SEACOOS White Paper for the Maritime Safety and Offshore Operations Theme

(First Draft, 4 JUL 05; Revised Drafts, 11 & 14 JUL 05, based, in part, on comments received from Bob Weisberg, Madilyn Fletcher, Harvey Seim, Lundie Spence, and Cj Beegle-Krause & Glen Watabayashi, NOAA/HAZMAT; Revised~~Present~~ Draft, 30 OCT 05, based, in part, on discussions at the SEACOOS Summer 05 WS; Present Draft, 8 NOV 05, based on additional comments received from Cj Beegle-Krause; provided by Chris Mooers)

Introduction. The scope of the Maritime Safety and Offshore Operations (MS&OO) Theme includes provision of the environmental information needed for Search-and-Rescue (SAR) operations; response to deleterious substance spills (e.g., oil, toxic chemicals, disaster management , and sewage); mitigation of impacts due to harmful algal blooms (HABs); safe and efficient navigation; engineering design studies for submarine pipe lines, outfalls, and offshore structures; support of forensic activities engaged in reconstruction of marine event scenarios, etc.

{NOTE: presently, MS&OO does not include activities associated with storm surge, rip currents, king waves, beach erosion, etc. in anticipation of the Waves Theme possibly morphing into a Coastal Hazards Theme.}

{NOTE: presently, MS&OO is only considering waterborne transport/dispersion. However, as our capability in coastal marine meteorology expands, we will almost inevitably also address the important topic of airborne transport/dispersion in at least the coastal marine boundary layer.}

The environmental information requirements for MS&OO include the basic physical variables (i.e., surface winds, sea state, air temperature, ambient currents, horizontal turbulent dispersion, vertical turbulent mixing, temperature, and salinity). It is essential that this information be available in real-time (within ca.1 hr delay). The information may be based upon expert analysis, climatology, synoptic (*in situ* and satellite and other remote sensing) observations, and/or numerical predictions. Typical horizontal domain scales range from 10 to 100 km, and time domain scales range from a day to a week or more. The desired horizontal resolution is 1 km or less on the continental shelf and 100 m or less in the estuaries, and the desired time resolution is 1 hr or less. The highest priority has typically been placed on surface fields; however, subsurface fields are often of importance, too, when the material of concern sinks or is mixed into the water column. For many, the environmental information is most usefully presented in a map format, while vertical and horizontal profiles and time series data are valued by others. To summarize the synoptic situation through a synthesis of all available information, “ocean weather maps” with the position of ocean fronts, eddies, and meandering jets, and particle trajectories and dispersion clouds displayed are particularly effective in conveying the essence of the environmental situation to on-the scene-commanders who are very busy dealing with the full range of operational response issues. Such synoptic ocean maps, together with conventional mesoscale marine weather charts, need to be updated several times per day. Electronic maps should be georeferenced. Downloadable fields would be

critical. Some users are capable of making their own data products; e.g., synoptic maps or run their own numerical models, but, in both cases, they need observational data and other model inputs for initialization, boundary conditions, verification, etc.

If SEACOOS is to support operational emergency response, it will have to transition to operational QA/QCed data fields with error estimates. For spill response SEACOOS will also need to align with the National ContingencyPlan (NCP), which defines the NOAA Science Support Coordinator (SSC) as the conduit for all scientific information into the Command Post and to the USCG Federal On-the-Scene Coordinator (FOSC). For disaster management in coastal areas, SEACOOS could leverage the same alignment, this time under the Emergency Support Functions defined in the National Response Plan (FEMA as lead agency, various agencies suppling the Principle Federal Official (PFO) in a particular locale).(For small incidents, SEACOOS would need to align through the state response agency.) Note that some agencies, such as the states and NOAA, serve in trustee roles as well as response roles.

MS&OO activities are generally the responsibility of governmental agencies, especially federal agencies but with some roles reserved for state agencies in state waters. In general, areas of operation are clearly defined, e.g. EPA is the lead agency for spill response on land and non-navigable water while USCG is the lead agency for spill response in navigable waters. Some of these responsibilities are accomplished with governmental employees and assets; others involve the use of contractors and their assets. Formal interagency plans exist from the national level down to the local level for MS&OO contingencies. For national disasters; such as, the response to Hurricanes Katrina and Rita, federal agencies coordinated under the Emergency Support Functions. These plans outline responsibilities, available assets, communication links, etc. These plans are the foundation for periodic training exercises, which are mainly canned exercises (i.e., not real-time) in order to efficiently exercise a particular aspect of response. However, MS&OO could work with the SSC on incorporating SEACOOS assets into drills. For example, the USCG plays a leading role in MS&OO operations and provides vehicles and satellite-tracked surface drifters for search –and-rescue. Command and control for spill response could be the Responsible Party or the USCG.

NOAA is the primary source of environmental information for the USCG. In the case of spills, NOAA/NOS HAZMAT through the SSC provides all scientific information to the USCG such as predictions of spill trajectories and fates and effects using its GNOME and ADIOS models, respectively, biological Resources At Risk, and information (including toxicity and reactivity) of the spilled products (hydrocarbon and / or chemicals) . (HAZMAT is prepared to leverage a number of data streams SEACOOS could provide; e.g., relevant circulation analysis, circulation forecasts, and real-time observations of environmental parameters.) In particular, regular overflights provide invaluable observations of spill conditions. Furthermore, NOAA/CO-OPS is developing a quick response buoy that can be deployed within 36 to 72 hrs of notification and provide real-time data. Similarly, NOAA/NWS can provide an incident meteorologist on-scene within 24 hrs with a met station. GNOME is equipped with graphics deemed useful for spill events. The commercial sector also provides spill response models; e.g., OILMAP by

ASA, which are useful in contingency planning and training exercises for oil spills within the US.ASA has also introduced a newer product, called COASTMAP, covering SAR for ports deemed important by USCG. In all these systems, the output is impressive and enticing. Clearly, there are avenues for SEACOOS to add to the data streams used during an emergency response; e.g., further SEACOOS research on how to use coastal HF radar together with circulation models to achieve a predictive capability would be useful.

There is presently no single operational model running in the strategic (continuous) mode to support MS&OO operations, including trajectory calculations, though Global NCOM is available. {NOTE: Global NCOM, run by NAVOCEANO, is presently the only USA operational ocean model that covers the entire USA coastal ocean as well as the global ocean.} However, NOAA/NCEP runs, in an operational mode, the Regional Ocean Forecasting System (ROFS) for the coastal ocean of the entire Atlantic seaboard north of the Straits of Florida. Also, NOAA/CSDL has a St. Johns River model running operationally under the 24 x 7 support of the NOAA/CO-OPS CORMS system. In the research, quasi-operational mode, SEACOOS has models available for this purpose. NOAA/HAZMAT is looking to each of the Regional Associations to provide operational regional scale models that could be leveraged during emergency response, with requirements to follow a specified subset of the IOOS/DMAC metadata standards. For example when Hurricane Katrina knocked out the source of the Navy-derived boundary conditions for the NOAA Gulf of Mexico operational forecast model, HAZMAT was able to leverage the Texas A&M circulation forecast models for the Gulf of Mexico and the Louisiana-Texas Shelf in the HAZMAT GNOME trajectory model.

While MS&OO operations must function within a national policy framework, they also need to be adapted to regional realities; e.g., differences in flow regimes. For example, in the SEACOOS domain, there is a great difference in the advection and dispersion characteristics of the broad, wind-runoff-and-tide-dominated WFS and the narrow, Florida Current-wind-and-frontal eddy-dominated EFS, with the CGB in between those two regimes.

The most critical environmental information need is for Lagrangian trajectory forecasts (with error bars), taking into account both the deterministic, slowly-varying ambient advection and the stochastic, turbulent dispersion.

SEACOOS needs to consider whether it is “marketing” to NOAA/HAZMAT, USCG/CGR&D, or state health agencies. The former two are improving their in-house capabilities. Significant spills are rare events in the SEACOOS domain. NOAA/HAZMAT may use SEACOOS assets once every few years for spill events.

Interestingly, for spill response, all SEACOOS needs to do is provide NOAA/HAZMAT with 3D time-dependent circulation fields with error estimates, and then NOAA would assume liability for the trajectory predictions.

By the way, an alternative use for these capabilities includes their application to searches for containers lost from ships, treasure hunting, ship routing, environmental management, and designs of offshore infrastructure (towers, pipelines, sewage outfalls, etc.).

Discussion. The major operational shortfalls at present are in the resolution and accuracy of synoptic Eulerian and Lagrangian surface transport estimates. Emergent capabilities (e.g., coastal HF radars and nowcast/forecast systems) from the research mode have the potential to improve operational environmental information systems. However, there is a need to improve the modeling of the time-dependence of convergence zones which define the small scales important for determining the effects of dispersant use and chemical spills. More resolution is also needed to correctly simulate the beaching of oil and the details of the mixed layer.

MS&OO events tend to be local in domain scale, though HABs on the outer shelf of the WFS, if entrained into the Loop Current, can be swept downstream and impact the EFS and CGB. Though MS&OO events can occur anywhere, they probably have a tendency to be concentrated near seaports due to the greater intensity of maritime activity and the consequent higher likelihood of accidents. As a corollary, the infrastructure for responding to MS&OO events is also more comprehensive near seaports. Since there are ca. two dozen significant seaports spanning the SEACOOS footprint, there is sufficient demand and opportunity for SEACOOS to examine these matters in a variety of regimes. Hence, the offshore neighborhoods of seaports represent potential foci for MS&OO-related activities by SEACOOS.

Throughout the SEACOOS domain there is a modicum of coastal tide gauges and meteorological stations & buoys (elements of the "national backbone") that comprise the present generation operational strategic observing system elements. In a quasi-operational mode, SEACOOS has augmented the strategic system with coastal HF radars and bottom-mounted ADCPs in testbeds fortuitously located in the vicinity of seaports. Only the USCG seems to have effective operational tactical observing systems elements; viz., air-deployable, satellite-tracked surface drifters. There should probably be a priority to have, in the R&D mode, additional rapidly-deployable, expendable observing system elements (e.g., profilers and floats) for use both in Lagrangian experiments and during MS&OO events. Such activities need to consider the NOAA/CO-OPS quick deploy buoy and the USCG SMART buoy. Note that WOCE and CODE-style drifters have limited use during oil spills because they do not move like oil (the oil always outruns them). However, MMS has demonstrated pancake and spherical buoys that move like oil on the surface.

Similarly, there may be a need to develop rapidly-deployable, very high-resolution (ca. 100 m or less) nested tactical models that can utilize the high-density tactical observations in a data assimilation mode. --- Useful lessons can be derived from the experience of the observing and modeling system response for the T/V PRESTIGE spill off Spain.

To support MS&OO operations efficiently and document the environmental information support provided, a Web-based information management system is needed that is compatible with USCG, NOAA et al. decision support systems. The USCG/SAR system is automated because it is time-critical; the NOAA/HAZMAT (also, NOAA/CO-OPS CORMS and NOAA/NWS) has a human forecaster in the loop. NOTE: SEACOOS should check out the CORMS 24 x 7 operation.

Effective approaches open to SEACOOS for advancing the state-of-the art in MS&OO activities may include

- Identify regional experts in daily analysis of local circulation within SEACOOS
- participation in agency training/demonstration exercises/drills
- execution of Lagrangian experiments within established testbeds
- a combination of the above
- optimization of access to SEACOOS (and other IOOS) data through the Web interfaces that integrate well with individual agency operations; for example, NOAA/HAZMAT has indicated a preference for use of either a GNOME format or a Live Access Server (LAS).

For full effectiveness in the MS&OO area, liaison and coordination is needed at the national, regional, and local levels with USCG/R&D Center & Department of Homeland Defense and NOAA/NOS HAZMAT, USCG District Headquarters with their HAZMAT SSCs, and local USCG units in some cases.

Plan of Action. As a first step, SEACOOS can provide NOAA/HAZMAT and USCG R& D Center with real-time observing system and modeling system data. (This has already been done with EFSIS & WERA for the Upper Florida Keys and NCOM for the Carolinas, respectively, with limited impact because data were only available as picture on web site.)

As a second step, SEACOOS can attempt to participate in agency planning/training for MS&OO exercises/drills. (This has been done with NOAA/HAZMAT (as mentioned above) with partial success.) This step requires developing protocols with concerned agencies. However, such exercises are very infrequent.

As an alternative (and preferable) second step, conduct a sequence of designed Lagrangian experiments/demonstrations to establish skill assessment /error bars in the testbeds located in the vicinity of the following ports: Tampa/Charlotte Harbor, Miami/Port Everglades, Savannah, Charleston, and Wilmington (?). These experiments would include assessing Lagrangian trajectories calculated from Eulerian models and

coastal HF radar against observed trajectories from deployed Lagrangian drifters, all done with enough replications to achieve statistical reliability. These experiments should be repeated under different seasonal and weather conditions. These results would be useful to NOAA/HAZMAT and USCG/SAR, especially if they participated in the planning, execution, and analysis phases. Some cross-training would be required. SEACOOS needs to establish the value it adds over present operational system capabilities. However, this effort may have limited impact because emergencies often happen during adverse or unusual environmental conditions.

A process should also be defined for responding to events that require timely and maximum emergency response to assess the utility of SEACOOS observation and modeling capacities. An example would have been the recent temporary "loss" of two boaters out of Charleston, SC, who were eventually found far north of USCG predictions.

There is an interest in a K-12 teaching tool for search-and-rescue and spills. The approach might entail the use (procurement) of ASA's OILMAP (and/or COASTMAP) software and the coupling of it to SEACOOS circulation models. Parts of the Florida school system have adopted GNOME as an online learning tool, so making SEACOOS data fields accessible to HAZMAT allows leveraging into that same work for educational purposes.

APPENDIX I: SEARCH and RESCUE information (HS, 6/22/05; RW, 6/25/05; CNKM, 7/11/05)

What are the coastal ocean/atmosphere information needs to support this application?

For maritime SAR, information on drift path, sea state and temperature are critical. Ideally drift is directly measured with a navigational beacon attached to vessel or individual, but when not, is estimated from currents, winds and directional waves, given some characterization of the drifter (e.g. human or vessel, windage, etc). Sea state is wave field (significant wave height and dominant period or spectrum), and sea and air temperature are important when a person is at risk.

Which federal and state agencies and private sector entities play which roles?

Led at federal level by the National Search and Rescue Committee, composed of DOD, DOI, DOC, DOT, DHS, FCC and NASA (http://www.uscg.mil/hq/g-o/g-opr/nsarc/nsarc.htm). For maritime SAR in continental US the Coast Guard runs Rescue Coordinating Centers (RCCs) associated with each district. For the SEACOOS domain this includes the Fifth (out of Norfolk VA, all of NC), Seventh (out of Miami, all of SC, GA and most of FL) and Eighth (out of New Orleans, FL Panhandle) Districts. Some contact with local CG groups and/or field units

(http://www.uscg.mil/d5/D5_Units/groups.htm; http://www.uscg.mil/d7/d7m/field_units.htm) but not sure what role they can play in tailoring SAR.---NOAA/HAZMAT becomes involved in complex SAR activities and large scale events such as airline disasters.

States: SAR in states seems focused on land SAR (fires, flooding), no obvious connection to maritime SAR. Not sure how state efforts interface with RCC activities.

Interesting hook to Eckerd College http://www.eckerd.edu/waterfront/ecsar.php

Private: seatow (seatow.com); [also seaspill…]. Not sure how much use they would have for environmental info… Many participants along coastline…

Who are the interfaces to/from the above?

SAR: Not sure of best connection to district offices, or if that is even appropriate. Mr Art Allen is in charge of SAR environmental data management and is out of Groton, CT, the Coast Guard R&D Center. Art has been active in working towards incorporation of HF radar observations into SAR environmental data and seems the most likely initial contact. NOTE: In St. Petersburg both Luther and Weisberg have made contact with the local CG unit, but with so much personnel turnover it has been difficult to maintain any continuity. Hence we are not used as a resource for SAR. This point of local contact problem is one that must be surmounted.

SEACOOS needs to consider what it could provide SAR on the time scale of **minutes**.

In the short term what can SEACOOS provide that is otherwise not available at present?

In situ observations of currents from fixed moorings, remote estimations of currents from HF-radar and analysed satellite products, modeled currents from numerical circulation models, sea and air temperature data, and winds (point measurements and fields). The ability to integrate current fields in time and space to arrive at pathlines is critical. This requires adequate model representations along with sufficient HF-radar coverage and in situ measurements outside of the radar footprint (either nearshore where radars do not measure or far offshore beyond the radar range). Adequate model representations require a sufficiently implemented and tested model, plus sufficient forcing fields (surface winds, heat flux, open boundary values) to drive the model (a perfect model will give erroneous results if driven by imperfect forcing fields). A critical component of COOS, as it is for SAR or any other application, is the surface wind field since all model applications depend on this. A substantial increase in the number of coastal ocean moorings is needed to observe the wind regime transitions from sea to land in order to improve on the regional atmosphere models' ability to forecast coastal ocean winds fields and hence the regional oceans models' ability to forecast the currents. NOTE: this requirement has not really been established rigorously, though it could be; a metric is needed; e.g., rmse of predicted surface particle trajectories.

Quality control and 24 x 7 support are essential, especially if things go wrong with a search. SEACOOS needs to arrange with the USCG or NOAA to cover for the liability issues.

What steps need to be taken to make this information available to identified users?

For sea surface temperature: basically there – need some error estimate for OI/EOF fields, then make available. I believe the best route is to make information available for inclusion in the CG Computer Assisted Search Planning (CASP) system.

Believe existing system (CASP) relies on NOAA data feeds, but which ones is unclear. May be that pushing obs to NDBC and the GTS makes them available to CG SAR – need to confirm this.

For currents: complete assembly of data within SEACOOS region; should include HF radar, ADCPs, drifters. Need to establish some initial QAQC/error, and find out how best to make it available to CG (RCCs?)

We also need a clearer path between those charged locally to apply SAR tools and the data providers. Timeliness is essential to SAR success so linkages must be established in advance of a specific SAR need.

What are some ideas on longer term actions in support of the application?

1) Improved and validated circulation models, improved wave measurement and modeling program may be of interest… Suggested prioritization is: improved wind fields, increased in situ currents and HF-radar currents, improved modeled current fields. Waves are secondary to these other factors, as is temperature (which for survival purposes we know sort of good enough). The in situ winds and currents go hand and hand since they can be jointly sited. Array design must have a local flavor since all shelf geometries are different. The near shore is the region of estuarine influence with salinity (density) gradients that affect the flow fields. This region is not genrally covered by long range CODAR or WERA so it requires its own mooring program. The inner shelf is the region of coastal jet response so it must be resolved. The outer shelf to shelf break and slope are strongly affected by deep ocean forcing so it must also be resolved. These regions blend together on narrow shelves, whereas they may be distinct on broad shelves. Stratification is also impotant since inertial oscillations can be very large (order a knot) and this can be very misleading when planning a search (you could look in the wrong direction if a beacon is tossed when the inertial oscillation is on the opposite phase relative to were the wind is blowing.

2) (from Lundie Spence/COSEE) – a web-based SAR exercise for students

RW: When it come to life and death issues I don't know if this is the area for student exercizes. There are many other more tasteful uses of COOS information, jus tmy opinion.

3) connection to pilots organizations throughout the region. We need the ardent support of such groups, but the line of communications and responsibilities must be firmly established. If it is the role of the CG then we must endeavor to play a supporting role to the CG, not blur the lines of responsibility. I think that goes for all such societal applications where clear lines are drawn, Hurricane storm sure for instance – we should endeavor to improve the information available for NOAA and Emergency Managers, not supplant that information.

APPENDIX II: SEACOOS Summer 2005 Workshop Discussion.

MARITIME SAFETY AND OFFSHORE OPERATIONS THEME INTRODUCTION (Chris Mooers)

Scope: Real time nowcasting/forecasting (hindcasting and simulations)
Concerned with environmental info to support SAR operations; (oil, toxins, sewage, etc.) spill response; HAB mitigation, forensic activities; possibly also include maritime safety for shippers and boaters & coastal hazard mitigation, e.g. storm surge, rip tides – merges with "waves application.".

Environmental info needs:

- Real time basic physical variables, e.g. winds, currents, sea sate, temp & salinity, turbulence in vertical and horizontal, coastal sea level (tides, storm surge, waves and surf, inundation).
- 2D and 3D Lagrangian trajectories
- Synoptic "ocean weather" maps with fronts, eddies, and meandering jets – front information is important to SAR and fisheries people because material accumulates there—very hard to model
- Domains: Typically small: 10 to 100 km; 1 to 30 days; sometimes exceptions, e.g. Exxon Valdez
- Resolution requirements are generally rather high: 0.1 to 1 km; 10 to 100 minutes; important that information is received quickly and includes error limits
- QA/QC required, including error bars

Users:

- NOAA: CO-OPS, HAZMAT, WFOs, et al.
- USCG
- State and county emergency managers
- Shippers, boaters, and fishers
- Coastal tourism operators
- Treasure hunters and lost container searchers
- Offshore infrastructure designers
- Value-added environmental industry, e.g. ROFFS ocean fish forecasting, commercial weather forecasters

Compounding/confounding factors

- MS&OO activities are generally the responsibility of government, so relatively new activities for academia and needs to find role
- There is a national contingency plan (NCP) that assigns NOAA the Science Support Coordinator (SSC)role
- Also, USCG plays the role of federal on-the-scene-commander (FOSC) for SAR and spills
- No national strategic ocean model in use yet to support MS&OO

- There is no concept-of-operations in place at the national, regional, and local levels for environmental info on a regular basis. This is an impediment to progress.

Strategic considerations:
For spill response, if SEACOOS provides NOAA/HAZMAT 4D circulation fields with error bars, NOAA will assume liability.

- If models can be coupled to coastal HF radar data to provide forecast, that could be a significant contribution
- Modeling improvements are needed for frontal convergences, mixed layer depth dynamics, and oil beaching, according to NOAA HAZMAT
- MS&OO events tend to be on local scale
- Our test beds are located near seaports, the most probable loci of MS&OO events
- NOAA/CO-OPS has a new Quick Response Buoy; USCG has a new Smart Buoy; their fit to SEACOOS is unknown
- NOAA has several portals that are possible interfaces (NDBC/HAZMAT/CO-OPS/CORMS/NCDDC) for automated, real time SEACOOS information
- Coordination at national, regional, and local levels with NOAA and USCG may be required (CONOPS needed)

Possible approaches

- Participate in agency training/demonstration exercises/drills – how do we do that?
- Execution of Lagrangian experiments centered on existing testbeds, then relay information to federal agencies
- Combination of the above
- Web interfaces compatible with NOAA, etc., operations (e.g. NOAA HAZMAT prefers GNOME, Live Access Server – LAS)

Plan of Action

- Provide NOAA/HAZMAT and USCG R&D center with real time info
- For orientation, participate in agency planning/training (protocols are needed)
- Preferably, conduct a sequence of Lagrangian experiments based on SEACOOS testbeds under differing conditions
- Process needed for testing value-added by SEACOOS response to MS&OO events
- Cultivate private sector partners for broader applications

Afterthoughts

- Important details on USCG regional infrastructure should be understood
- NOAA infrastructure is differently oriented
- Surface wind field is a critical determinant in all these matters; continuing effort is needed to quantify the quality of surface wind estimates in a period of rapid advances in operational mesoscale NWP by NWS and Navy
- SEACOOS modeling needs to emphasize validation and verification
- Also need links to marine pilots and port captains associations, et al.

Comments
Frank Muller-Karger: perhaps place to do test is in the states themselves, rather than look to feds
Pat Welsh: There is no oceanographic authority for connecting with other agencies. White House starting to address
Bob Weisberg: need to establish partnerships up front
Andy Shepherd – haven't talked much about the DoD contributions/involvement in SAR and MS&OO
Ray Toll: Don Roman and Ray Toll have been assigned to train and run exercises. Navy has huge interest in marine exercises and NFRA is starting to build connections. Navy watching development of IOOS closely. Need to develop relationship with Naval Meteorology and Oceanography Command.
Bob Weisberg: A given solution won't satisfy all regions. E.G. HF radar will work in some regions, not others. So need test beds in a variety of conditions. Also need to remember that currents are 3D– can't just track things on the surface.

CASE STUDY PRESENTATION

Search & Rescue Planning (Art Allen, USCG/DHS, Arthur.A.Allen@uscg.mil**)**
We're responsible for very large portion of Pacific and Atlantic.
Typically run 30,000-40,000 cases per year Save on average 10 people per day. Lose about 2 people per day, plus another 1 per day that cannot be accounted for.
Here in District 7: Save over 1000/year.
At operation center, need about 7 people for 24/7.
Build SAR case → Assemble search plan (where are they likely to be now?) (OOS information is valuable for understanding how to develop search plan) → disseminate search plan → capture search results (often not successful → evaluate what can be done differently to be successful)
New search planning process + SAROPS. In development. Begin to test in October.
Between now and then, populate the EDS (mainly surface currents and surface winds). Also need surface waves, meteorological parameters.
Env fields:

1. Drift – 10 m winds, 1.0 m surface currents, uncertainties
2. Survival – SST, waves, surface air temp
3. Detection – visibility, humidity, clouds, precipitation

Example of SAR case: Sat. May 5, 2001: Chesapeake Bay.
Warm, soft breezes, followed by cold dry front at 5:30 pm. Then: number of disabled boats: 12 incidents. Two boats not found. On one boat, two lost. Two others found and saved.
SAR tools – now improved: Run model, use ADCIRC tidal currents

Comments

Mark Luther: where do you get current model information?
Art Allen: right now, choose one current product and one wind product. In future, hope to be able to enlarge that.
Chris Mooers: Who runs ADCIRC for them?
Art Allen: It's just tidal. Winds were historical winds from C-MAN station at a state park. Big lesson: must provide information in way that can be accepted by user. They have to pull the information (firewalls).
Harvey Seim: What kind of tools for offshore?
Art Allen: getting global NCOM and use Arthur Mariano's ship drift files.
Tom Cook: Do you identify yourself to folks that you're pulling data from?
Art Allen: they need to be able to get best available data. If data sources go down, they'll go back to the models.
Brian Haus – they also can modify sampling.

BREAKOUT SESSION

Search and rescue/hazardous materials (Gary Ott, NOAA, HAZMAT Science Support Coordinator)

1. Helplessness

    - We pretend to clean up oil spills.
    - Clean up is actually around 10 percent.
    - Need to determine how to not do more damage by cleanup attempts.

2. Scale

    - Exxon Valdez
    - Desert Storm

3. How do you participate?

    - Get involved with NRP – National Response Plans
    - Federal law enforcement, homeland security – no public outreach concerns or capabilities.
    - In an emergency situation, costs are reimbursed to emergency response team personnel

Area contingency plans – USCG. Need to be involved as they are created. Have quarterly meetings. There are a contingency plans for each marine safety office or sector commands. FL has been proactive in becoming involved.

When people are angry they cannot hear. Working with USCG to devise methods of interaction that minimize conflicts (booths with experts – one-on-one).

Homeland security – the person who gets their map/digital GIS there first wins.

Micro spills – need high resolution data to locate. 98 % of spills are small.

Comments

Chris Mooers: Need synoptic ocean maps, like weather maps

Art Allen: USCG data from drifters (SLDMBs). MOU is in process to make data available through NDBC. 900 drifters currently is use, hoping to increase number

Gary Ott: Lack of communications between USCG and observational scientists. Rapid turnover within USCG increases problem. Need a better data connection, rather than relying on correspondence.

Art Allen: Environmental Data Server pulls data into USCG system daily and is probably the best method of contributing to USCG database.

Art Allen: A SEACOOS public ocean weather terminal that shows conditions at all times may be a good idea.

Art Allen: Might SECOORA of the future include an operations center that bridges the gap between SEACOOS data and USCG, DOD, DHS, etc.?

Art Allen: UCONN/URI/Rutgers contract with USCG (over now) – 1) CODAR data for Block Is. Sounds system; 350 current meters, 2) drifter vs. CODAR predictions, 3) long range comparisons between CODAR and drifters.

Art Allen: Operational data vs. academic data – difference is often a subjective call by the USCG person using the data.
Short-term action items:

- Models/error estimates -- construct an error estimate field before sending to USCG
- Models AND observations have errors
- Focus on testbeds to conduct Lagrangian drifter experiments off Tampa, Miami/Port Everglades, Charleston, and Wilmington.
- Micro spills – need high resolution data to locate. 98 % of spills are small.
- Coordinate with Cuban exodus to provide more drifters
- Explore HF radar to track recreational and go-fast smuggling boats -- Environmental data and Homeland Security connection? HS wants a picture of the ocean with location of all vessels approaching the coast, vessel tracking.

- How to engage DHS on vessel tracking? Counter narcotic and terrorism /DHS funds CODAR systems. Does not work well with small vessels.
- USCG does conduct case studies of SAR events that are not successful to look for lessons learned.

Roster for Search and Rescue/Hazards Breakout Session
Chris Simoniello
Katie Greganti
Alex Barth
Inkweon Bang
Joshua Young
Gary Ott
Heather Holm
Gracie Kennedy
Luke Stearns
Barbara Spector
Jack Thigpen
Jesse Cleary
Dwayne Porter
Jennifer Dorton
Rob Bassett
Earle Buckley
Michelle McIntyre
Michael Muglia
Brian Blanton
Jay Blaire
Sandy Bernard
Cliff Merz
Alex Soloviev
Arthur Allen
Tom Cook
Chris Mooers
Mark Luther
Pat Welsh

PLENARY SUMMARY

Marine Emergency Management Applications Team (26 JUL 05)

Chris Mooers, RSMAS/UM Chair

INTRODUCTION

DISCUSSION

PLAN-OF-ACTION

APPENDIX

INTRODUCTION

SCOPE

REAL-TIME NOWCAST/FORECAST

(ALSO,HINDCAST/SIMULATE)

ENVIRONMENTAL INFO TO SUPPORT

- SEARCH-AND-RESCUE OPERATIONS
- OIL, TOXINS, SEWAGE, ETC. SPILL RESPONSE
- HARMFFUL ALGAL BLOOM (HAB) MITIGATION
- FORENSIC ACTIVITIES
- MARITIME SAFETY ???
- COASTAL HAZARD MITIGATION ???

ENVIRONMENTAL INFO NEEDS

•REAL-TIME: BASIC PHYSICAL VARIABLES {E.G., WINDS, CURRENTS, SEA STATE, TEMPERATURE & SALINITY, "TURBULENCE", COASTAL SEA LEVEL [TIDES, STORM SURGE, WAVES & SURF; INUNDATION]}

•2D & 3D LAGRANGIAN TRAJECTORIES

•SYNOPTIC "OCEAN WEATHER" MAPS WITH FRONTS, EDDIES, & MEANDERING JETS

•DOMAINS: 10 TO 100 KM; 1 TO 30 DA.

•RES: 0.1 TO 1 KM; 10 TO 100 MIN.
•QA/QC; ERROR BARS

USERS

•NOAA (CO-OPS, HAZMAT, WFOs, ET AL.)
•USCG
•STATE & COUNTY EMERGENCY MANAGERS
•SHIPPERS, BOATERS, AND FISHERS
•COASTAL TOURISM OPERATORS
•TREASURE HUNTERS & LOST CONTAINER SEARCHERS
•OFFSHORE INFRASTRUCTURE DESIGNERS
•VALUE-ADDED ENVIRONMENTAL INDUSTRY
•WEATHER BROADCASTERS

COMPOUNDING/CONFOUNDING FACTORS

•MEM ACTIVITIES ARE GENERALLY THE RESPONSIBILITY OF GOVERNMENT
•FOR EXAMPLE, THERE IS A NATIONAL CONTINGENCY PLAN (NCP) THAT ASSIGNS NOAA THE SCIENCE SUPPORT (SSC) COORDINATOR ROLE
•ALSO, THE USCG PLAYS THE ROLE OF FEDERAL ON THE SCENE COMMANDER (FOSC) FOR SAR & SPILLS
•NO NATIONAL STRATEGIC OCEAN MODEL IN USE (YET) TO SUPPORT MEM
•THERE IS NO CONCEPT–OF-OPERATIONS IN PLACE AT THE NATIONAL, REGIONAL, AND LOCAL LEVELS FOR ENVIRONMENTAL INFO ON A REGULAR BASIS

DISCUSSION

STRATEGIC CONSIDERATIONS

FOR SPILL RESPONSE, IF SEACOOS PROVIDES NOAA/HAZMAT 4D CIRCULATION FIELDS WITH ERROR BARS, NOAA WILL ASSUME LIABILITY

•IF MODELS CAN BE "COUPLED" TO COASTAL HF RADAR DATA TO PROVIDE FORECASTS, THAT COULD BE A SIGNIFICANT CONTRIBUTION
•MODELING IMPROVEMENTS ARE NEEDED FOR FRONTAL CONVERGENCES, MIXED LAYER DEPTH DYNAMICS, AND OIL BEACHING, ACCORDING TO NOAA HAZMAT
•MEM EVENTS TEND TO BE LOCAL, ON THE SCALE OF SEACOOS TESTBEDS

DISCUSSION

STRATEGIC CONSIDERATIONS(2)

•OUR TESTBEDS ARE LOCATED NEAR SEAPORTS, THE MOST PROBABLE LOCI OF MEM EVENTS

•NOAA/CO-OPS HAS A NEW QUICK RESPONSE BUOY; USCG HAS A NEW SMART BUOY; THEIR FIT TO SEACOOS IS UNKNOWN
•NOAA HAS SEVERAL PORTALS THAT ARE POSSIBLE INTERFACES (NDBC/HAZMAT/CO-OPS CORM/NCDDC) FOR AUTOMATED, REAL-TIME SEACOOS INFO
•COORDINATION AT NATIONAL, REGIONAL, AND LOCAL LEVELS WITH NOAA AND USCG MAY BE REQUIRED [CONOPS NEEDED]

POSSIBLE APPROACHES

•PARTICIPATE IN AGENCY TRAINING/ DEMONSTRATION EXERCISES/DRILLS

•EXECUTION OF LAGRANGIAN EXPERIMENTS CENTERED ON EXISTING TESTBEDS

•COMBINATION OF THE ABOVE

•WEB INTERFACES COMPATIBLE WITH NOAA, ETC. OPERATIONS (E.G., GNOME, LIVE ACCESS SERVER (LAS))

PLAN-OF-ACTION

•PROVIDE NOAA/HAZMAT & USCG R&D CENTER W/REAL-TIME INFO
•FOR ORIENTATION, PARTICIPATE IN AGENCY PLANNING/ TRAINING (PROTOCOLS ARE NEEDED)
•PREFERABLY, CONDUCT A SEQUENCE OF LAGRANGIAN EXPERIMENTS BASED ON SEACOOS TESTBEDS UNDER DIFFERING CONDITIONS
•PROCESS NEEDED FOR TESTING VALUE-ADDED BY SEACOOS RESPONSE TO MEM EVENTS
•CULTIVATE PRIVATE SECTOR PARTNERS FOR BROADER APPLICATIONS

APPENDIX

•IMPORTANT DETAILS ON USCG REGIONAL INFRASTRUCTURE
•NOAA INFRASTRUCTURE IS DIFFERENTLY ORIENTED
•SURFACE WIND FIELD IS A CRITICAL DETERMINANT IN ALL THESE MATTERS; CONTINUING EFFORT IS NEEDED TO QUANTIFY THE QUALITY OF SURFACE WIND ESTIMATES IN A PERIOD OF RAPID ADVANCES IN OPERATIONAL MESOSCALE NWP BY NWS AND NAVY
•SEACOOS MODELING NEEDS TO EMPHASIZE VALIDATION & VERIFICATION
•ALSO NEED LINKS TO MARINE PILOTS AND PORT CAPTAINS ASSOCIATIONS, ET AL.

COMMENTS

Ideally SEACOOS would do Lagrangian drifter experiments, but will be limited by funding availability. In meantime, are there other programs doing Lagrangian experiments that we can work with?

Might SECOORA of the future include an operations center that bridges the gap between SEACOOS data and USCG, DHS, DOD, etc.?

Anon.: What is purpose of this exercise?

Harvey Seim: three-pronged: develop short term objectives for integrated activities; provide support for SECOORA; develop long term vision that addresses real needs and facilitates funding.

Harry ???/ FWRI: There are static GIS data layers, which may be made more dynamic by inclusion of SEACOOS data.

Peter Betzer: occasionally there are sewage outflows, which might be incentive for more funding. Another example of possible increased interaction with states.