# Mine Impact Burial

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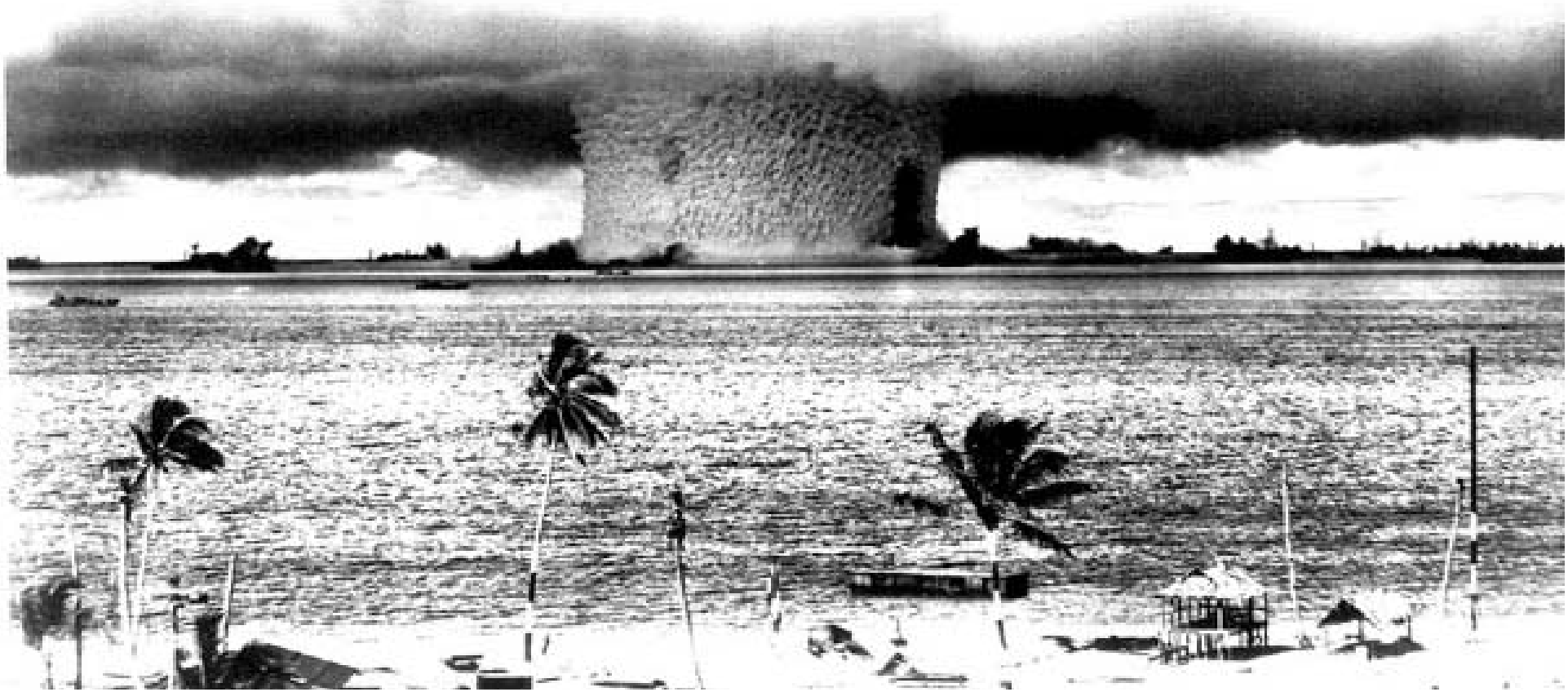


# Mine Warfare

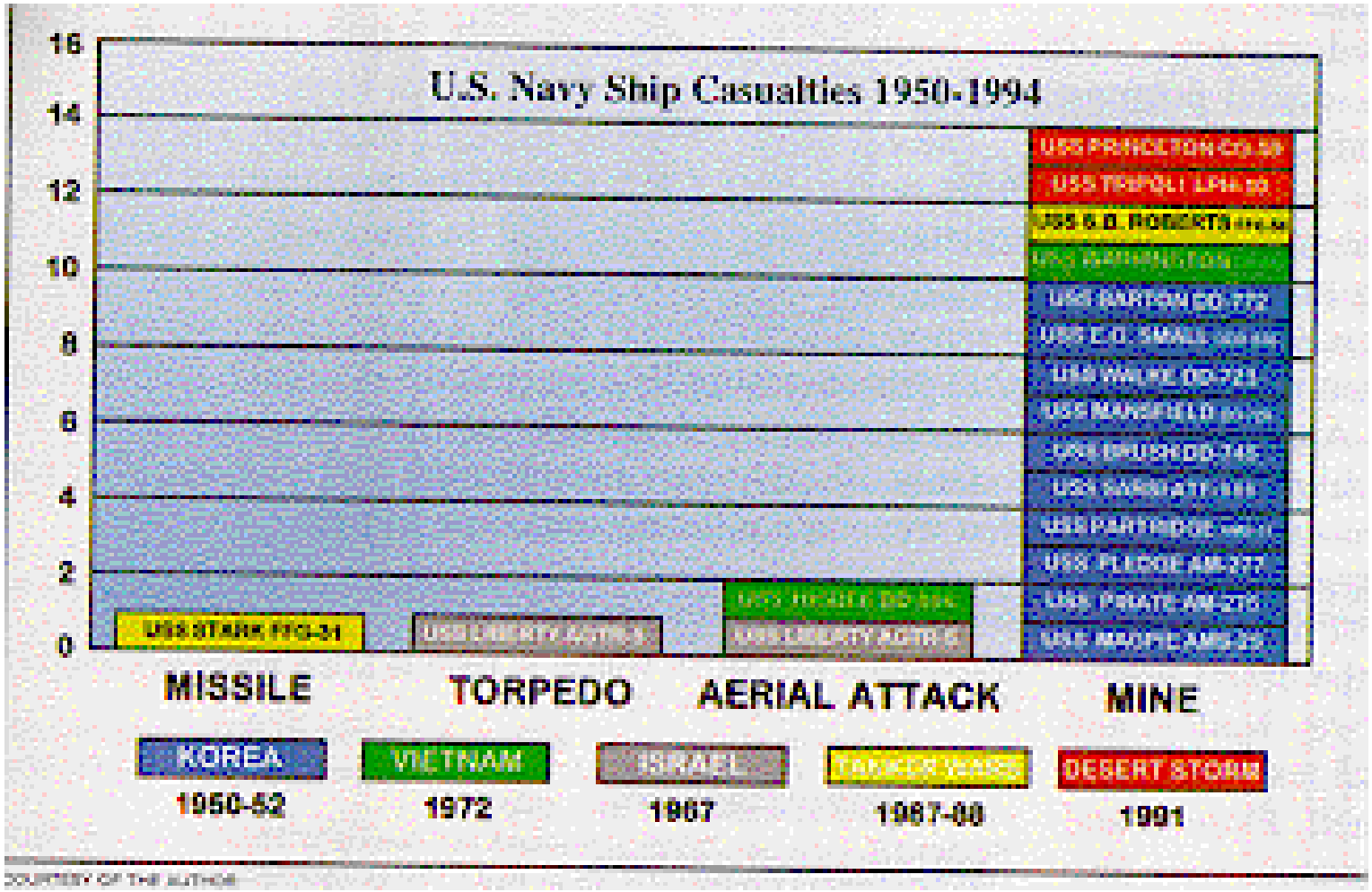
**<u>Different than other weapons systems</u>**

- Target comes to the weapon
- Weapons system activated (planted) without a specific target detected.
- Don’t have to be there for it to work.
- Can be crude and still be VERY effective
- Requires advanced planning

# US vs Mines

- Of the 18 US Navy ships that have suffered battle damage in the last 50 years, 78 per cent was as a result of mines

# U.S. vs. MINES




What It Takes To Go"Anytime, Anywhere" by Rear Adm. Horne, Proceedings, Jan 1998

# USS Tripoli (LPH-11)

# “Bad Day at Sea”

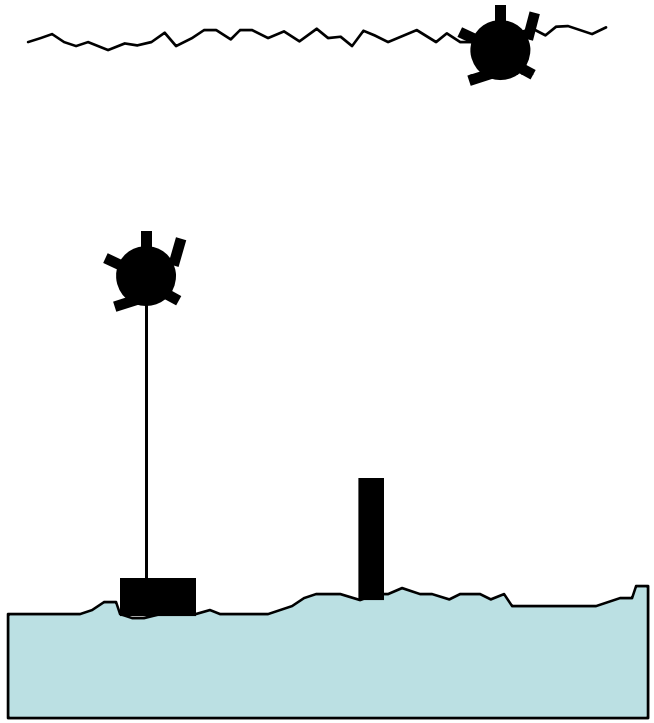
# The Mission Of Mine Warfare

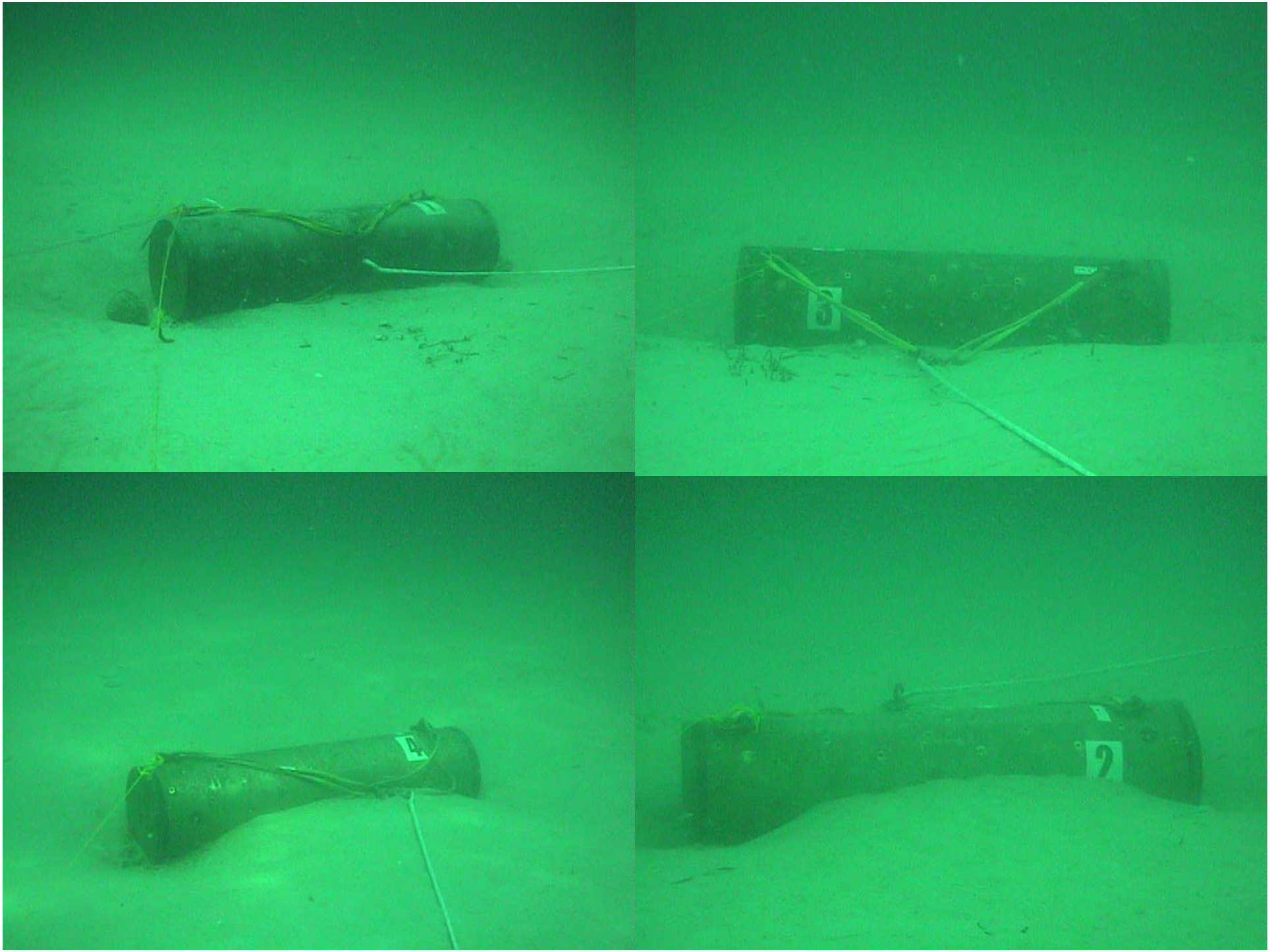
- Detect and Avoid or Eliminate mine threat (Mine Countermeasures (MCM))
- “Mining is also a force multiplier in today’s and tomorrow’s conflict scenarios....”

- Force 2001

# Classification of Mines

- By position in the water after delivery
  - Moored mines
  - Bottom mines
  - Drifting mines
- By method of delivery
  - Air-delivered mines
  - Surface-delivered mines
  - Submarine-delivered mines
- By method of activation
  - Contact Mines
  - Influence Mines
    - Magnetic
    - Acoustic
    - Pressure
    - Combination




3
4
2

# Mine Countermeasures (MCM)

- Clearing/Removing Mines
  - Mine sweeping
    - Cut cables then activate to destroy (moored mines)
    - Use acoustic/magnetic noisemakers to activate
  - Mine hunting
    - Search and neutralize individual mines
    - Use sonar then investigate every possible target.

# Sediment Conditions for MIW

**NAVOCEANO MIW Databases:**

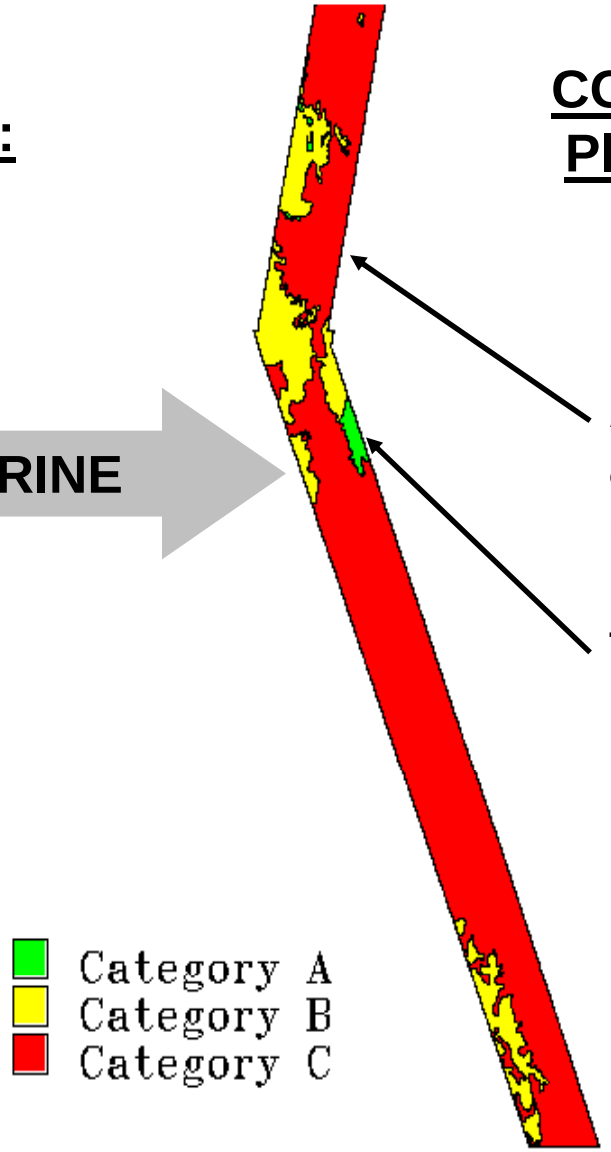
**SEDIMENT TYPE**

**MINE CASE BURIAL**

**ROUGHNESS**

**CLUTTER DENSITY**

**DOCTRINE**

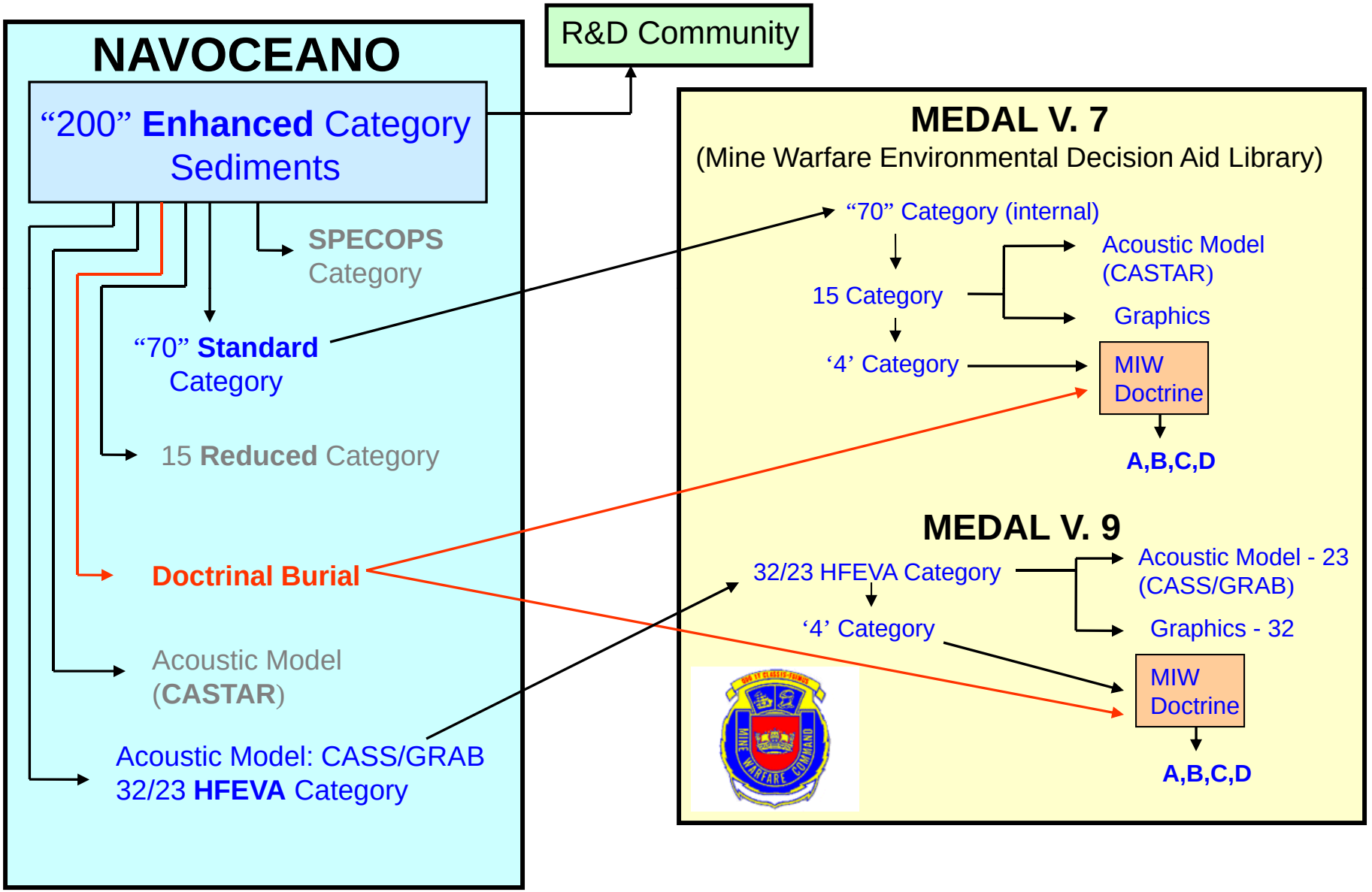


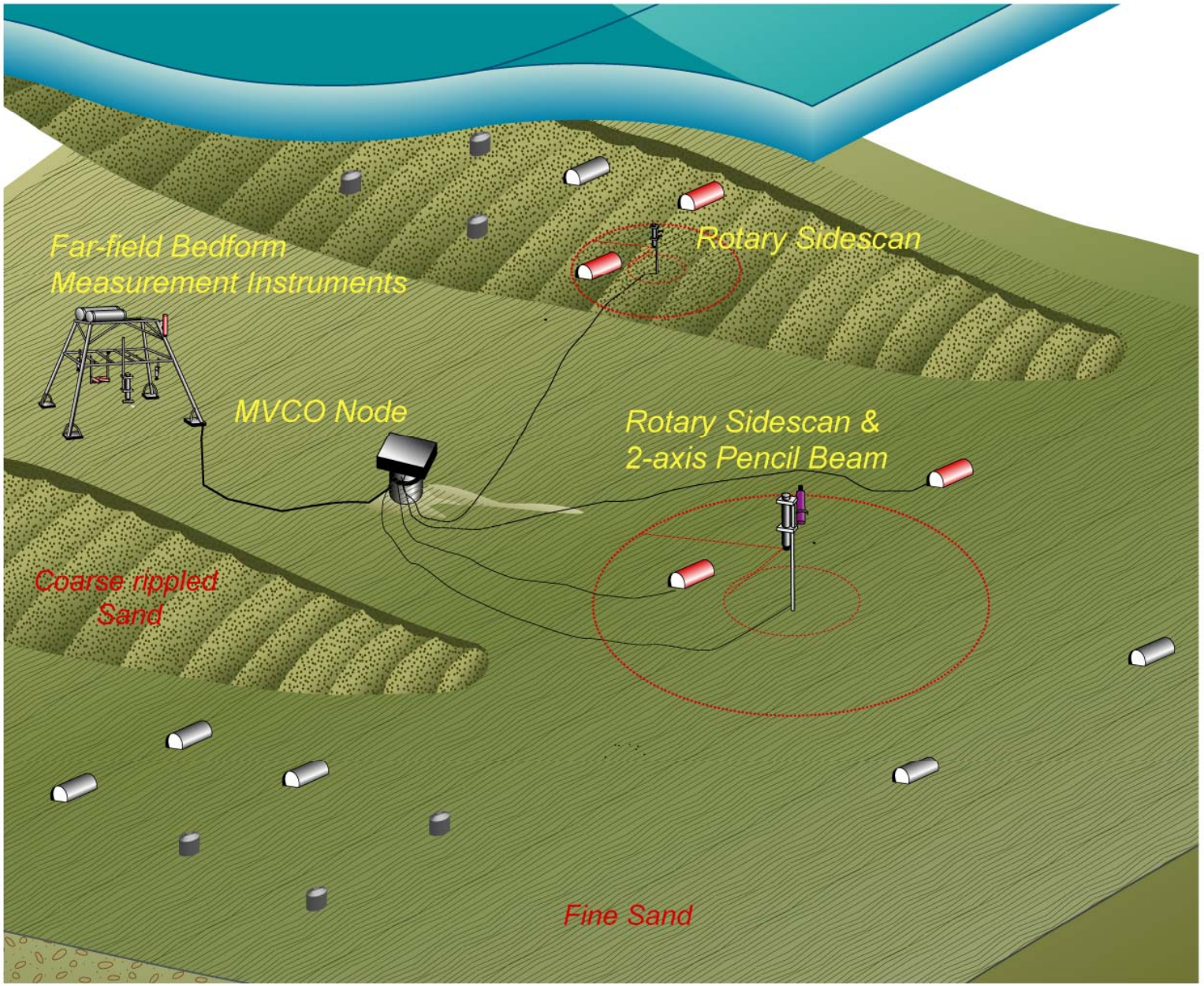

**COMINEWARCOM Planning, Tactics**

**(MEDAL)**

**A track in the red area takes 3.5 times (per unit area) longer to clear than a track in the green area.**

# DOCTRINAL MINE BURIAL CATEGORIES AND MEDAL

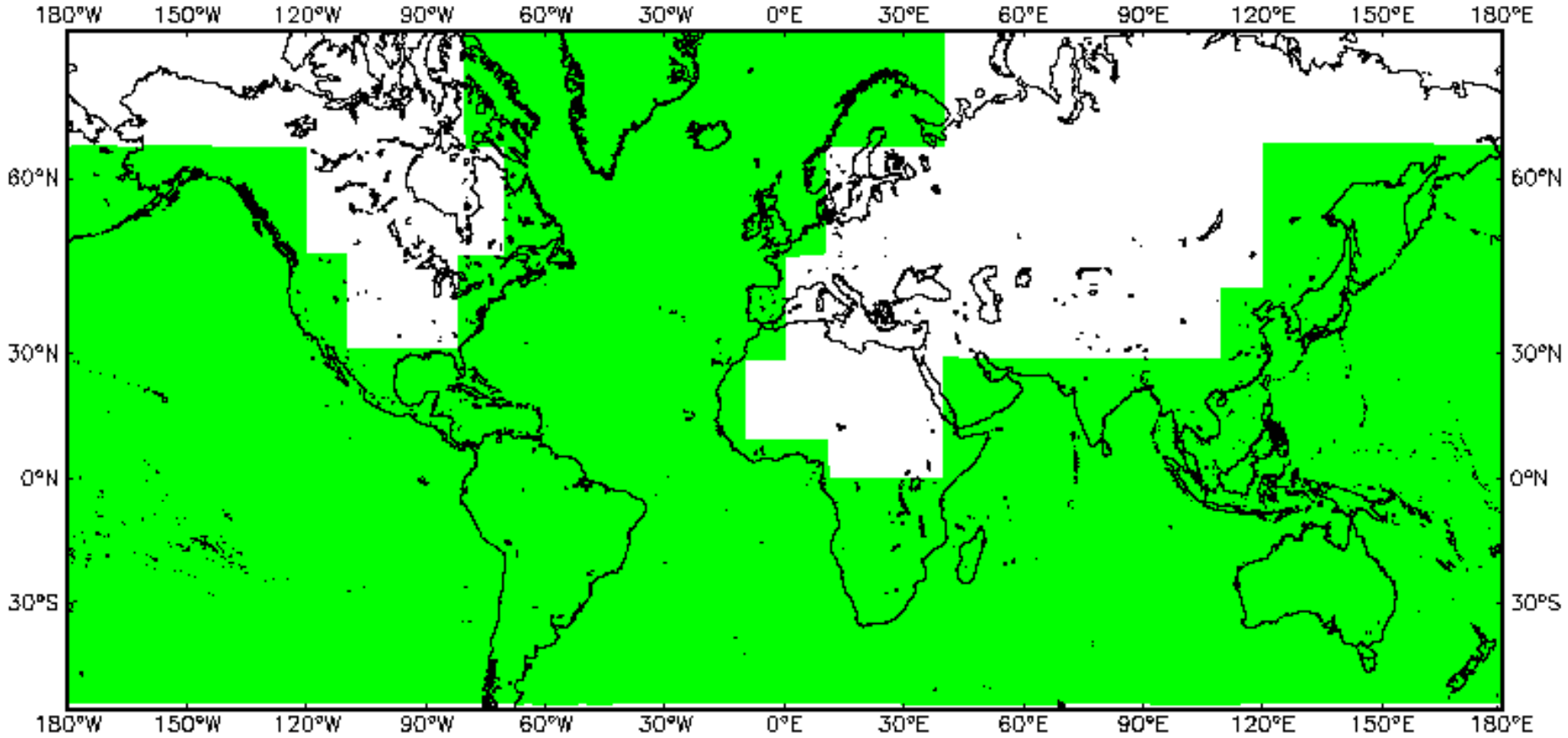



Far-field Bedform
Measurement Instruments
Rotary Sidescan
MVCO Node
Rotary Sidescan &
2-axis Pencil Beam
Coarse rippled
Sand
Fine Sand
N.R.L. Acoustic
Instrumented Mine
F.W.G. Optical
Instrumented Mine
Misc. Non-Instrumented
Mine shapes

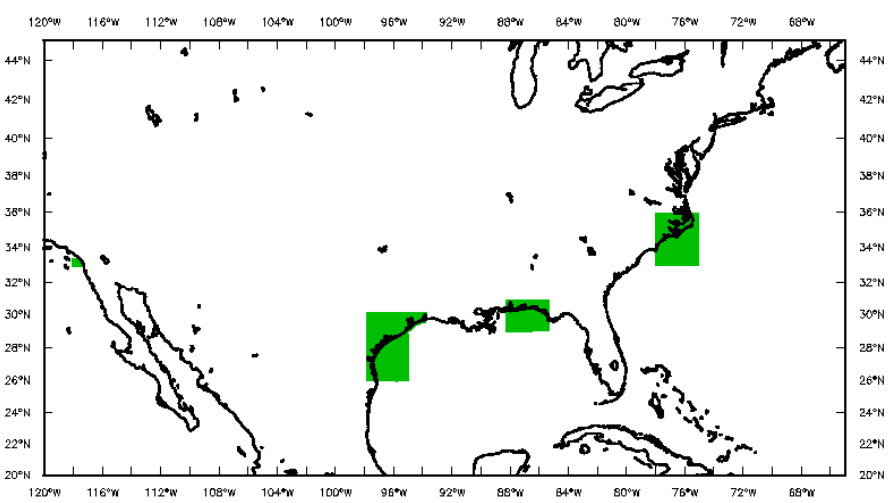
# An urgent scientific problem  in MIW

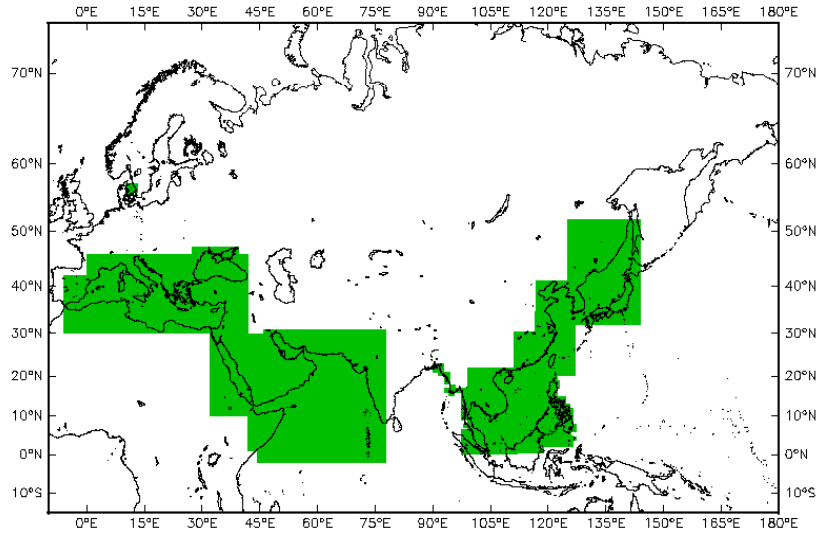
- What is the temporal-spatial variability in littoral environment (sediment, sound sped profiles, atmospheric forcing …)?

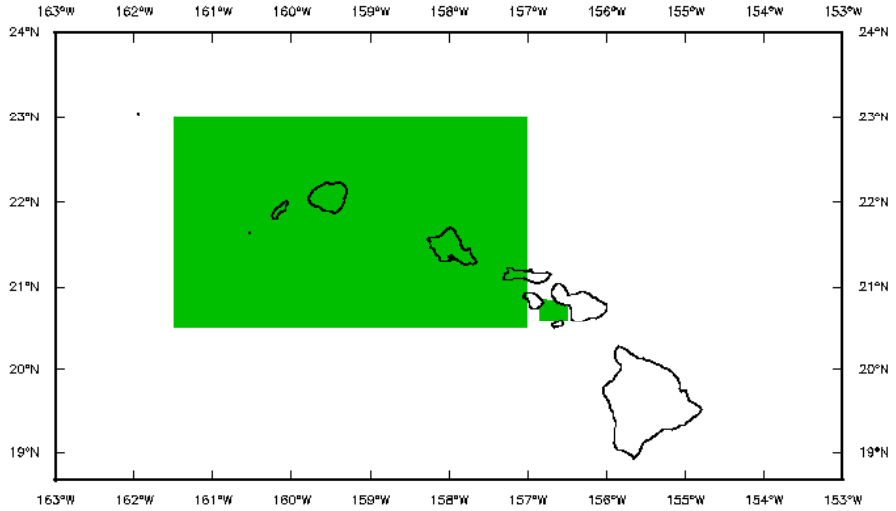
# Low (5-minute) resolutions NAVO sediment type data



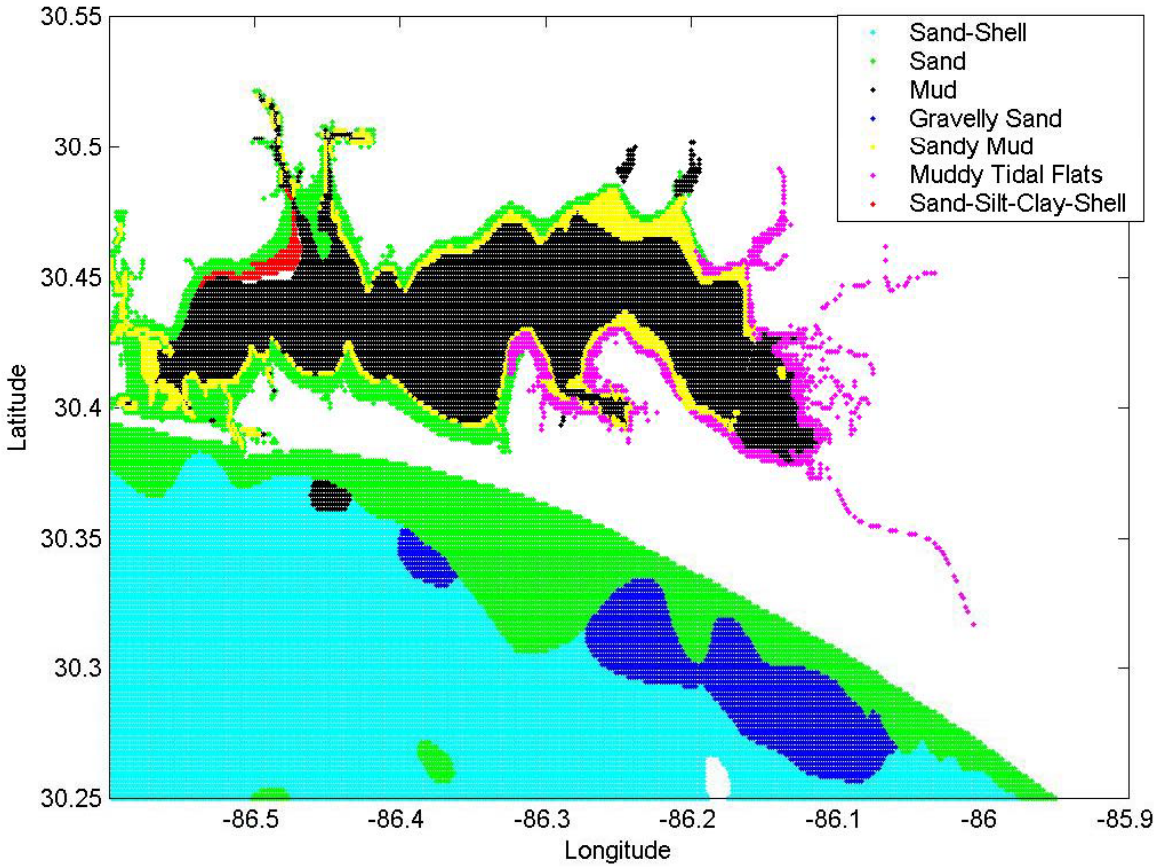
# High (~150 m) resolutions NAVO sediment type data



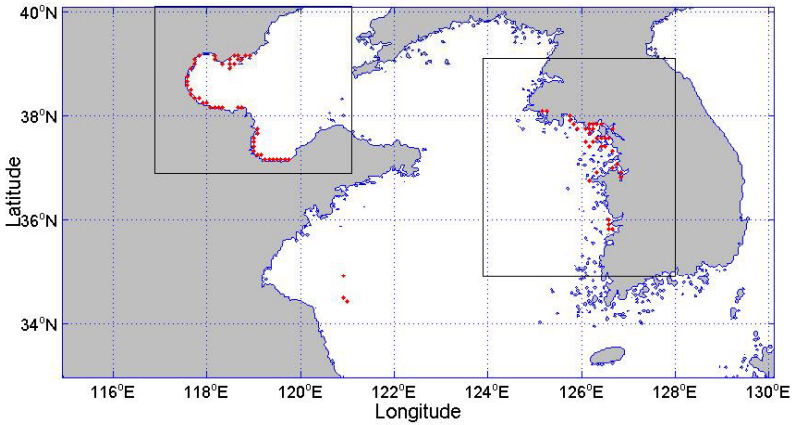



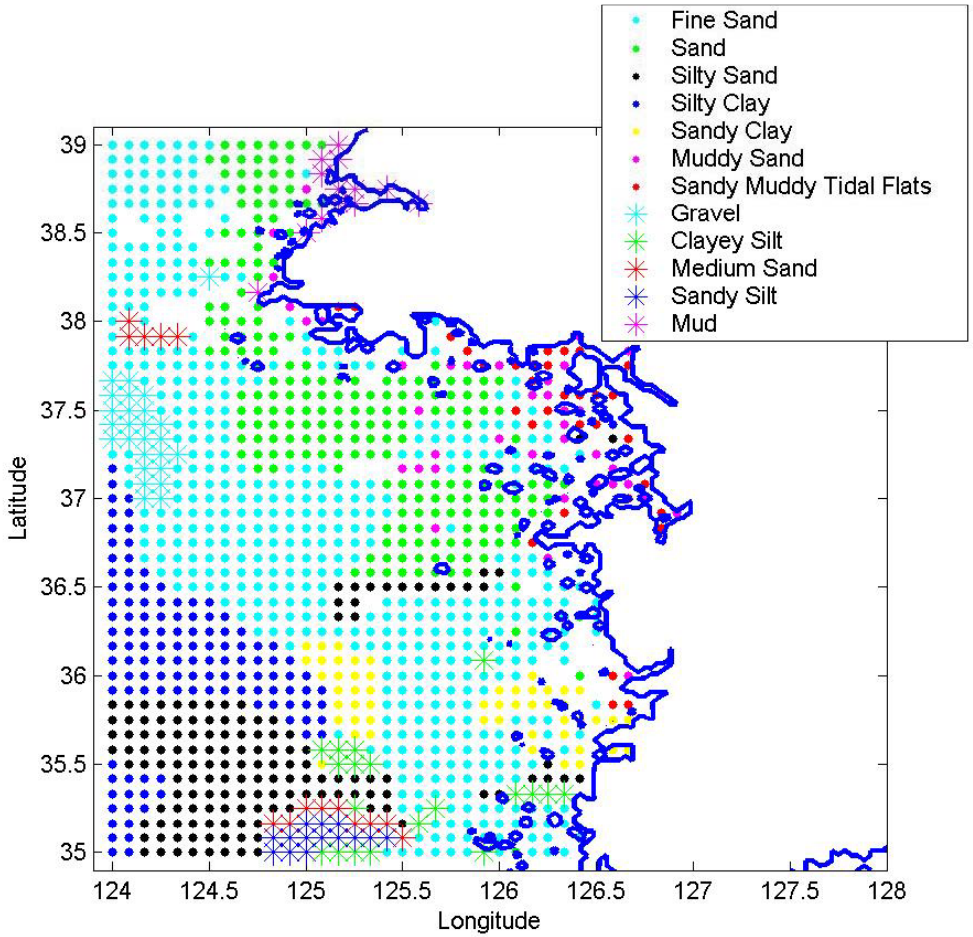



# Sediment type in the Louisiana coast (microtidal area) from NAVO's SSTDS data.

# Sediment type in the Korean coast (macrotidal areas) from NAVO's SSTDS data.



# Thesis Topic (1)

- (1) How often do we need to survey the ocean environment especially the sediment for MCM?
  - Determine the temporal-spatial variability in littoral zone using data and models
  - Survey Periodicity
  - 1-2 Students needed

# Thesis Topic (2)

- (2) Similarity analysis on  littoral environments (sediment type, sound speed profiles, atmospheric conditions, …)
  - 1-2 Students needed