US Navy Oceanographic Requirements

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Briefing Agenda

- Introduction
- Navy Changing
- Navy Oceanography Changing
- Requirements
- Contacts

Navy Changing

- Decade of change
    - 529 to 286 Ships
    - 495,000 to 364,000 active duty personnel
    - Three quarters of Navy budget spent on personnel (970,000)
    - CNO says, must recapitalize fleet, downsize personnel to do it.

Decision Processes

Accelerated Transaction Rates

Time Sensitive Missions

Time Critical Strike

Warfighter Decision-makers

Timely METOC Observations and forecasts

METOC Impacts

Navy METOC Directorates

Anti-Submarine Warfare

Naval Special Warfare

Mine Warfare

ISR Oceanography

Increased Focus

Precise Time and Astrometry

Navigation & SSBN Ops

Fleet Operations

Maintain Excellence

Maritime Operations

Aviation Operations

Increased Efficiency

NAVAL METEOROLOGY AND OCEANOGRAPHY COMMAND

- **METOC Directorates**

- **METOC Production Centers**
  - **Naval Oceanographic Office**
  - **Fleet Numerical Meteorology and Oceanography Center**

- **Smart Collection**

- **Focused Analysis**

Observations and Rapid Environmental Assessment

Disposable, inexpensive, small, rapidly deployable, inconspicuous, real-time reporting ocean instruments.

Mobile sensors traversing surf zone.

Smart seaweed.

In situ Arctic sensors for ice drift, atmospheric pressure, and temperature fields.

National Technical Means (NTM)

Development, validation and transition of algorithms from NTM.

Emphasis on coastlines, beaches and nearshore bathymetry.

Interest in surf zone traits, currents, and wave heights and directions.

Bathymetry in Denied Areas

Ocean nowcasts and forecasts in denied areas dependent on bathymetric data. Validated methods for estimating nearshore bathymetry required.

Autonomous Underwater Vehicles (AUV)

**Increasing role in new Navy.
Needs:**

-**Guidance and Control**

- **Autonomous survey control**

- **Navigation and positioning**

- **Sensors**

- **Communications**

- **Power**

- **Deployments**

- **Simulation**

- **Environmental factors**

Sediment Classification in Denied Areas

Ability to acquire surface and subsurface sediment data in denied areas.

Sediment Electrical Conductivity

Where acoustic clutter precludes acoustic mine hunting, electrical sweeping must be used. Sediment conductivity does not vary over time of interest and can be data-based.

Techniques for collecting from AUV and other fleet assets should be developed.

Ice Edge Characterization

Daily ice analysis and forecasts required for submarine operations. Atmospheric and surface water contamination negatively impact satellite retrieval methods.

Ice Applications of Synthetic Aperture Radar (SAR)

Submarine force commanders have requested SAR imagery be used in ice analysis.

Airborne Lidar Bathymetry

Requirements:

- **Hazard/target detection**

- **Bottom characterization**

- **Tidal modeling and tide corrector application over large survey area**

- **Integrated GPS**

- **Accurate positioning of nav aids and shoreline structure**

- **Integration of additional sensors**

Sub-bottom Classification/ Characterization

Enhancements to software algorithms for characterization and classification of surface and subsurface sediments.

Optics

Strong need for remote sensing of optical properties in shallow water.

Suggest multispectral and hyperspectral applications using SeaWIFS and MODIS satellite data from NASA.

Satellite Altimetry

There is a need for better assessment of sea surface heights in shallow water from satellite altimetry.

Assessment and impact of Internal Waves on Acoustic Measurements

Development and transition of a method for accurately detecting and measuring the location, movement and amplitude of internal waves is required.

Improved Bathymetry and Hydrography Data Processing Algorithms to Improve Productivity

Quality control of hydrographic data "on the fly" in order to reduce human interaction during both data collection and processing is necessary.

SEAMAP Processing Improvements

Algorithms are needed to extract data from a chirp signal to produce high resolution seafloor images.

Improved Relative Acoustic Tracking System (RATS)

Need improved acoustic or other capability to define motion dynamics of a towed vehicle. Specifically, with regard to tow ship.

Bioluminescence Photometer Calibration Technique

Bioluminescence calibration technique or standard required. Current techniques of bacterial cultures or radioactive sources are time intensive, require laboratory facilities and are increasingly difficult to procure.

Object Overboard Recovery

Techniques for making objects in sea more visible and more easily recoverable is very desirable.

Visualization of Battlespace

Readily understood

Three dimensional

Geospatial Information Systems

Common Operational Picture

Gravity collection in littoral and denied areas

Gravity products are essential to meet needs of Inertial Navigation Systems.

Navy seeks development, implementation and transition of "miniaturized" gravity meters for installation in submerged vehicles.

Real Time Dynamic Draft Measurements

Shipboard hydrographic surveys require ability to measure and apply real time dynamic draft data in order to become more tactically ressponsive.

Effects of Migrating Fish Populations on Low Frequency Propagation Loss

Collection of geoacoustic data used in the Low Frequency Bottom Loss database are negatively impacted by migrating fish populations. Results in incorrect sub-bottom parameters.

Marine Mammals

Require autonomous acoustic recording devices in support of marine mammal monitoring. Data would be used in addition with tracking data to aid Navy acoustic testing policy decisions.

Automated Change Detection for Mine Warfare (MIW Applications)

Automated Change Detection for mine hunting operations required. The process of comparing side-scan images is currently a manual operation.
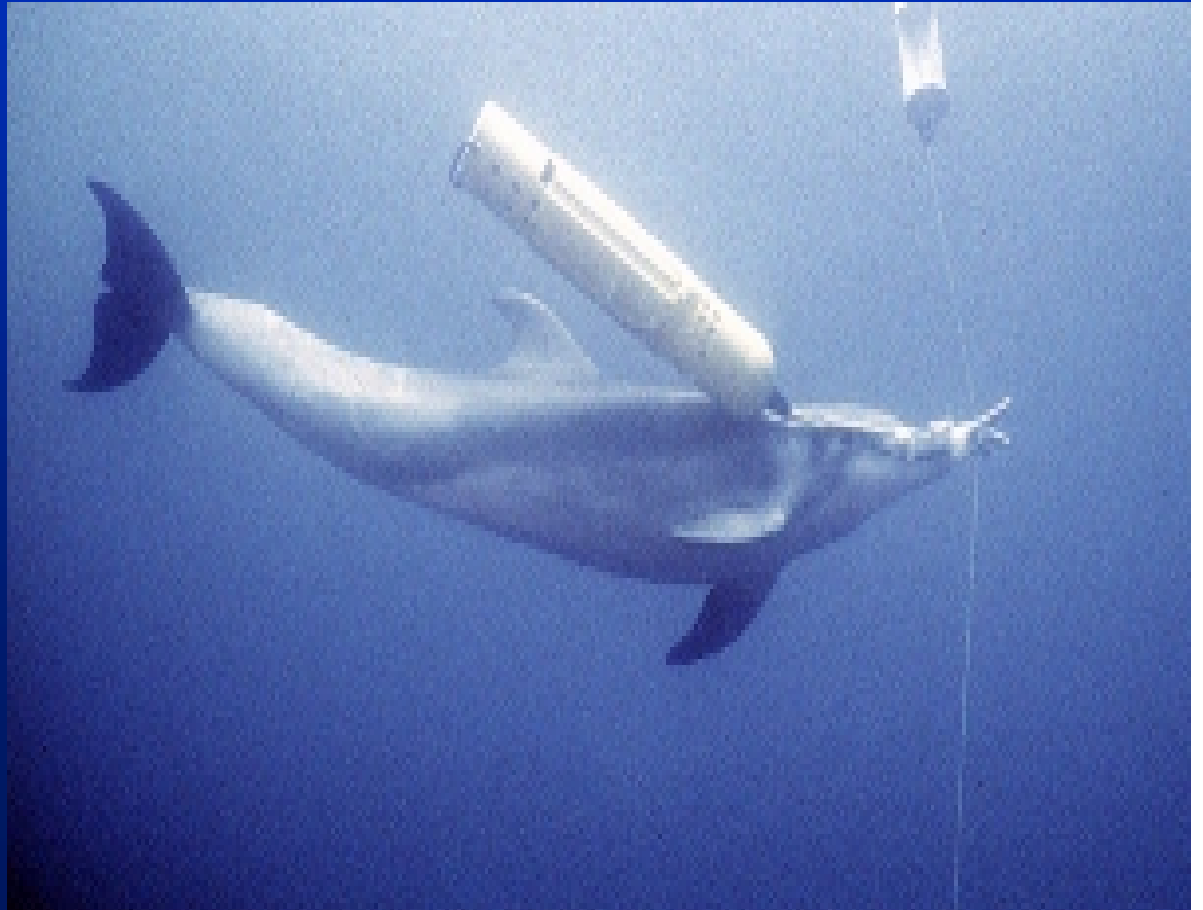
Automated Provincing of Acoustic Imagery

Algorithms required for locating specific features, including sand waves, in acoustic images, measuring the height and provincing areas based on the size of these features.

Coastal Ocean Forecasting

Improve speed and quality in two areas:

 - Forecasts of vertical sound speed structure in critical areas and associated confidence values.

 - Forecasts of ocean currents in denied, coastal using remote sensing, in situ sensing, modeling, etc.

Sea Ice and Marginal Ice Zone Prediction (Modeling & Data Assimilation)

Need exists for better techniques for forecasting convergence and divergence of ice fields as a determinant for ridging or leads.

Environmental Database Construction using "Through- the-Sensor" Combatant Data Acquisition

Received signals of combatant sonars contains untapped information about the underwater environment with every ping.

Naval combatant laser systems also have atmospheric conditions data embedded within the returning signal.

# Geoid-corrected Satellite Altimetry into Oceanographic Dynamic Models

Derivation of an accurate global geoid determined from direct gravity measurements would greatly aid in understanding dynamic height anomalies of ocean.

Ocean Bottom Geomorphologic Modeling

Requirement exists to use prevailing historical current patterns and weather patterns to model expected geomorphology. Needed to optimally design data acquisition plan.
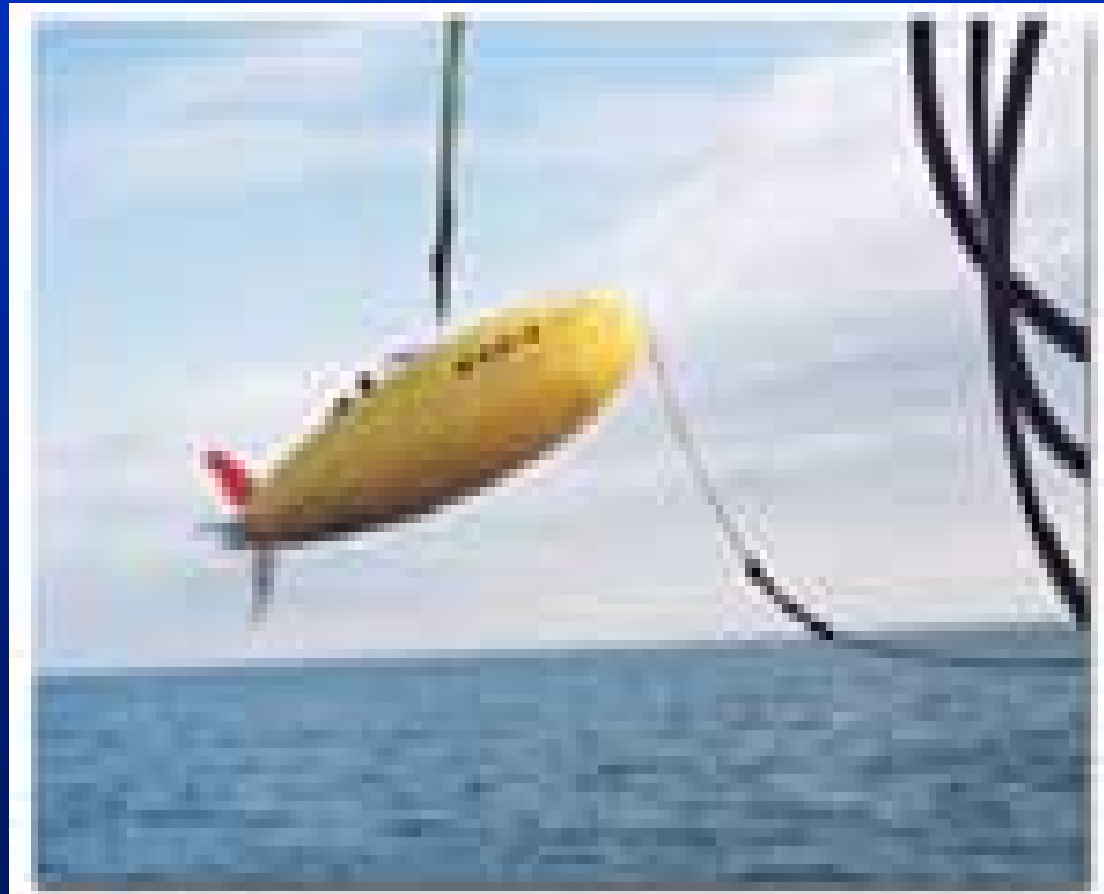
Mobile Acoustic Test Range

Need exists for a portable, retrievable acoustic test range for purposes of collecting all acoustic data necessary for advanced acoustic modeling and signal processing.

Fusion and Confidence Attribution of Bathymetric Surfaces (N4)

Need to be able to combine all sources of bathymetric data including derived, predicted, measured, and charted into a fully attributable database with confidence levels for all entries.

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