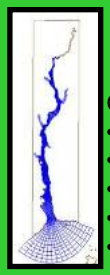
ANALYSES
- Fronts & Eddies
- Ocean Color
- Visibility



ARCTIC CAP NOWCAST FORECAST SYSTEM

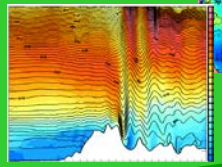






COASTAL CIRCULATION
- C-NCOM
- COAMPS
- DELFT3D
- PCTIDES
- HYDROMAP

FNMOC Atmospheric Forcing
- NAVGEM
- COAMPS



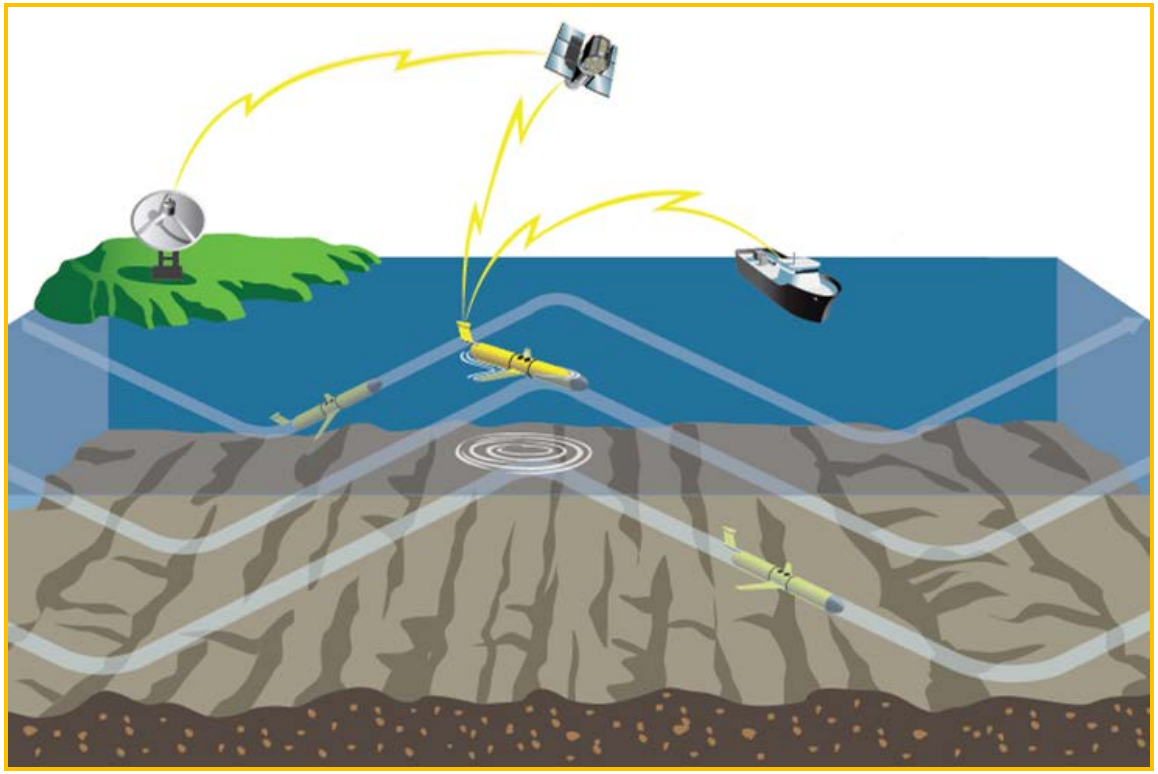
Exploitation & Analysis
Tasking
Collection
Processing
Dissemination
TCPED

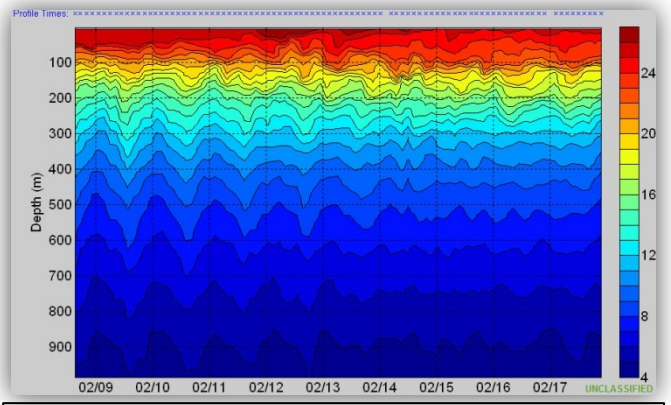
Collection and Sensing Tools

+ *Military Survey Ships (T-AGS)*
+ *Hydrographic Survey Launch (HSL)*
+ *Maritime Homeland Defense Mine Warfare SWATH Vessels*
+ *Airborne Coastal Survey (ACS)*
+ *Fleet Survey Team (FST)*
+ *Autonomous Underwater Vehicles (AUVs)*
+ *Profiling Floats, Buoys & Marine Mammals*
+ *Environmental Acoustic Recording System (EARS)*
+ *Naval Platforms (TTS)*
+ *Satellites*
+ *National and International Data Exchange Agreements*

Persistent & State of the Art

Ocean Gliders





Note that temporal variability can increase with depth, down to 1000m, in areas where internal waves are generated (straits, etc).

LBS-Glider Specifications:

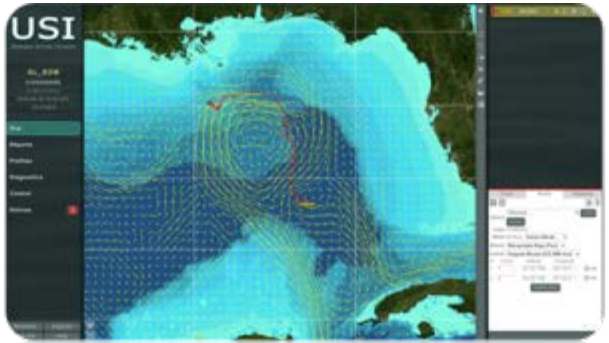
Weight	60kg	Max Depth	200/1000 m
Hull Dia.	22 cm	Endurance	4-6 months
Length	1.5 m	Range	4000 km
Speed	31 cm/s	Energy	Li-oxyhalide

Application of Ocean Gliders

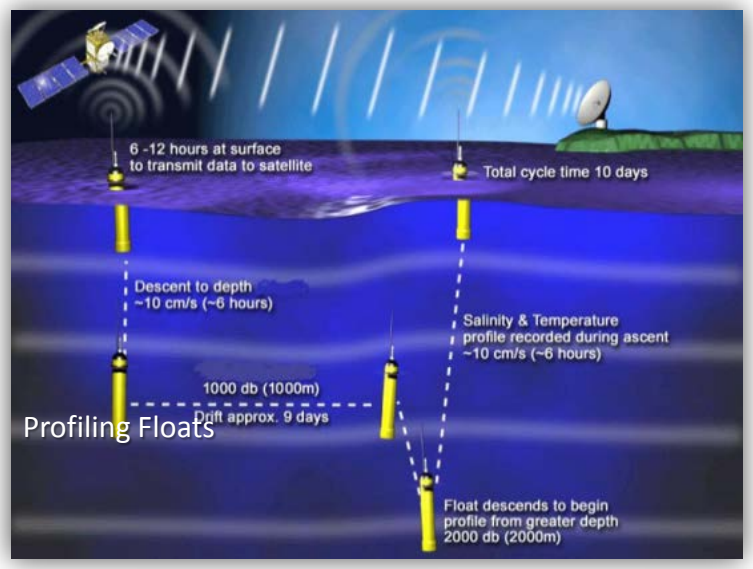
Persistent **sampling with gliders in the Physical Battlespace leads to...**

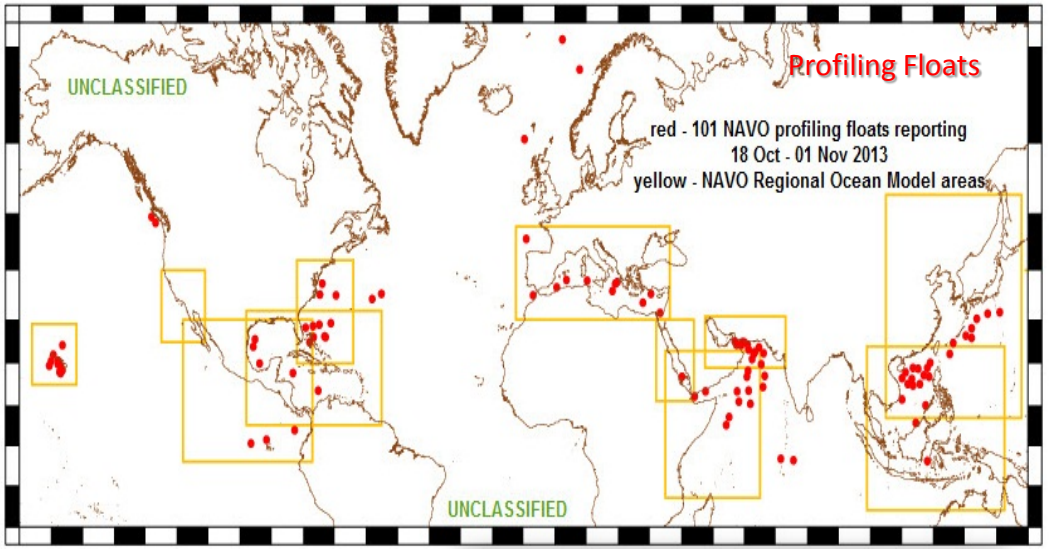
Predictive Physical Battlespace Awareness **for decision superiority in the maritime domain**

- **Ocean currents – unmanned systems, mine/debris drift models, SAR**
- **SST – sound velocity profiles, acoustic propagation, beam attenuation**
- **Fronts and eddies & sonic layer depth – environmental exploitation**
- **Ocean optics – vertical and horizontal visibility, asset vulnerability**

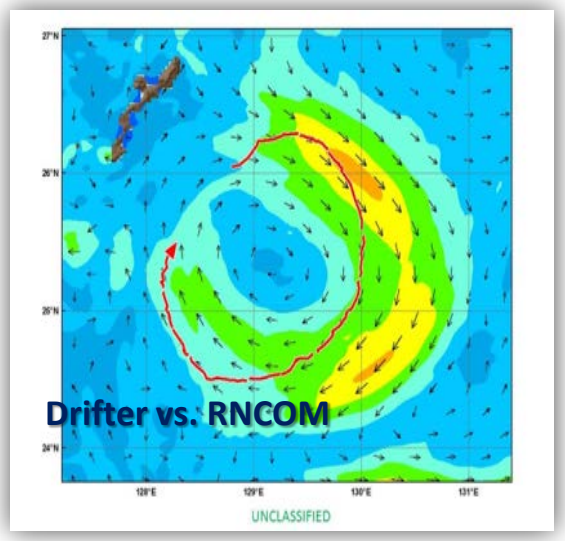


Other in situ *Measurements*



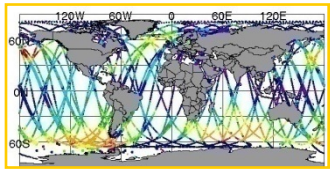


Marine Mammals

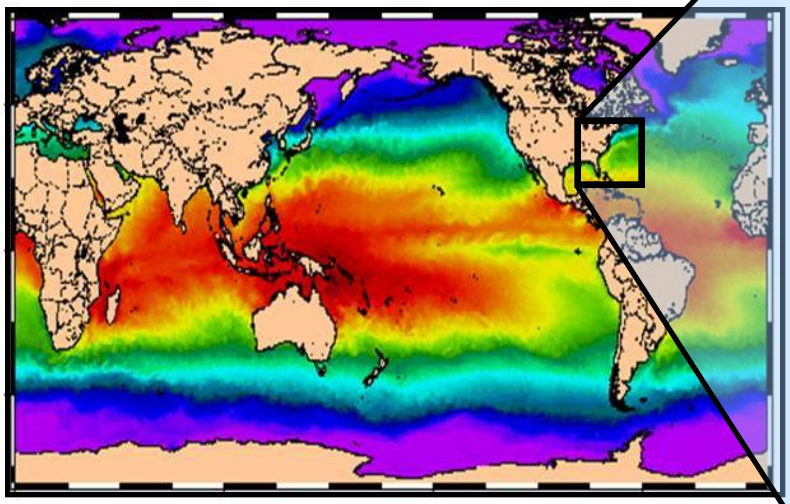


Ocean Circulation Modeling

Global → Regional → Local

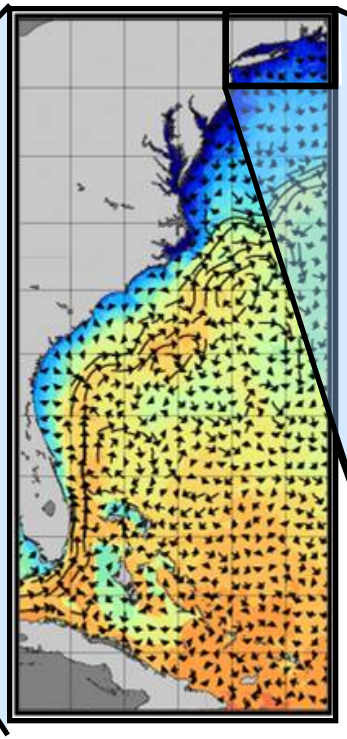


9 km



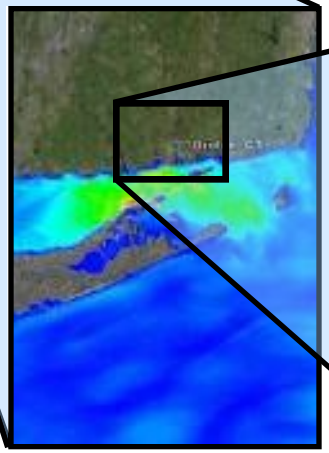
Global HYCOM

3.7 km



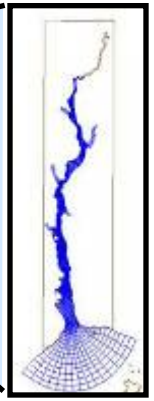
US-East NCOM

500 m



Groton NCOM

60 m



Groton Delft3D

3D full physics, Data assimilating, Forecast models

Currents
Temperature
Salinity
Wave Height
Object Drift
Sound speed

Ocean Forecasting System

Observations

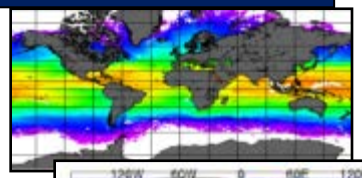
Ocean Models

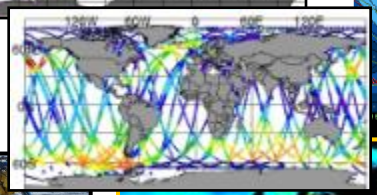
Forecasting

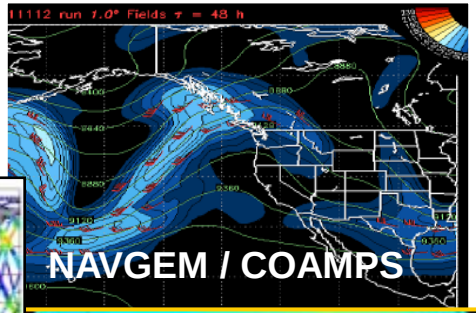
Global – Regional – Coastal – Port

9 km 3 km 300 m 10 m

Satellite & *In situ*





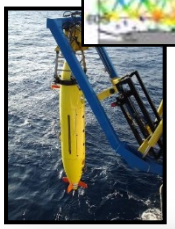


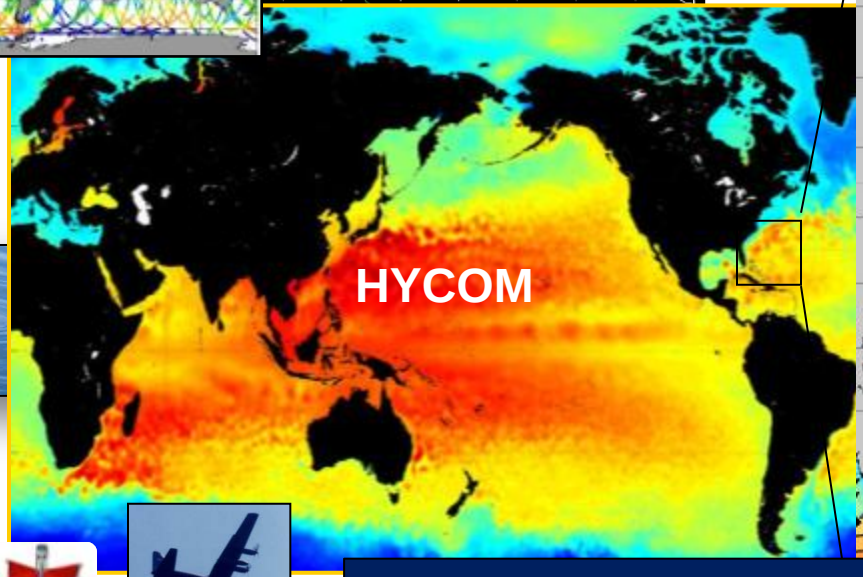
NAVGEM / COAMPS

- 3D Full Physics
- Assimilation
- Forecasts to 7 days
- Nesting / Boundary

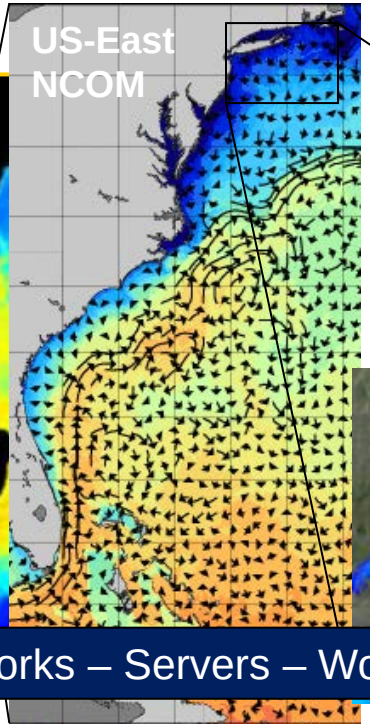
Oceanographers
- Configure models
- Interpret forecasts & observations
- Evaluate uncertainty
- Tailor analysis to Navy mission

Civilian – Military Forecasting Teams

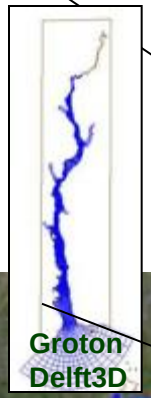




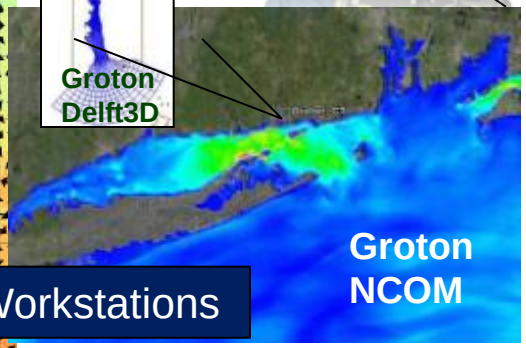
HYCOM



US-East NCOM



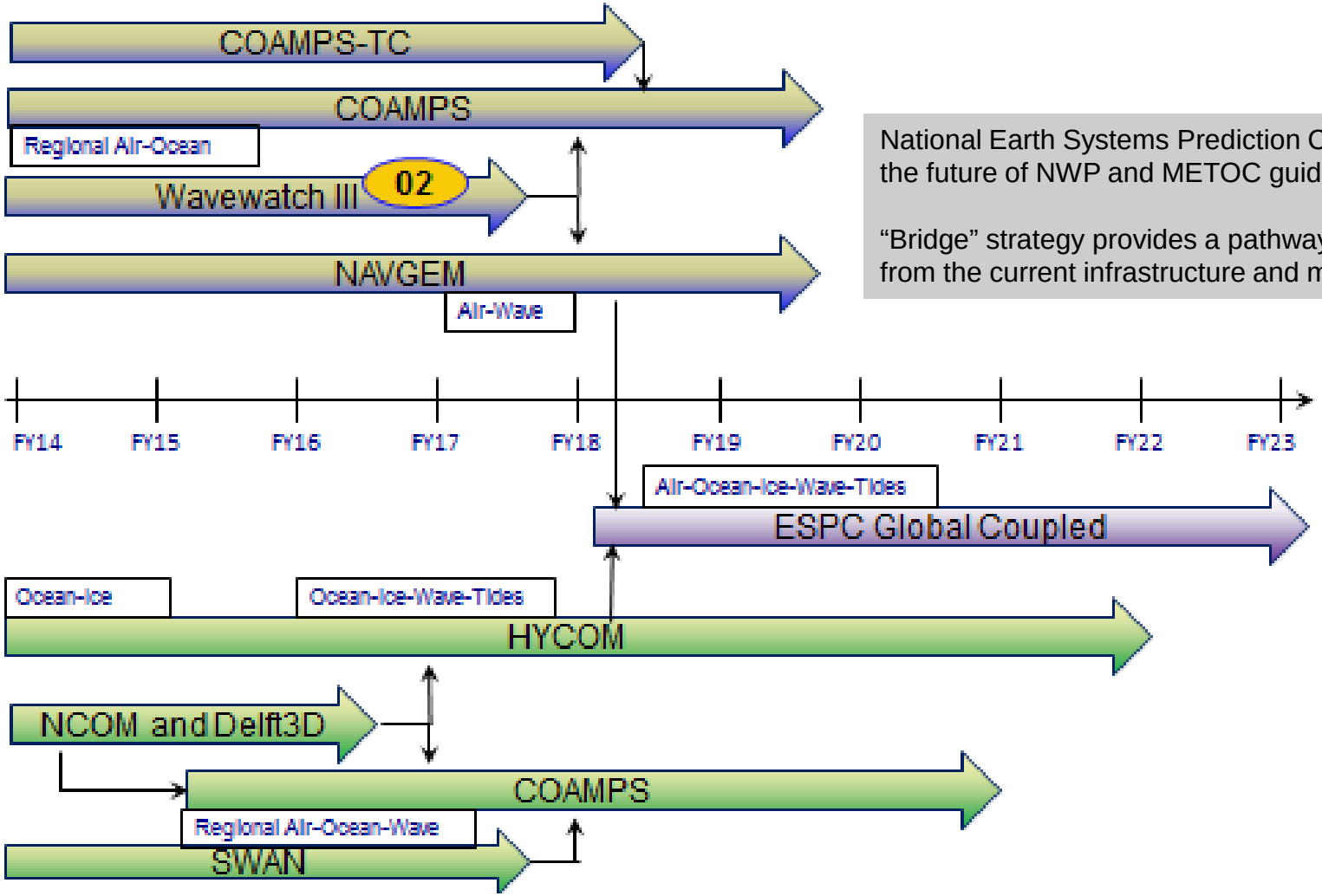
Groton Delft3D



Groton NCOM

Super Computers – Networks – Servers – Workstations

CNMOC Modeling Roadmap



National Earth Systems Prediction Capability (ESPC) is the future of NWP and METOC guidance fields

"Bridge" strategy provides a pathway to the future ESPC from the current infrastructure and model suites

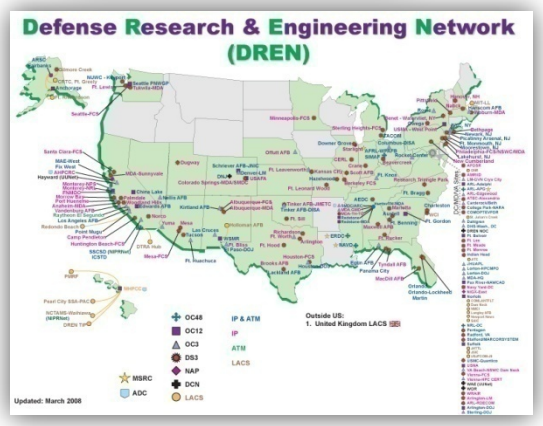
High Performance Computing

DoD Supercomputing Resource Center (DSRC)

+ Among the top supercomputing centers in the world
+ Peak computing capability of 777 Teraflops

Petascale Data Storage and Mgmt

+ Top Tier of Nation's secure and scalable data management and archival facilities



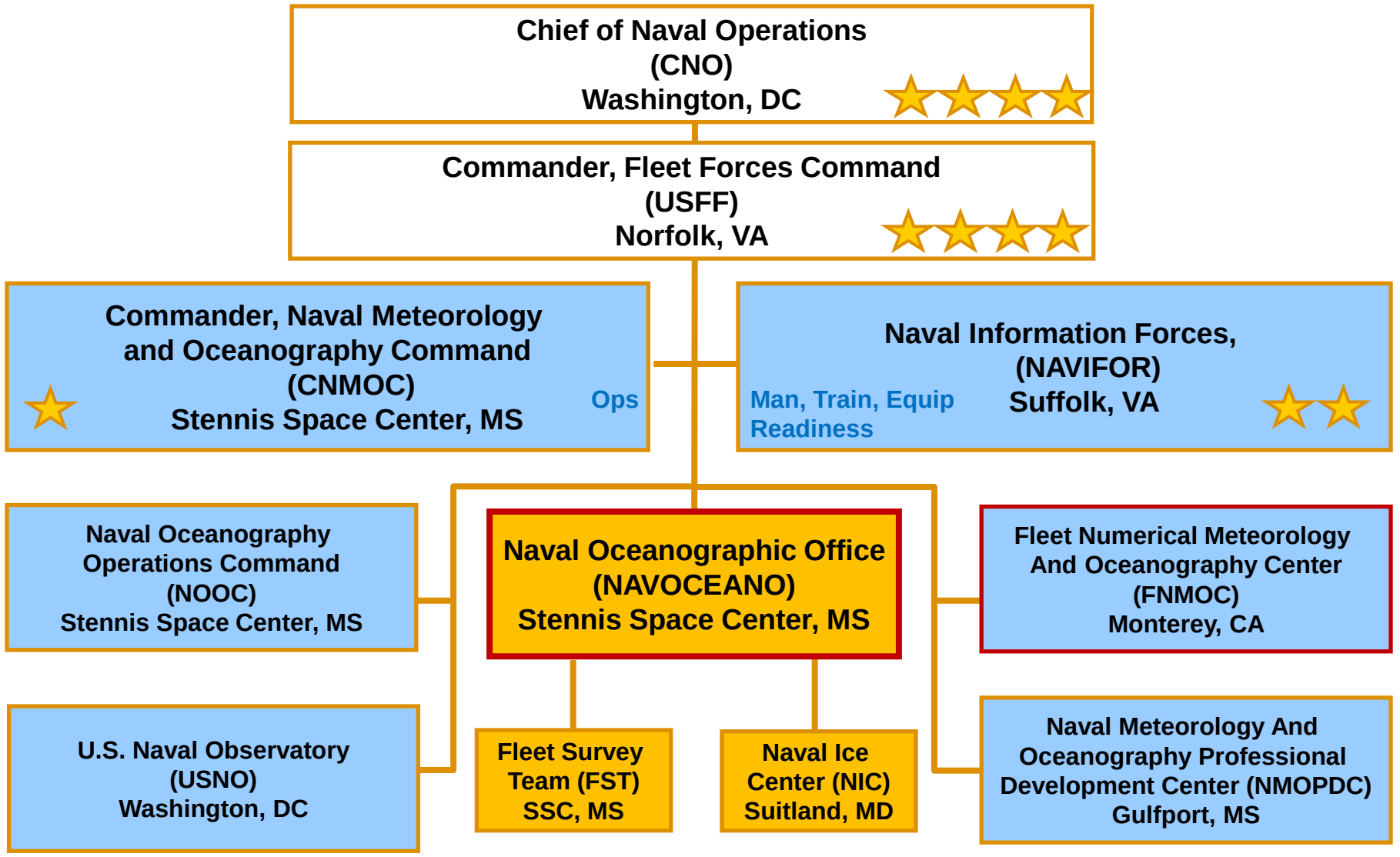
Cutting-edge Networking Connectivity

+ Stennis designated DISA C2 Mega-site
+ Resilient, multi-GB connectivity via Defense Research & Engineering Network (DREN) to all major nationwide gov't, industrial, and academic networks

Agenda

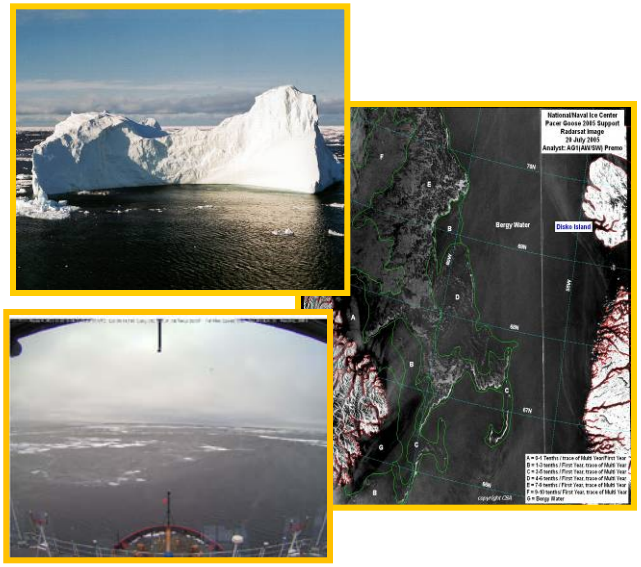
- Overview of NAVOCEANO's missions
- **Structure within Navy**
- Value of COPC and its related activities

Fleet Alignment



National / Naval Ice Center

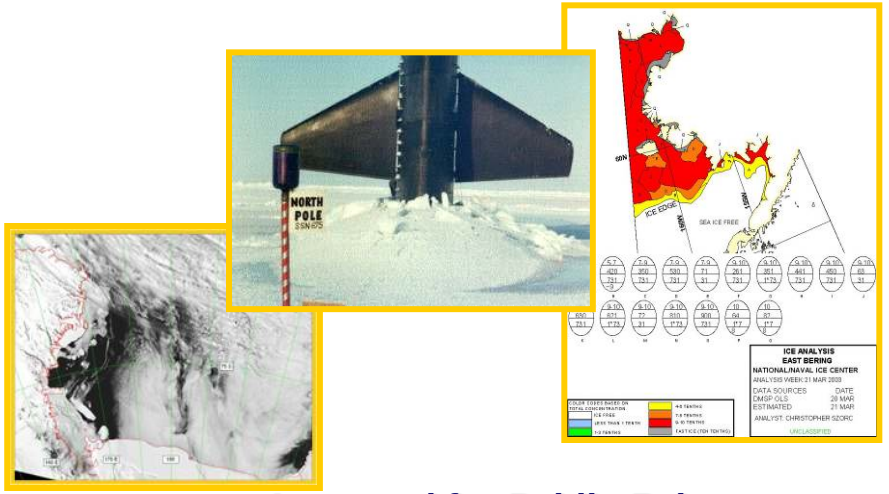
Tri-Agency (Navy, NOAA, USCG) Partnership



- Navy-led organization with ~40 military and civilian personnel located in Suitland, MD
- World's only center that provides operational global, regional and tactical scale sea ice and iceberg analyses and forecasts
- International collaboration with ice services of the world

NIC Products

SPecial ARctic Oceanographic Synopsis (SPAROS)
Ice characterization (a.k.a "Egg Charts")
RADARSAT & OLS Annotated Imagery
World's only Antarctic iceberg database
Supporting: SUBFOR, ONI, USCG, NOAA, NWS, NSF, MSC, and NASA



Agenda

- Overview of NAVOCEANO's missions
- Structure within Navy
- **Value of COPC and its related activities**

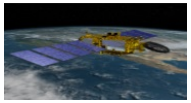
Value of COPC and its related activities

- **Satellite Supported Projects**
  - MCSST
  - ADFC
  - Ice Concentration
  - MMSPS (Multi-Mission Satellite Processing Segment)
  - NFLUX (Net Satellite Fluxes)
- **In-situ Projects**
  - Buoy/Float
  - RTDHS
- **On-going/Future Transitions**

Current Altimetry Satellite Status

Newest to Oldest

JASON-3

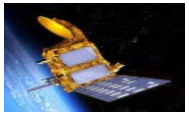


- Launched: January 2016
- Data ingest started MAR 2016
- Satellite declared operational end of JUN 2016
- Operational product deliveries started early JUL 2016

SENTINEL 3a

- Launched: February 2016
- Data provided by NOAA/STAR
- SSHa products operational early FEB 2017

AltiKa



- Launched: February 2013
- Satellite put in a geodetic orbit JUL 2016 due satellite health issues
- SSHa geodetic products were operational early AUG 2016

CRYOSAT-2

- Launched: April 2010
- Satellite in extended mission

JASON-2

- Launched: June 2008
- Interleave orbit mission: OCT 2016
- SSHa interleave products were operational early NOV 2016

Ice/NFLUX/MMSPS Project(s)

- JPSS Stored Mission Data Hub (JSH Block 2.0)
  (8 March 2017)
- Multi-Mission Satellite Processing Segment (MMSPS)
  (4Q FY17)
- AMSR-2 EAP processing to L1(A,B,R) via NOAA
  provided JAXA Executable (4Q FY17)
- NFLUX Operational data feeds from FNMOC, 557th,
  and NOAA -- PDA & DAPE (2Q FY17)
- Ice Concentration Processing System (ICPS)
  (4Q FY17)

RTDHS and Buoy/Float

RTDHS

- Completed setup & testing of Boulder NCEP IDP

- Successfully transitioned over to Boulder NCEP IDP – retrieved obs data into Operational processing

Buoy/Float

- Directed by NCEP to utilize IP addresses and not use DNS. (November 2016)

- NAVO implemented the duplicate data feed to Bolder for buoy/float data (January 2017)

Current/Future R2O Transitions

- NFLUX -- Atmosphere/Ocean surface fluxes - Sept 2017
  - Channel Brightness Temp
  - Wind
  - ATMP
  - Ozone
  - NAAPS, HYCOM SST, K10 SST
- Ice Concentration – June 2017
  - AMSR2
  - VIIRS
- MMSPS (Multi-Mission Satellite Processing Segment) – July 2017
  - NPP/JPSS-1 Stored mission data (JSH)
  - GCOM-W1 AMSR2
- Altimeter Satellites
  - Jason-3 (OGDR/IGDR via OSPO) -- Operational July 2016
  - Sentinel-3 (NOAA/STAR) – Operational February 2017

Summary

- ***COPC partnerships enable:***
  - ***Access to full range of satellite data***
  - ***Access to observational data***
  - ***Sharing of model data***
  - ***Coordination of standards***
  - ***Networks to efficiently and safely move METOC information among the partners***

- ***Impact: Naval forces get the world's best environmental data, relevant and timely, to support operations around the globe***

Questions?