It is a classic chicken-or-egg dilemma, where without the transition to operational mode, users cannot depend on the continuity of either monitoring or forecasts, and therefore do not come to depend on either. Even if the transition is made, there is a natural lag time between delivery of a product and the acceptance and expansion of applications within the user community. Continuous, high-frequency information may be delivered to monitoring agencies, but analytical techniques are seldom in place at the outset to incorporate this information into traditional sampling programs.

Part of the difficulty in establishing support for these systems is that the initiators have typically built an observing system funding base as a house of many cards. The system is developed to demonstration stage via an assemblage of many smaller projects supported by a broad range of sources. Even if this assemblage can be made somewhat stable, the transition to operational mode is made difficult because no one agency feels ownership, especially after the fact, when the system shape and identity has been developed without the participation of the agency. Most systems are multipurpose by design, to develop the widest user base for such a committing undertaking. And often, these purposes have very different time scales of interest, ranging from nowcasts and short-term forecasts, to monitoring of long-term ecosystem change. Rationales and justifications are seldom so compelling that they speak uniformly to the entire range of users. Operational funding appears most stable in systems such as the Texas Area Buoy System (TABS) or PORTS where the primary purposes and funding support are singular. TABS is funded by a unified agency for enhancing the ability to respond effectively to oil spills. PORTS was supported initially by NOAA, and then by maritime interests in the local ports.

Regardless of the reasons for the lag between the initiation of observing systems and the availability of operational support, it often leaves the systems in somewhat fragile states. Salaries must be maintained for personnel with a range of expertise, from mooring technicians to electronics technicians, to programmers skilled with visualization and web communication techniques. Ship time for maintenance cruises and instrumentation replacements are other substantial budget items. All too often, these costs are borne by scientific or development grants, which sometimes contribute a disproportionate amount of support to sustain the system. Invariably, the scientists leading the effort are diverted too far from science in search of sustaining funds. An aspect of this mode of funding, depending on the fortuitous overlap of numerous small projects contributing to the whole, is the large fluctuation in support level. This fluctuation leads to inefficiencies and sometimes to the difficulty in retaining skilled and trained personnel.

Instrument Calibration

For time series used to study long-term but potentially small environmental trends due to climate change or anthropogenic effects, it is very important that the instrumentation has maintained a consistent calibration over the entire record. Without this consistent calibration there is no way to determine that changes seen in the data are due solely to real-world changes and do not include changes in the sensor calibration. Likewise, differences seen in data from sensors at two different locations must not include differences in the calibration of the two sensors. It will be important to establish consistent calibration methods (and means of accessible documentation) for all sensors in a coastal GOOS. It will also be important to fund groups to assess the calibration of past data times series, that will be used in conjunction with newer data in the determination of long-term trends and similar analyses.

An example where this issue has already been examined is sea level change based on data obtained from tide gauges over the past century. A critical consideration here was maintaining a consistent reference (of the water level data) to the land. For decades this was accomplished in the U.S. by the careful leveling of each tide gauge to bench marks (usually ten) installed in solid rock and other immovable objects. For the float-in-a-well type gauges used for decades, this was actually done by leveling from the bench marks to a tide staff next to the gauge, and having an observer make manual simultaneous observations from the staff to be compared with the tide gauge measurements. The modern acoustic water level gauges now being using by the National Ocean Service (NOS) and other groups allow for direct leveling from the bench marks to the end of the transducer. This brings up the second critical consideration: the comparison between the old and new method of water level measurement, and any possible difference that might have an effect on long-term trends obtained from analyzing the data time series whose first part came from the old system and whose second part came from the newer system. To minimize this problem, NOS ran the two systems simultaneously at all locations for up to several years. It also studied the possible long-term effects on the new acoustic system, such as temperature effects in the sounding tube.

Biofouling

Physical and acoustic systems typically have minimal problems in this area as materials like copper-based paints can be utilized. Unfortunately, these cannot be used with optical and chemical systems. Conductivity sensors experience biofouling problems and even mechanical current meter rotors have been affected in extreme situations (e.g. barnacles). A large amount of work has been and is being done to find effective means and methods for reducing biofouling effects on optical