Ocean.US Surface Current Initiative (SCI)

A status report by
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Ocean.US Surface Current Initiative (SCI)-Components

HF radar

HF Radar Advantages
- Wide-area coverage
- Low cost
- Real-time
- True surface observation
- Improves model skill

Other likely SCI components
Satellite-based:
- feature tracking
- surface drifters
- altimetry

Moored current meters
Data assimilating circulation models
Preamble

Surface currents are an identified high priority product for coastal ocean observing systems. Surface Current Mappers (SCMs) that broadcast and then observe back-scattered radio signals from the ocean’s surface are now an operational technology that has been implemented in numerous locations worldwide. SCM technologies, using the same back-scattered radio signals, have also produced useful surface wave and vessel-tracking data in research applications. A nested network of SCMs installed along the coast of the United States, and used in conjunction with other observations and data-assimilative forecast models, will address issues critical to the seven major goals of IOOS.

Mission

This Surface Current Mapping Initiative (SCMI) will facilitate the implementation of a nested network of SCMs as part of the national observational backbone of the Integrated Ocean Observing System (IOOS). More specifically, the SCMI will (a) promote the installation of a national network, (b) develop a framework to coordinate its operation, data dissemination, and product generation, and (c) foster research that will enhance its operational products.
SCMI Steering Committee Members

• Jeff Paduan (NPS; Chair)
• Larry Atkinson (Ocean.US; ex officio)
• Jim O’Donnell (U Conn)
• Art Allen (USCG)
• P. Michael Kosro (Oregon State Univ)
• Scott Glenn (Rutgers)
• Mark Bushnell (NOAA/NOS)
• David Musgrave (U Alaska, Fairbanks)
• Lynn (Nick) Shay (U Miami)
• Libe Washburn (UC Santa Barbara)
• Mark Luther (USF, NOAA/ACT)

Biased toward experienced HF radar users
Includes agency representatives
First meeting: September 2003
Voluminous email exchanges since
Drafting plan for wide community input,
including March 04 ACT workshop
SCMI Issue Areas

- **Governance**—How to run the system
- **Siting**—Permissions and physical location restrictions
- **Frequency Allocation**—Need primary licenses; mutual interferences
- **Products**—Value added and QC procedures
- **Research**—Continuing improvements
- **Vessel Tracking**—Dual-use capability to track ships over EEZ

...see issues papers
Proposed Backbone Network

Based on:

- Long-range systems (120-200km)
- Modest resolution (5-10km)
- ~5 sites per node
- ~100 sites (for minimal AK, HI)
Backbone Network

The real thing!

NEOS Radial Currents

222 km
Long-Term Trends
Winter 2002 average

Significant Events
A rapidly moving nor’easter

SCMI
Backbone Network—(another) living example

Three (now 4) long-range sites capture mesoscale variability out to 150 km offshore and along 1/2 of the Oregon coastline.

Continuous observations for the critical coastal regime in which satellite AVHRR and altimetry seldom or cannot see
Backbone Network—(another) living example
Backbone Network—(another) living example
CBI/TEES
Coverage of HF-Radar Along Texas Coast

- Active
- Under Construction
- Being Purchased

Coastal—13 MHz
Bay—25 MHz
Unedited map of hourly surface-current vectors off Galveston TX (11/30/03 0900 UTC)

Weak upcoast flow and an ebb tide from Galveston Bay.
# Backbone Network–Costs

<table>
<thead>
<tr>
<th>Installation of one site</th>
<th></th>
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<tbody>
<tr>
<td><strong>Hardware</strong></td>
<td>110K–150K</td>
</tr>
<tr>
<td><strong>Installation</strong></td>
<td>40K–70K</td>
</tr>
<tr>
<td><strong>Number of sites</strong></td>
<td>100–200</td>
</tr>
<tr>
<td>(depends on coverage in AK, HI, &amp; territories)</td>
<td></td>
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</tbody>
</table>

**Total Network Installation**  
$15M–44M

<table>
<thead>
<tr>
<th>Annual Operating Costs (based on 5 sites/node)</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Technicians (2/node)</strong></td>
<td>110K–150K each</td>
</tr>
<tr>
<td><strong>Materials</strong></td>
<td>30K</td>
</tr>
<tr>
<td><strong>Nodes</strong></td>
<td>20-40</td>
</tr>
</tbody>
</table>

**Total Annual Operating Costs**  
$5M–15M

*Needs to be broken into 3-5 year phased implementation
Backbone Network–Advantages

Direct advantages

Improved Search & Rescue

Improved Mitigation of Hazardous Spills

Improved Regional Circulation Models
   Ability to embed meaningful, high-resolution models

Economies of scale

HF radar-based mapping system is uniquely self contained

Advantages to central management/coordination with distributed implementation

Few advantages to distributed management/coordination
Backbone Network–Advantages through economies of scale

- All HF radar systems supply same product
  - Radial current maps can be combined regardless of manufacturer
  - Data is (practically) trivial

- Labor costs higher than hardware costs: optimize the people
  - Common training needs; Shared knowledge & experiences
  - Common required skills
    - Tech #1
      - Driver’s license
      - Basic electronic skills
    - Tech #2
      - Scripting (e.g., PERL, ftp)
      - Communications (wireless, modems)

- Calibration concerns are common
- Frequency and siting needs are common
- Remote communications needs are common
Backbone Network–Pilot Study Plan

Achieve phased implementation through a sequence of pilot studies

Ready to begin immediately given the large number of research efforts underway using SCMs

Should cover significant* area(s)

*to include several nodes so that the challenges of data exchange and reliability can be demonstrated

Should include systematic approach to frequency and siting problems

Should support parallel program in data assimilation

Should support provisions to test ship tracking algorithms
SCMI Conclusions–Timeline

Jan04

AGU Ocean Sciences Meeting

Feb04

TOS/ALSO Meeting

Mar04

NOAA/ACT

Jun04

Detailed and vetted implementation plan available

Oct04

Begin national-scale, multiple node pilot studies

Detailed SCI outline and SCMI implementation plan to NORLC and public
A national SCMI benefits everyone

RAs will do the work
RAs will get the credit
IOOS will get the credit
Users will get the products
RAs can “densify” for the marginal costs
It will cost less than the alternative of working from RAs outward
It will actually happen