Questions from ADM Watkins letter of March 28, 2002

Coastal observation systems are sprouting up to many appropriation bills these days. Has agreement been reached on how a regionally based, but nationally coordinated, coastal observation program should be implemented before these independent systems grow beyond the point where they can be integrated?

My perspective is that we will not invent the right approach to integrating such systems *ab initio*, but rather, we will invent/discover an optimal approach through iterative experimentation. An appropriate venue for such experimentation may be prototyping on a supra-regional scale. Done correctly, such efforts could prototype different approaches to national integration in parallel, learn from one another and converge quickly on an optimal solution.

There is definitely a lack of coordinated federal leadership, which has led to the sprouting of regional observing activities supported by congressional earmarks. Continued lack of leadership by federal agencies to fill this vacuum with agency sponsored initiatives could lead to more such earmark-driven efforts with even less coordination.

My sense is that the recent Ocean.US workshop at Arlie House has made great strides in conceptualizing the shape of a nationally federated coastal observing system. The workshop summary, however, seems biased toward the *in situ* end of the system and does not provide adequate treatment of the parts of the architecture needed to address system design evolution, systems operation, data collection and concentration, data analysis, data assimilation, modeling, nowcast and forecast, and archival…it is difficult to appreciate that the workshop discussed an “integrated” coastal ocean observing system. The current document is unbalanced in this respect and needs modification. Secondarily, the federation, as described, does not have a clearly defined “systems manager” with control over funding for the federation – this will be critical to enforce standards across a federated system.

So, the succinct answer to the question is “not quite yet”.

Should the U.S. reorganize how we plan and manage our space-based ocean observing system?

Do we manage our space-based ocean observing system? I would argue that we manage parts of it, but we don't manage "it" as a functional whole.

Clearly NASA prototypes space-based observing technologies and develops best-of-breed science algorithms through peer-review. NASA's record over the past three decades at taking ideas and turning them into space-based sensors with known characteristics and error budgets is not simply good, it is excellent.

DOD's use of specific space-based sensors for military purposes has benefited from a requirements driven process. On the other hand, this process has slowed development and implementation of innovative approaches, and, pitted many such concepts against more traditional surface-based investments.

We do not have a federal agency that is taking a leadership role in operational space-based ocean observations. There are indications that NOAA/NESDIS maybe organizing itself to take on this role. However, NOAA suffers from having no clear internal "client" for ocean observations, unlike on the meteorological side, where the National Weather Service is the client. The reality is that the "ocean clientele" is spread across multiple agencies in the federal government, academe and private industry. The breadth and diversity of ocean interests could be a strength, however, in this case it dilutes the "pull" side of the equation.

Nor, for that matter, do we have a process for prototyping and transitioning space-hardware from NASA, DOE or NRL to an operational setting. Such a process existed in the 70s and early 80s between NASA and NOAA, and to a limited extent exists today for DOD needs through the USAF STEP process.

The NPOESS JPO has a process in place for DOD and NOAA (NWS) requirements to be inserted into a space-based system, *i.e.,* money talks: there is not a strong ocean voice in this process. In fact, other potential observing clients, *e.g.*, climate, have even weaker voices in this process. Second, the JPO is using a requirements driven model to procure its system rather than one that would encourage inclusion of the best technologies and science into the final system.

Yes, I think we must reorganize how we plan and manage our space-based ocean observing system…

What do we need to ensure high quality ocean products are obtained from future ocean remote sensing systems?

As noted in the response to the previous question, I think that we need to have a strong ocean client exercising "pull" on the space-based observing system. This could be a single agency, or, a revised NORLC (maybe an NOLC?). The reason that current systems are responsive to meteorological needs, *e.g.*, NPOESS, is that the NWS and USAF have demonstrated their needs and provided resources to the federal space-platform operating entities. How this is effected for ocean applications is the question.

Should there be an official "data policy" for data obtained using public funds? Should the Commission make a recommendation on this, and what should it be?

Yes, there should be an official "data policy" for data obtained using public funds. Such a policy will become increasingly necessary as we move towards ocean nowcasting using integrated ocean observing systems. The data assimilation and forecast models require near-real time access to data in order to make nowcast and forecast products. Without such data, developing accurate, high quality analyses is probably impossible.

Yes, the Commission should make a recommendation on this matter.

I suggest that the Commission recommendation on "data policy" be simple and straightforward:

> Data obtained using public funds should have free and open dissemination in near real time, *i.e.,* no closed period for exploitation before the public has access to the data.

The Commission is charged to perform an assessment of "existing and planned facilities associated with ocean and coastal activities." Please provide a one-page description, from the community's perspective, of the state of the health of ocean and coastal facilities.

This is a difficult topic to address due to the breadth of facilities needed for ocean and coastal research and education efforts. As an aside, determining whether a facility is local, regional, or national is not resolved, which can complicate the process of determining who should support them. The response is broken down into comments on physical plant, sea-based laboratories, and other infrastructure.

Physical Plant

Shore-based physical plant health is mixed. Many new institutions have become players in the past decade and have brought new or refurbished physical facilities to the field. Conversely older institutions are challenged by the need to improving education and research spaces. Virtually all institutions suffer a lack of facilities for state of the art biology, *e.g.,* genomics and/or proteomics, for computer visualization, and for medium-scale numerical ocean modeling. Small institutions (marine labs or stations) have been slow to embrace current information technology: there is a noticeable gap between smaller and larger institutions in their ability to connect with the high-speed commodity Internet and Internet-2 networks, perform computations, and so forth.

Ship-based laboratories

There are a small number of state-of-the-art labs at sea, *i.e*., in many areas a single lab may exist for a given measurement or technology, *e.g.,* underwater imaging, and horizontal sonar. Conversely, more traditional technology, *e.g.,* auto-analyzers (nutrient chemistry), CTDs (water column conductivity, temperature and density), is plentiful. Put another way, there are notable "one-off" capabilities whose loss could severely constrain ocean research. While these labs are in existence, funding to support ongoing operations, including shipboard personnel and general maintenance and supply needs is lacking.

Infrastructure

An NSF facilities program (OCE) and the ONR DURIP provide mechanisms to acquire small to medium-scale instrumentation (less than $1-2M or so, aggregate investment). There is no easy mechanism to capitalize facilities in the $1M to $20M range – a variety of approaches have used: institutions have self-funded such facilities, or earmarked federal or state budgets, or, amortized costs with use-based cost structures. There is a strong need for a peer-review mechanism to address this range of infrastructure. The Major Research Infrastructure" account in NSF could be used to address larger infrastructure needs, e.g., ships or observing arrays, observing system components, etc. In practice this has not occurred (yet). There is no systematic way to approach even larger investments, as might be envisaged for coastal ocean observing systems, space-based systems, regional satellite receiving facilities, large scale blue-water observing systems, nor, for that matter to either scale up prototype systems to larger operational systems.

Closing thoughts
The Commission could make an impact in the infrastructure area by recommending agency roles, responsibilities, and needed investment modalities in medium to larger coastal and ocean infrastructure. One would estimate that the community could readily utilize $50M-$100M p.a. in this area to revitalize such facilities, improve information technology infrastructure and implement the foundations of a coastal and ocean observing systems. Another issue is in education: labs that have been focused on education have a tendency to fold because it is a losing battle with regard to trying to balance tuition, operations, facilities needs, *etc*. We need some mechanism to provide lab and field facilities with funds to support education in addition to research.

Are there any new models the Commission should examine for funding the transition from research to operations?

Suffice it to say, that there is no facile mechanism for transitioning research to operations in the civil sector. Agencies that must do this, NOAA, for example, have problems with virtually every such transition, even when the entire process is internal to NOAA. DOD does this through its 6.1, .2., .3, .4,… process in a structured, though time-intensive way.

So, yes, the Commission should examine new models for doing and funding the transition from research to operations. The only workable models seem to be in the military and transition times of nearly a decade are not unusual – to my mind, we need models which would facilitate transition in 2-5 years, not 8-12 years or longer.

What might be considered? Silicon Valley, though currently vilified for the “Dot.com” bust, has developed a process termed “rapid prototyping” which seems to be effective and one of the reasons for the current pre-eminence of major chip makers, such as INTEL. I believe we should use a similar approach. The question that one is left with is an institutional one: who, read which agency, should do this?

An obvious candidate agency is NOAA. NOAA does not have a good track record in the recent past for project management and implementing innovative ideas. A NOAA with strong leadership could be a natural home for such efforts. Or, one might think of a partnership of federal, academia and private industry for such an activity.