

SEACOOS Fall 2007 Workshop

### **Monday PM Break-out combined sessions: Linking Coastal Ocean Research and Supporting Applications/Analysis**

Judy Gray (AOML) moderated the combined Monday afternoon session Linking Coastal Ocean Research Applications and Supporting Applications/Analysis and provided the Tuesday morning summary. Chris Simoniello reported.

#### **Charges for the Session:**

How best to define and connect the research and development component of the RCOOS to achieving societal goals, focusing on how to achieve synergy between research and applications.

How best to accomplish a dedicated effort in application development, partnership development, and analysis of the RCOOS itself.

#### **Session Overview:**

The session opened with Mel Briscoe stating he was not attending the session because the wrong question was being asked: "Research should be relevant to research-nd worry about applications." Dialogue began with Judy posing questions regarding the link between R&D and applications in the SEACOOS program, focusing on lessons that will benefit the RA. Prior to tackling the charge to the group, comments on various topics were made.

Pat Welsh stated that an outcome of research needs to be the development and continuity of people. Planned personnel losses occur when people graduate. Unplanned losses occur when funding is cut. Long term RA planning must factor in budget flexibility for personnel. Unlike federal budgets, RAs can plan into the future and hold money for key activities.

George Voulgaris made the point that a challenge for SEACOOS was that we made the stipulation to work with application science, despite mainly being a research and development program. Thought must be given to both how basic science is funded and how applications will be built in (short term vs. long term objective). Concern was expressed about the division of labor amongst work groups. Bill Arnold (FWC) made the comment that the fact observing and other working group members were in separate rooms for the breakout sessions doesn't bode well for SECOORA. Integration/inreach is impossible unless everyone is on the same page. How can we discuss applications and linkages without all the players in the room?

#### **Model Validation/Verification**

SECOORA and other RAs need to improve validation verification and this should always be done by a third party. Welsh cautioned that the temptation is to take the best case you have and show everybody. At NOAA AOML, Judy Gray said that for something to become "operational" information has to be presented before the Board and adopted. ACT and other programs should be used to evaluate data/instrument accuracy. Validation verification is a potential role for the proposed forecast analysis centers.

Evaluation of models is difficult. Judy posed the question, do you pick scenarios for comparison? LIDAR data for storm surge models was presented as an example by Kathleen O'Keefe (FWC). Several models from various institutions were released and slosh models were deemed no longer the best choice. FWC made a big effort to evaluate the various models. There was no validation for the other models, so they went back to the slosh models, primarily because NOAA provides at no cost. The example shows the gap that exists between R&D and operations. The RA needs to articulate its' role-e.g. to provide the needed information, do you build a new product or improve on the existing slosh model. Liability needs to be considered.

Regarding liability, Cliff Merz (USF) raised the question about the legal issue of "official" models. Judy emphasized that the level of sophistication of each model needs to be communicated, but the consensus is a model ensemble should be used. Some are better for specific conditions than others.

### **Research and Development vs. Operational Mode**

One obstacle to making early progress on the charge to the group was the lack of agreement on the mode SEACOOS and any RCOOS is functioning-R&D vs. operational. Numerical modeling was a topic of considerable discussion. Bob Jensen (USACE) commented that people try to apply technologies in an operations mode when they are still in R&D mode. The RA should develop through an articulated process and establish benchmarks. Inundation and wave models were given as examples. Having a beautiful model doesn't mean it gets incorporated into operations. Nick Shay (RSMAS) said we have to evaluate before we can validate. All codes and data that go into models have to be relinquished to a third party to critically evaluate. Hurricane test beds were provided as an example.

Model (and other) data are an approximation of the truth. Cisco Werner (UNC-CH) said there is ongoing discussion as to which models and data most closely reflect the truth. An interesting point demonstrated by OSSEs was that more data doesn't always improve the model. For example, eliminating drop sondes from certain locations in a storm actually improved model accuracy. From the E&E perspective, the distinction between R&D and operations is not critical-as long as it's clear what the data can and can't tell you. It's best to engage early and provide caveats with the information.

### **Linking R&D to Applications**

SEACOOS had difficulty defining what its products should be. For the RCOOS, we try to observe everything. In trying to do it perfectly, we end up doing nothing. George Voulgaris (USC) suggested working out details from beginning to end in small areas, then transfer the technology. Rick Janke (SKIO) said we need to determine the full spectrum of R&D-developing sensors, communication and power systems before we can develop application products. It is also necessary to identify the part the RCOOS has carved out that doesn't duplicate agency efforts.

Dave Chapman (CO-OPS) emphasized that user needs are fundamental. Users range from highly technical to casual. The RA needs to identify its strategic position and

serve as a filter to determine where the RCOOS fits. Some areas might be best left for the private or other sectors. Concern was expressed that basic science is at odds with everything being end-user driven. Harvey stated that the cost of SEACOOS focusing on user needs and applications was that we could have done a better job tying in the science and research. The value of researchers needs to be optimized.

Because IOOS dollars to support research are lacking, Jose Quintrell (NFRA) said the RAs need to be a champion of user needs. Being application driven means RAs will have community support to hound NOAA, NSF, etc. for funding. As the budget shrinks, the science mission needs to develop first. The idea is that if the science is done right, users will develop around it. Jahnke countered by saying the only way to make the system robust is if R&D supports it and is directly connected to the information needs of users. Designing applications presupposes that we know what the product is going to be. It requires knowledge from needs assessments. Gerry Creager (Texas A&M) provided the mantra “no new science kills product development and applications.”

### **Communication is Key**

RAs need to do a much better job of leveraging and organizing efforts. Kathleen provided the example of habitat modeling and management issues. If the arrays help manage living marine resources, upper management can be targeted by showing cooperative efforts. Internal communication (inreach) is just as important as outreach. Research activities need to be discussed across work groups. Shay used HF radar as an example to demonstrate that while most are aware of its value measuring surface currents, many are unaware about directional waves and ship tracking applications. He says that process oriented groups like SAR never came to fruition because of the lack of cohesiveness and inreach in SEACOOS. Other missed opportunities mentioned were the SAB cold water upwelling event and high profile fisheries events (Roger Pugliese-SAFMC). There is broad agreement that had SEACOOS capitalized on these, the need for technology/modeling would have been elevated and support increased. Getting cogent folks together is critical to deliberate interactions to move forward.

### **How do we develop applications?**

A challenge with the work groups is that each has specific duties and all are multitasking-trying to do QA/QC, do science, engage users and develop applications. The idea of “ocean forecasters” was presented-a dedicated group to look at data and not worry if radars are working, data is flowing, etc. The RA needs to consider how to organize priorities-bottom up vs. top down organization. To make connections between inreach/outreach and move from conceptual examples to regional applications, all people need to be included.

There is a timing factor for developing applications. Appropriate people with local expertise need to be included at the right time. Geno Olmi (NOAA CSC) used rip current forecasting in SC as an example. Voulgaris reiterated the importance of focusing on manageable problems, for example, it is more effective to use all capacity to solve a problem in detail and export the solution to other regions as opposed to trying to cultivate all backyards and only managing to accomplish partial solutions. Creager agreed that maintaining a cluster here and there is not cost-effective and that

bringing the expertise together improves overall results. In a problem-rich environment, the obvious challenge is establishing priorities. Jahnke observed that all the pilot projects SEACOOS undertook (fisheries/ecosystems, SAR, oil spills and hazards) are rich with issues. To move forward, need to integrate regional efforts and deal with issues of scale. Projects ultimately have to serve regional interests. Brian Haus (RSMAS) said that while there is tremendous value in what we can learn from experiments, that is not the purpose of COOS. For experts to be engaged in regional activities, they have to have a vested interest. As a group, the RA can play an important role in helping inform the federal agencies of requirements.

There is an applications continuum—from basic research which is more curiosity driven to applied research which looks to the user community for motivation. Inreach is important because it ensures there is an awareness of the information that is available. Each RA is starting with a different level of science/administrative resources, so stakeholders must be cognizant that what they want vs. what is available and the time frame to deliver will differ.

### **Challenging questions discussed**

#### *How do we do inreach?*

Suggestions for how to improve inreach within a distributed program included: newsletters highlighting topical areas; reminders to look at web site updates; rotating meetings among institutions to gain familiarity with people and capabilities, and Blogs. SECOORA must explore options because decisions about approach and strategies need to be made. For example, a design document for fisheries must include all aspects of the science, user needs, application development, etc. Additionally, the overall strategy should be pursued with the governance now in place for SECOORA. Kathleen cautioned that it's a slippery slope from the funding standpoint if SECOORA chooses to focus on technology—is the RAs focus on themes, technology or both. Jahnke expressed the group's frustration about expectations by saying we all have to deal with how frequently they change. Maximum progress can be achieved by building on what has been done and integrating our own efforts. Inreach is critical to generate ideas of approaches before investing money. Simoniello suggested reviewing SEACOOS Product Interface Committees as a model for inreach and bringing multi-organizational groups together to develop applications.

#### *How can scientists contribute to federal agency programs?*

With the lack of guidance from federal agencies, Voulgaris asked for their opinion on what they do well and don't need help with vs. where they have gaps and can benefit by the research community. Judy said the prevailing view on NOAA labs (AOML, PML, etc) for interacting in RAs is that they have neither the budget nor constitution to do it all. NOAA AOML emphasizes coastal forecasting as being most important (cf climate forecasting) and contributes some work to the RA via the Ocean Data Partnership. More efforts are required to get AOML research into the RA framework. AOML has the longest time series of Florida climatologies and is part of the national backbone, but there is too much for the federal agencies to do on their own and too many scattered interests. The community at large can push NOAA to act together. Zdenka is making progress with program planning, but wants to be sure we don't duplicate efforts.

The role of NASA in IOOS is unclear. Judy plans to speak with Bob (?) to gain insight. NSF's role in ocean observing has been in OOI. The prospectus is now under review. Their contribution to GOOS has been via few, but critical high latitude instruments. The cables and integrated pioneer array on the east coast may provide opportunities for focused activities.

A concern of single federal agency responsibility for operations is that advocating for external research and development is difficult but essential. The process is translational—some research and some development is needed. Funds need to support the transfer of technologies and product development. The term 'valley of death' was used to describe the gap in bridging new technologies with development of applications. There are also issues with the flexibility needed to take in new capabilities, including technologies not yet developed. Coastal forecasting was used as an example of what happens when the level of investment is paltry compared to what is required.

Considering private sector interests, it is not yet clear how they can contribute/profit from the operations side of business. It's a catch-22 because the RA needs money to engage them, but will have great difficulty securing funds without their support. The RA has to strive to engage despite the difficulties.

*How do we demonstrate program legitimacy and value to gain support: USCG SAR as an example.*

SEACOOS efforts targeting USCG SAR were revisited. Rick Luetlich (UNC CH) said that despite being a willing partner, there was no money to fund model development. They are grateful recipients of data and set up a data integration network to acquire data, a system that has been recently upgraded and provides the opportunity to move forward. The high visibility can and should be used to justify SECOORA's efforts and provide program legitimacy. Issues remain with the predictive capabilities and error bars associated with data. SEACOOS attempted to pursue, but was unsuccessful in securing funds. The USCG was also strapped financially. Clear ideas have been created on how to build connections but the onus is on the RA to provide QA model output. Interaction with USCG SAR is an example of an application that led to a research question—what is the best way to specify the accuracy of data and provide quality assurance.

Harvey compared the issue here with that of fisheries—both have clear questions that require specific science-based answers. If we use physical state estimation as a consistent element of the program, a number of applications can develop. For example, with a focus on understanding what controls the accuracy of simulations and gaining an understanding of processes in the region, SECOORA can begin to develop a plan and explore options for pilot studies. Voulgaris again warned of the compromise inherent in a focused project vs. a regional application and suggested one model be used for an entire area, with selected sub-areas for test beds. Comparisons of circulation and wave data from WERA was used as an example—with researchers creating test bed as well as region-wide connectivity.

Aside from SAR, The USCG in general does not collect data from vessels but supports buoys and drifters. Dave Chapman (MACOORA) works closely with them and is not aware of sensors on ships. Unlike the *Explorer of the Seas* and some ferries with routine

tracks, CG vessels have variable tracks. However, the USCG in Connecticut is interested in high resolution MACOORA model output data and is acquiring in exchange of decommissioned drifters (usually retrieved after 2 y). Chapman plans to export the lessons learned to other RAs.

*Forward-looking comments to close the session*

Program planning is an iterative process. The suite of possibilities for any group is astronomical. For fisheries alone, there is a variety of aspects to consider. Some activities can be done on a regional basis and others tested locally. The idea is to attempt to discuss all possibilities and determine what initial steps makes sense for the region.

Communication throughout the process is critical. Whether via thematic news letters, meeting in person or Blogs, the RA needs to target multiple ways people learn.

SECOORA has not taken advantage of lobbyists. If stakeholder needs are reflected in the business plan, the RA can define areas where information is needed and gain support. Matt Howard and Ann Johchens caution they did this in GCOOS, but the private enterprise in Texas didn't cooperate. The right business matches are needed to protect interests.

As part of the research to applications theme, the government and/or private sector need to be engaged in the transition from research and development to applications. R&D must be funded in tandem with applications to avoid the "valley of death."

Luetlich made an interesting point about potential support from fishermen experiencing difficult times. The fishing fleet can be regional resources-servicing and cleaning equipment or providing transportation. The cost might be more affordable than research vessels. Many universities view facilitating private sector development as favorable.

Rick DeVoe (SECOORA, SC SG) concluded by saying no decisions have been made regarding how responsibilities will be delegated or how the system will evolve over time. SEACOOS was established as a pilot. RAs have the responsibility to oversee the RCOOS link. The private sector may handle the Data Management side of business, but it is clear that ever-evolving R&D must be scientifically focused to maintain the health of the system as a whole.