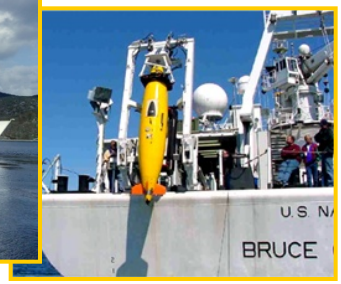
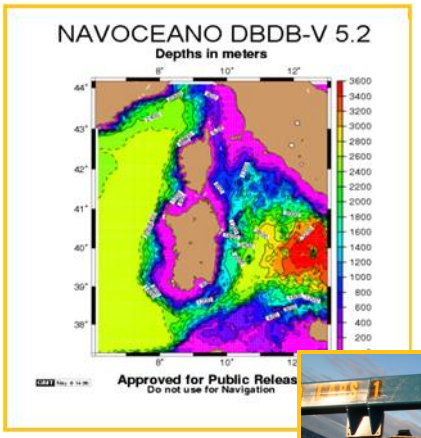
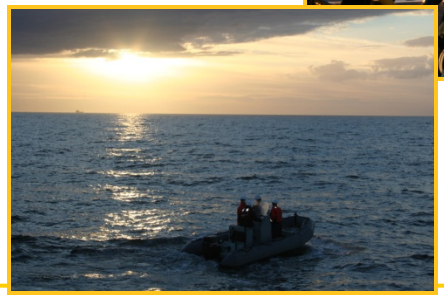
Naval Oceanographic Office





Spring COPC Update
03-04 May 2016



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

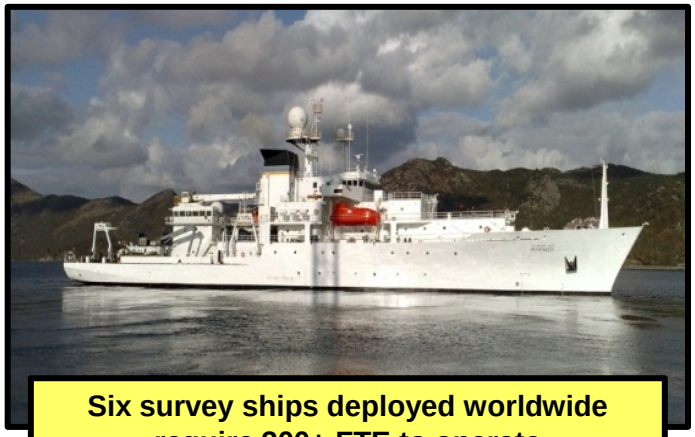
Agenda

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

NAVOCEANO Mission

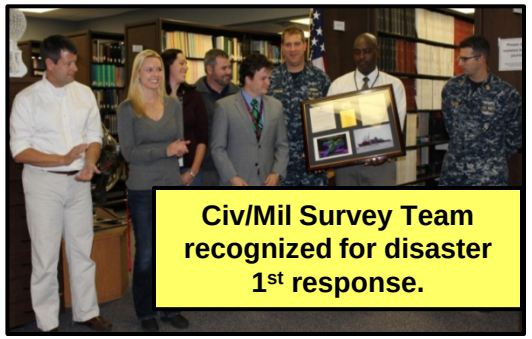
To optimize sea power by applying relevant oceanographic knowledge in support of U.S. National Security

Highly Qualified, Scientific, & Motivated Military and Civilian Work Force



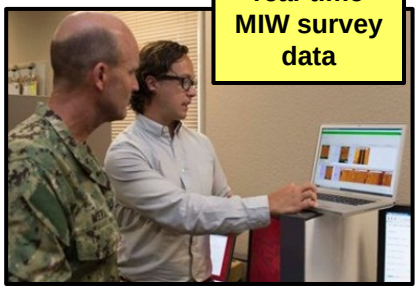
Six survey ships deployed worldwide require 300+ FTE to operate

NAVOCEANO Civilian Receives Award for 5000+ days of survey



Civ/Mil Survey Team recognized for disaster 1st response.

Fleet Survey Team provides rapid response to Fleet Rqmts



Civilian scientists analyzing real-time MIW survey data

NAVOCEANO

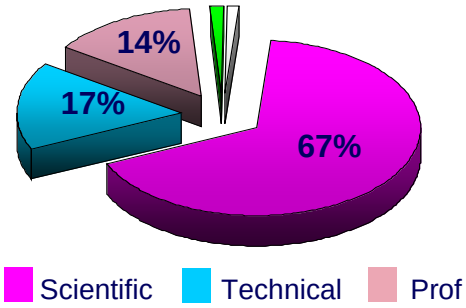
Civilian	704
Contractor	60
Military	23
Total	**787**

Fleet Survey Team

Civilian	23
Military	45
Total	**68**

Total Workforce:

~ 855



Education	% Total
Ph.D.	4 %
M.A./M.S.	19 %
B.A./B.S.	47 %
Assoc. Deg	12 %
Other	18 %

The Deep Bench for Warfighting

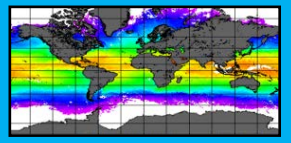
Tasking, Collection, Processing, Exploitation and Analysis, and Dissemination (TCPED)

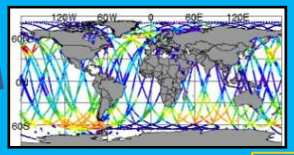
Dissemination
STAFF BRIEFING MATERIAL
ENVIRONMENTAL ASSESSMENTS
- OPS PLANNING
- AREA FAMILIARIZATION

POST OPS
- R & A
- LESSONS LEARNED

Tasking
COMMANDER TASK GROUP 80.7

Collection
Satellites
- SST
- SSH
- NHFLUX
- Ice





RTDHS

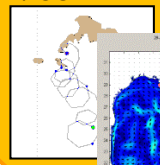
Buoys
- NODC
- EARS

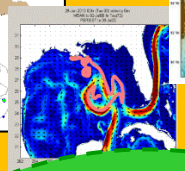
AUVs
- Gliders
- Profilers
- Drifters
- REMUS

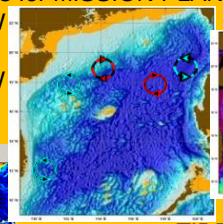
Ships & Aircraft
- XBTs
- CTDs
- BSPs
- MVPs

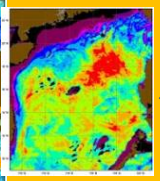
Exploitation and Analysis
TOFAs for MISSION PLANNING
- ASW
- MIW
- EXW

DRIFT FORECASTS
- LOST OBJECTS
- OIL / CONTAMINANTS







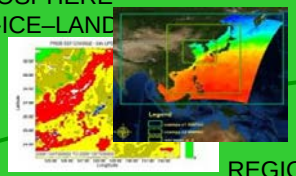


TIDE TIME SERIES

TCPED
Dissemination
Tasking
Collection
Processing
Exploitation & Analysis

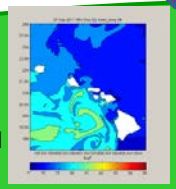
Future Processing
COUPLED ATMOSPHERE–OCEAN–WAVE-ICE–LAND
- COAMPS
- ESPC

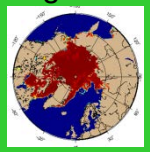
ENSEMBLES
- REGIONAL NCOM
- GLOBAL HYCOM
- UNCERTAINTY
- PROBABILISTIC



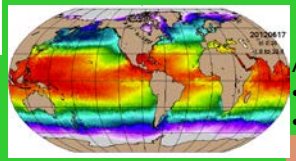
WAVES
- Multi-Scale WW3
- SWAN, SURF

REGIONAL CIRCULATION
- R-NCOM
- Coupled COAMPS

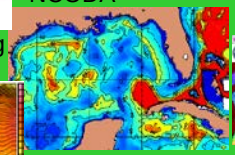


Processing


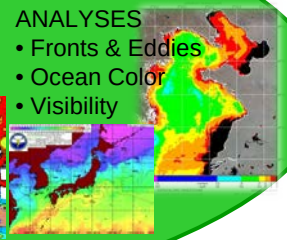
GLOBAL CIRCULATION
- HYCOM



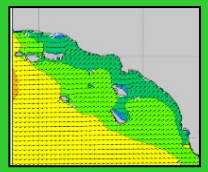
ASSIMILATION
- Ocean QC
- NCODA

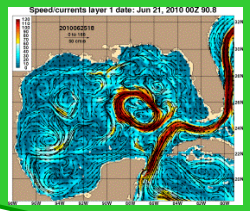


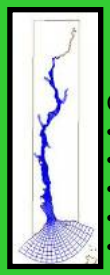
ANALYSES
- Fronts & Eddies
- Ocean Color
- Visibility



ARCTIC CAP NOWCAST FORECAST SYSTEM

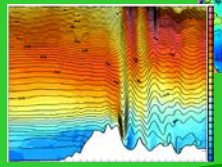






COASTAL CIRCULATION
- C-NCOM
- COAMPS
- DELFT3D
- PCTIDES
- HYDROMAP

FNMOC Atmospheric Forcing
- NAVGEM
- COAMPS

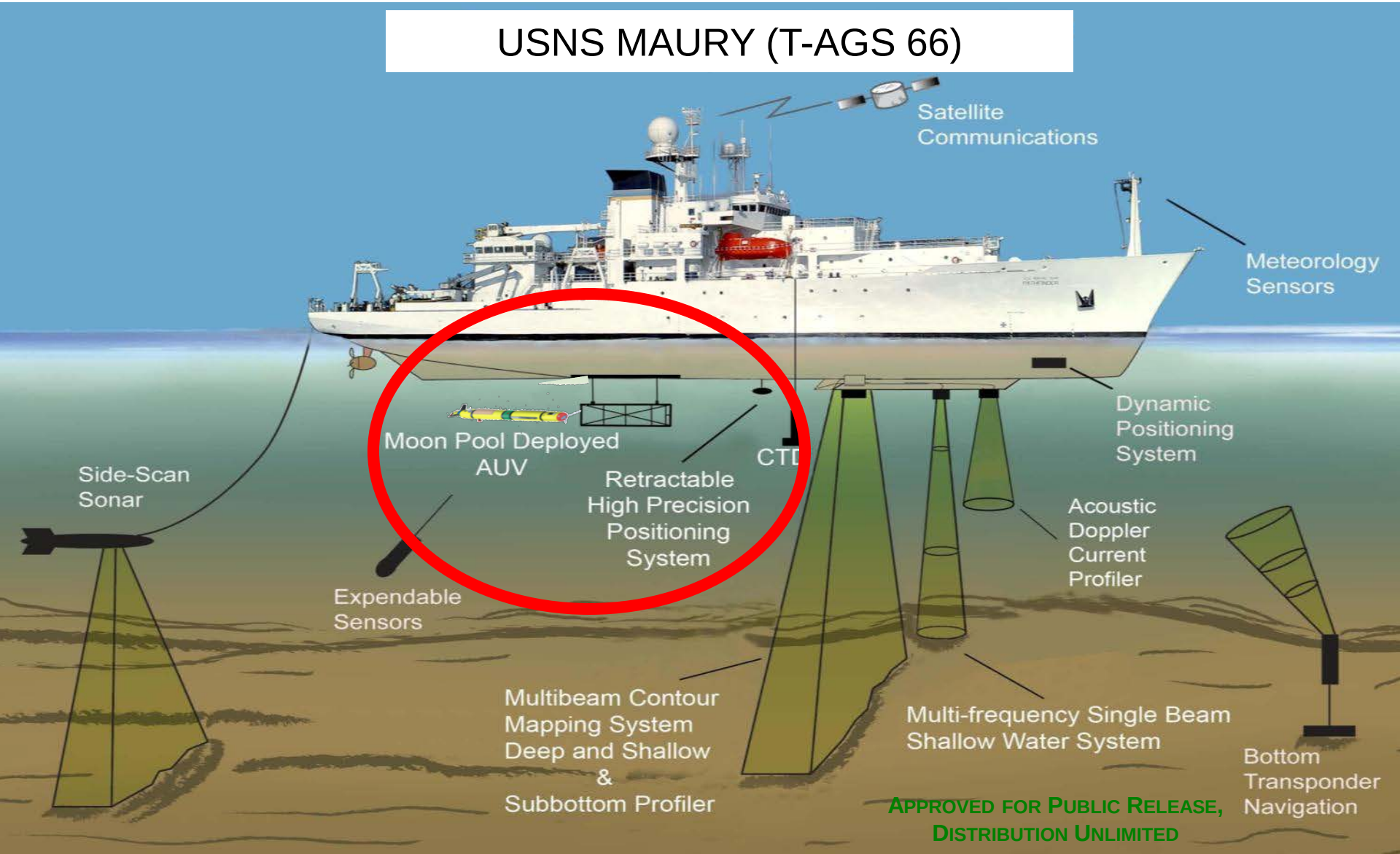


Collection and Sensing Tools

+ *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

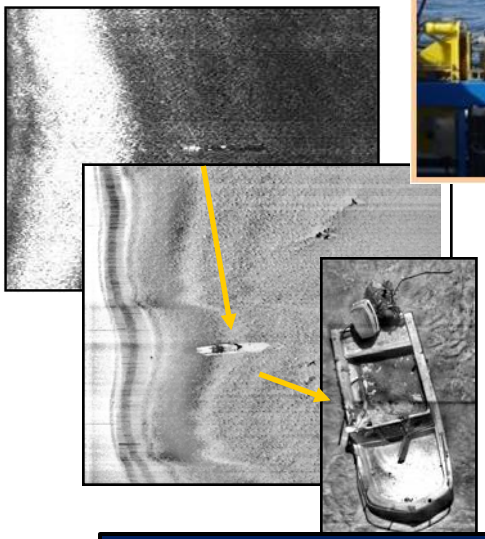
USNS MAURY (T-AGS 66)



Autonomous Underwater Vehicles (AUVs)

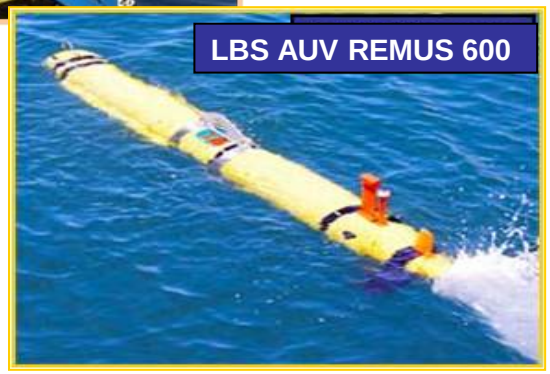
Deep Water — Littoral — Surf Zone

Full Ocean — 3000 M — 300 M — 100M — Shore Line



Capabilities

Side Scan Sonar
Sub-Bottom Profiler
Camera
CTD
ADCP
GPS
Iridium, Freewave, & Acoustic Comms



Over a Decade of Full Ocean Depth AUV Expertise

LBS-Glider System

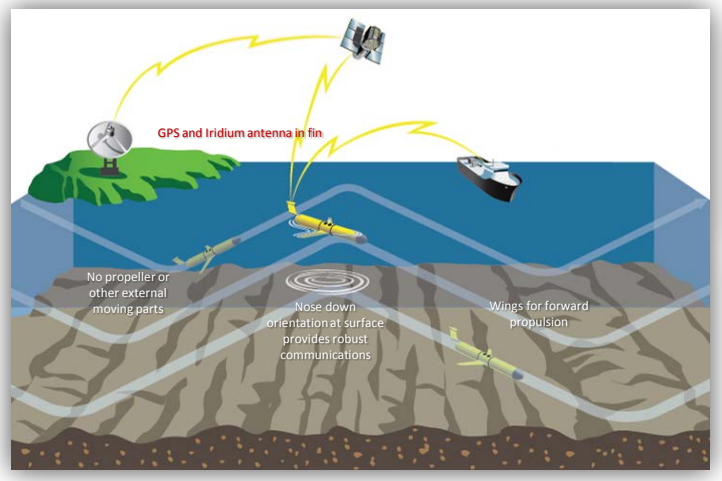
Mission: Persistent autonomous oceanographic data collection.

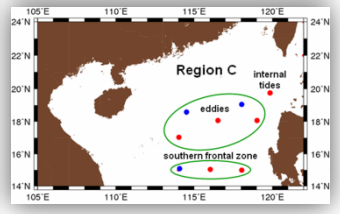
Description:

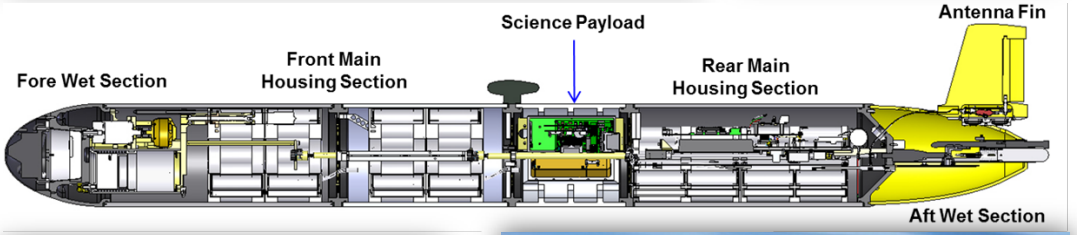
- Unsophisticated deployment
- Long-duration 4-6 mos on-station
- Iridium Comms
- Piloted 24/7 by NAVO Glider Operations Center
- Optimize ocean feature characterization for tactical and operational products for ASW, MIW, AMW, and Special Ops.
- Current Inventory: 50 Operational
- Endstate: 150 gliders by end of FY 15 (50/50/50 plan)

Platforms:

- T-AGS 60 Class (5 per → 10 per)
- USS vessels of opportunity
- Coalition forces assets
- Range patrol craft





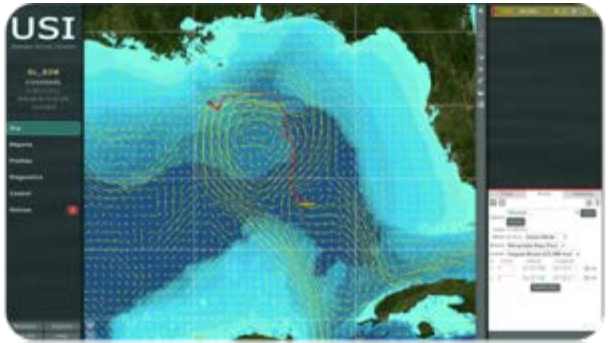


Application of Ocean Gliders

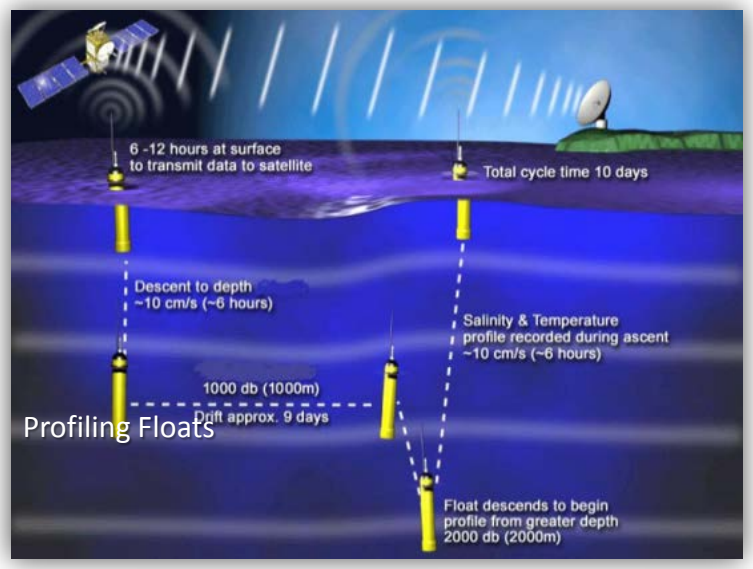
Persistent **sampling with gliders in the Physical Battlespace leads to...**

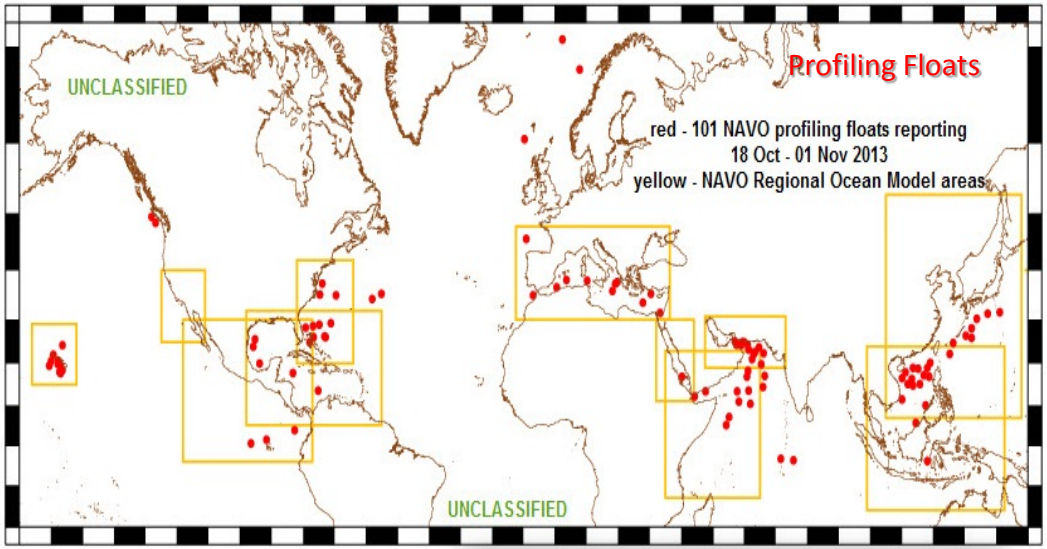
Predictive Physical Battlespace Awareness **for decision superiority in the maritime domain**

- **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**

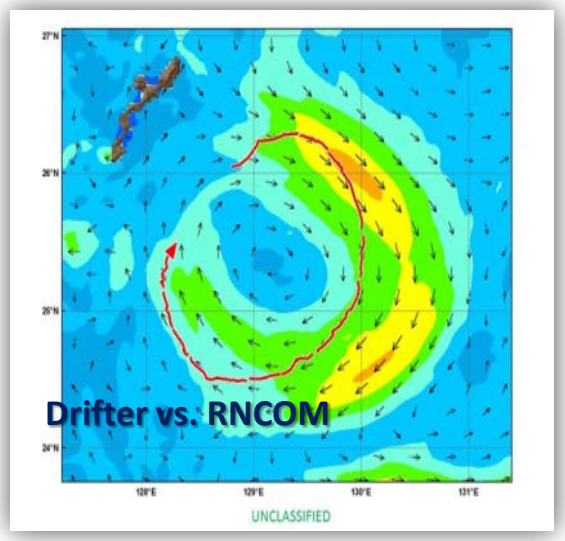


Other in situ *Measurements*



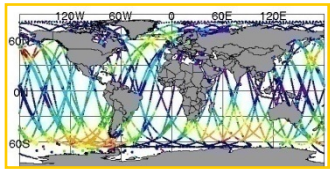


Marine Mammals

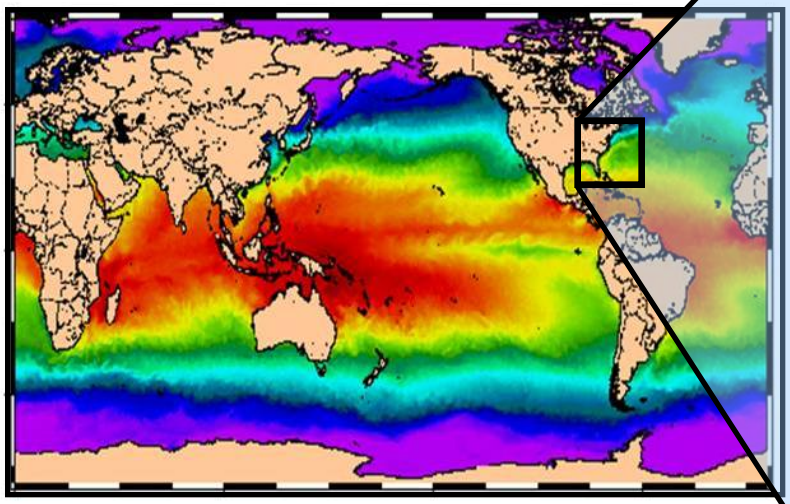


Ocean Circulation Modeling

Global → Regional → Local

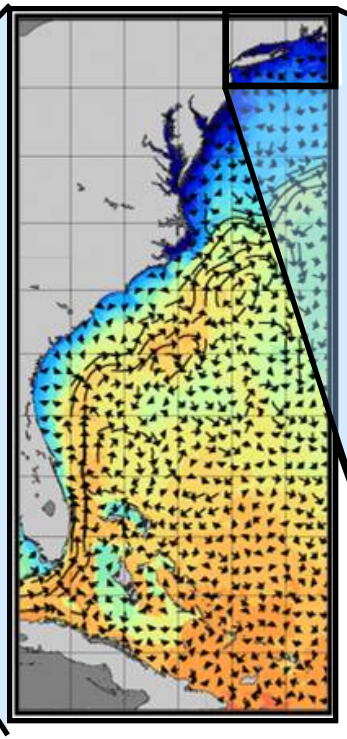


9 km



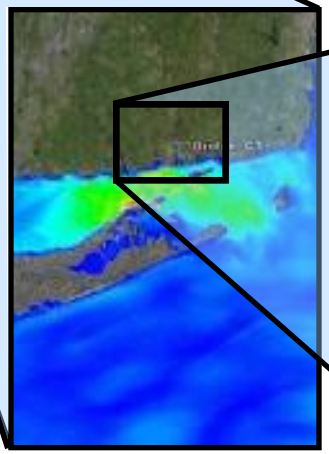
Global HYCOM

3.7 km



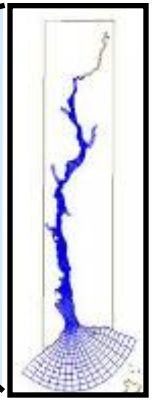
US-East NCOM

500 m



Groton NCOM

60 m



Groton Delft3D

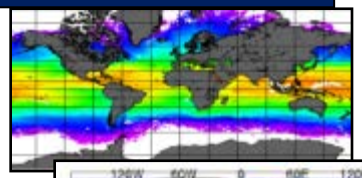
3D full physics, Data assimilating, Forecast models

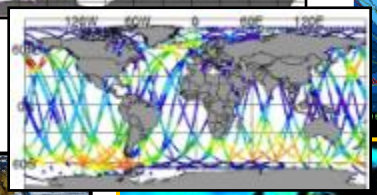
Currents
Temperature
Salinity
Wave Height
Object Drift
Sound speed

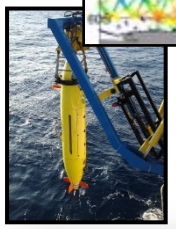
Ocean Forecasting System

Observations

Satellite & *In situ*



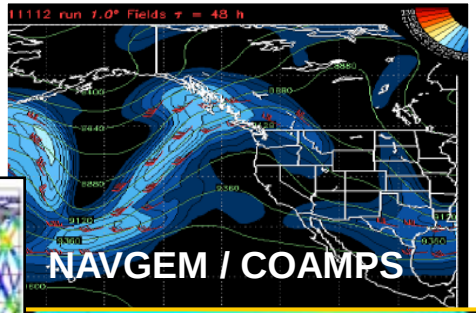




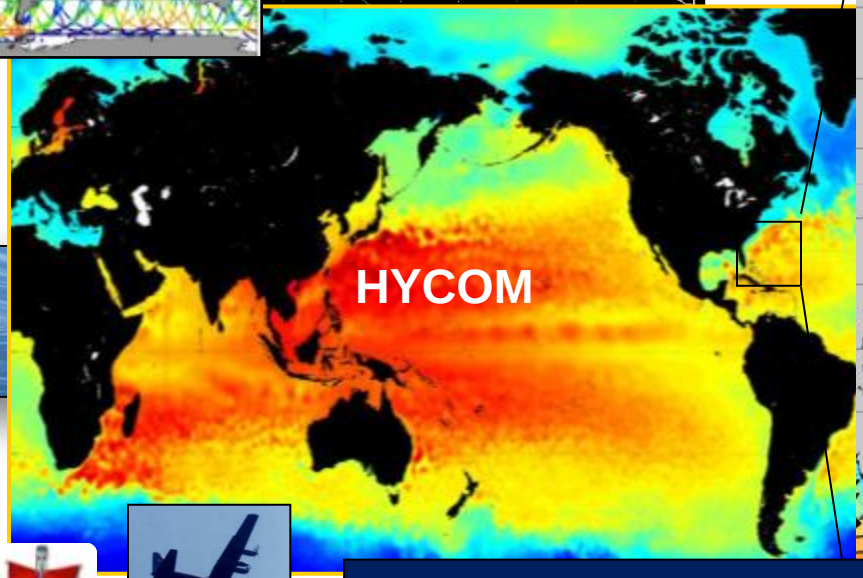
Ocean Models

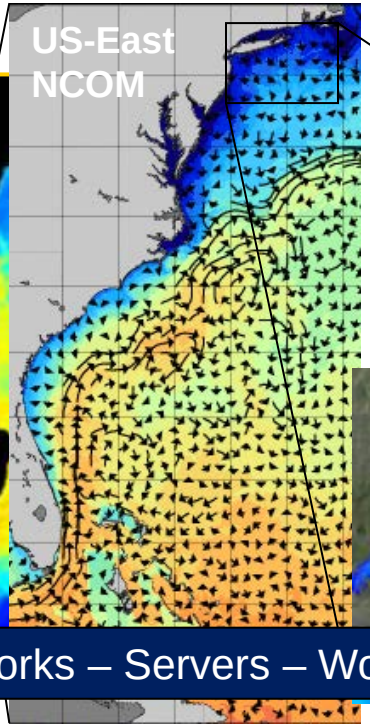
Global – Regional – Coastal – Port

9 km 3 km 300 m 10 m



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

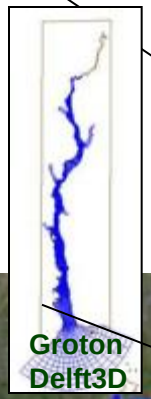


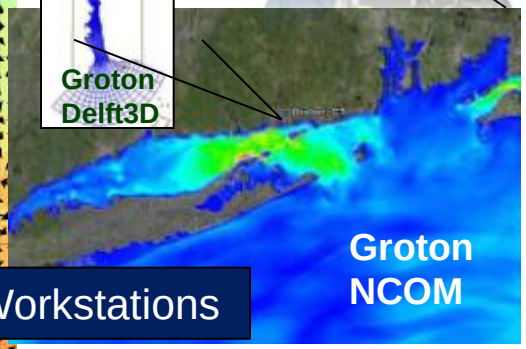


Forecasting

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

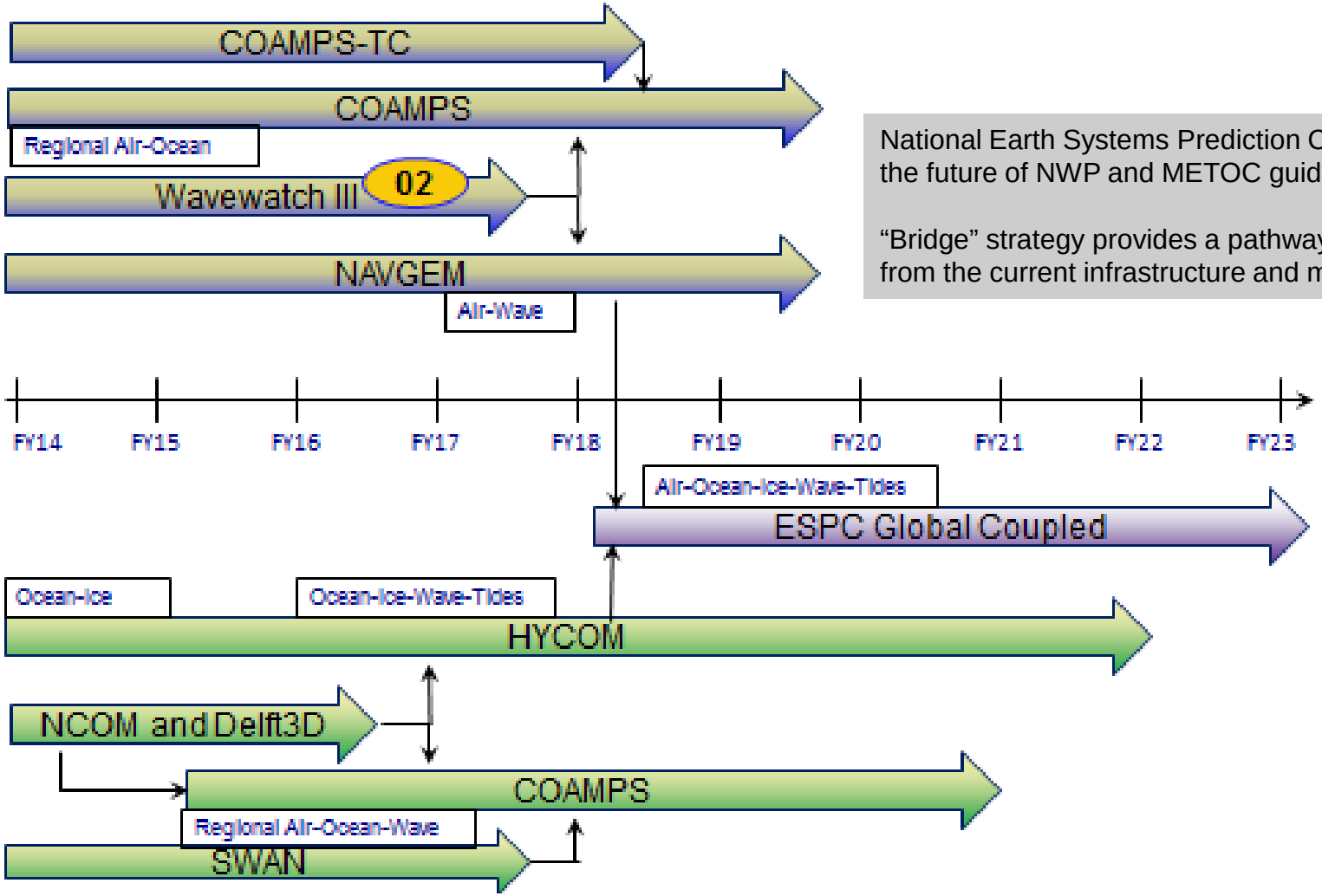
Civilian – Military Forecasting Teams





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

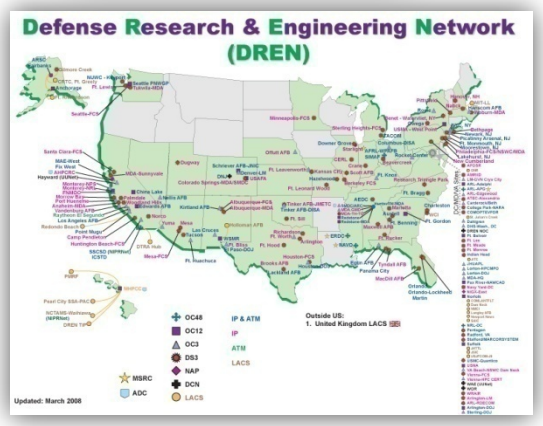
High Performance Computing

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



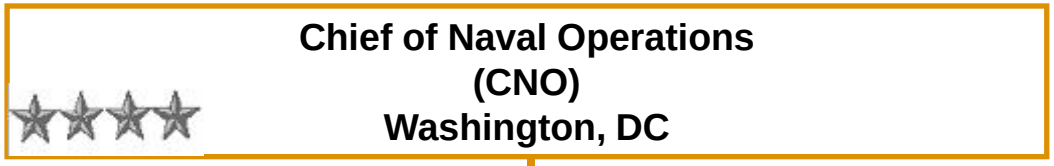
Cutting-edge Networking Connectivity

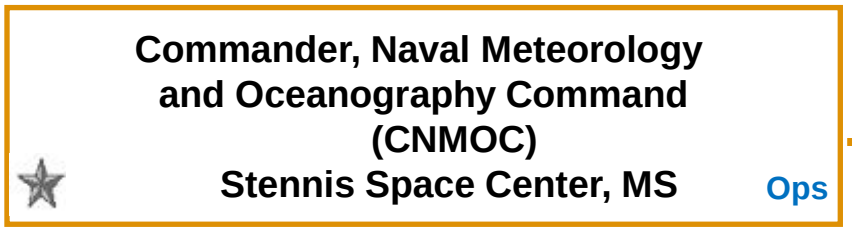
+ Stennis designated DISA C2 Mega-site
+ Resilient, multi-GB connectivity via Defense Research & Engineering Network (DREN) to all major nationwide gov't, industrial, and academic networks

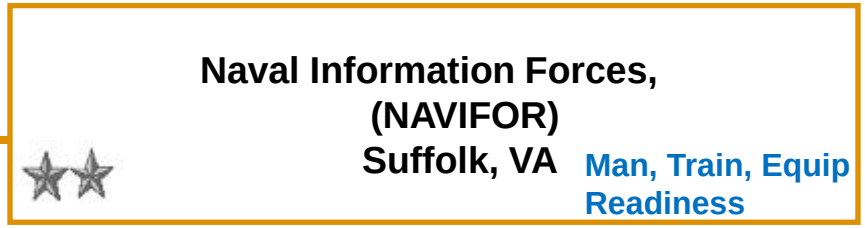
Agenda

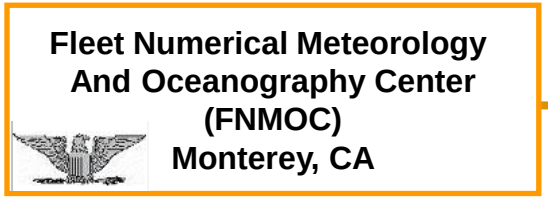
- Overview of NAVOCEANO's missions
- **Structure within Navy**
- Value of COPC and its related activities

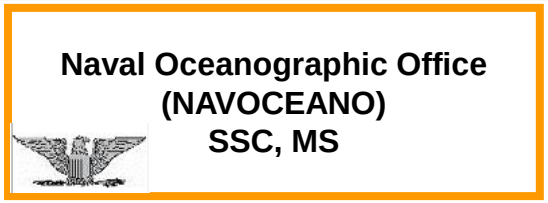
Fleet Alignment

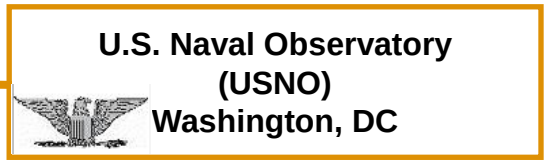


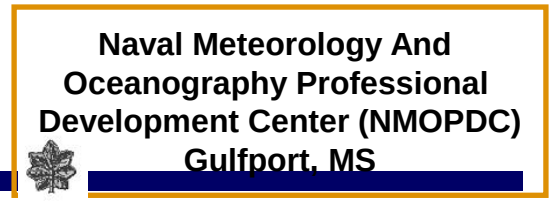


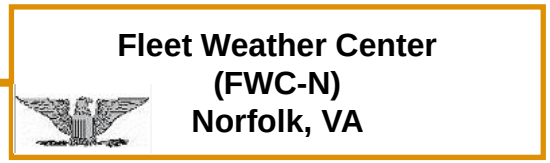








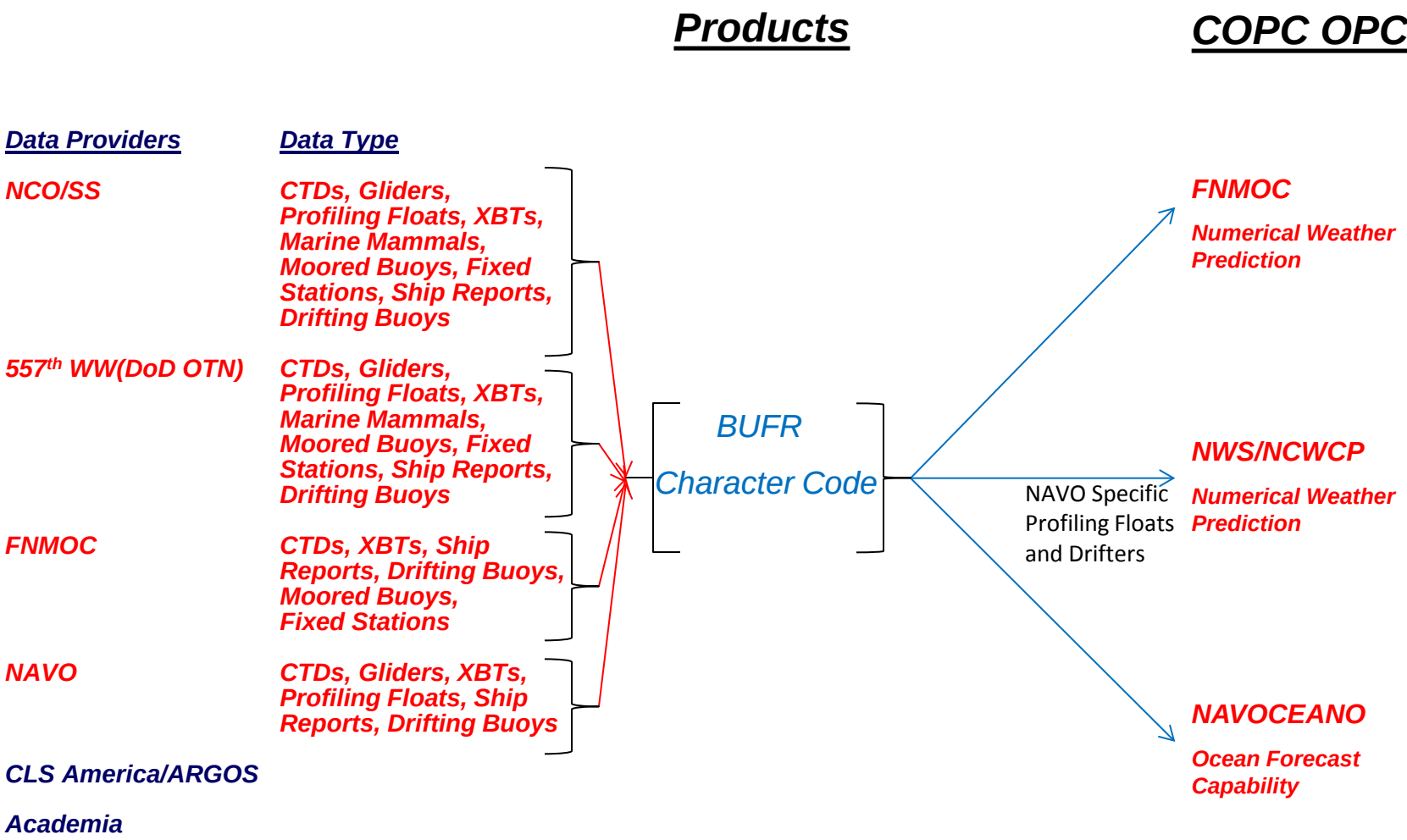




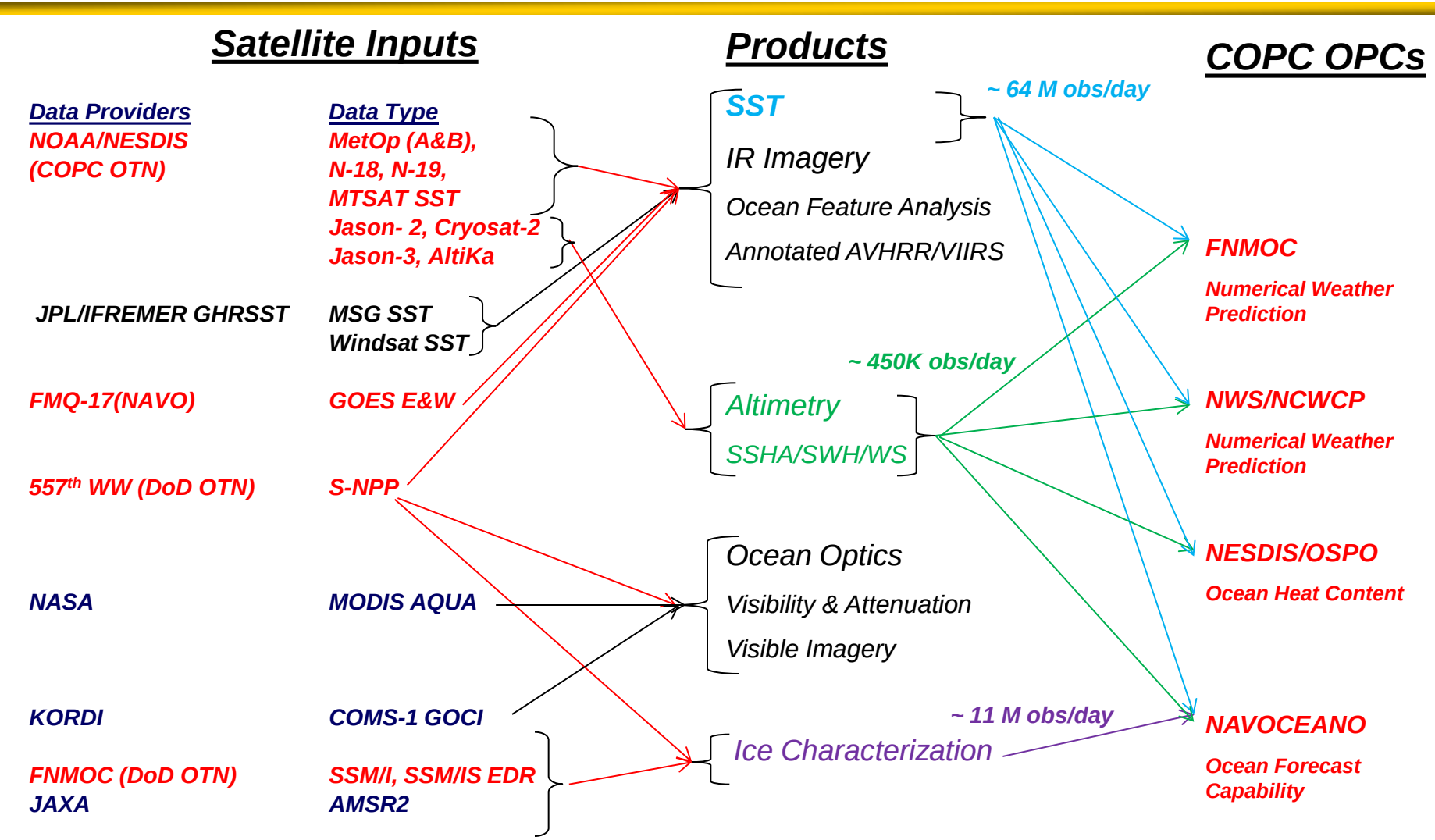
Agenda

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

In-situ Data Inputs & Impacts



Satellite Data Inputs & Impacts



NAVO JAG/CCM Related Circuit Actions

- ✓ *Upgraded NAVO to NWS Suitland, MD circuit from 28 to 400 Mbps*
- ✓ *COPC 2nd Connection*
  - *DISA implemented circuit from Buckley AFB to Boulder, CO OC-48 (2 Gbps)*
  - *Will establish alternate comms pathway*
- ➢ *NAVO's Boulder circuit pending implementation; ECD April 2016*
- ➢ *NIPRNET Federated Gateway/Mission Partner Gateway (NFG/MPG)*
- ➢ *Joint Regional Security Stack / Joint Information Environment (JRSS/JIE)*
- ✓ *Stennis DISN upgrades*
  - *Implemented diverse OC-192 circuits, provides survivability to Stennis DoD customers*
  - *Working path (south bound route) to Keesler AFB*
  - *Protect path (north bound route) to Eglin AFB*

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 relevant and timely environmental data to support operations around the globe***

Questions?