Observing System Capabilities -- Gap Assessment and Design
Prerequisites of design process

- Clear vision, priorities and requirements – not easy, especially across all scales
- Some commonalities across scales – most obvious is core/essential variables list
- Can then translate priorities into requirements for each variable; reconciling multiple requirements challenging
Steps towards design

- Census of observing system components – what existing systems will ‘commit’ to being part of IOOS?
- Gap assessment – what’s missing in present system to be able to satisfy the requirements? Need to define adequacy when multiple requirements exist – balance of costs, priorities, time frame
Design process

- Should blend expert knowledge and more objective assessment
- Complexity demands ongoing design and evaluation
- Numerous existing quasi-independent observing programs suggests a System of Systems design approach is needed, highlights need for interoperability between subsystems at all scales.
Overarching Issue Challenges

- Short-term. Are core/essential variables the right way to bridge across the various scales (global/national/regional) of U.S. IOOS? Which subset of variables provides the most benefit in connecting across the scales of observing efforts?
OBSERVING SUBSYSTEM
• Many observing programs exist, internationally, nationally, regionally and locally
• Ships: critical sampling platform and support for autonomous platforms
• In-situ platforms: buoy/mooring arrays, drifters, profiling floats most developed; gliders increasingly important; others
• Remote sensing: satellite systems mature; sub-orbital, land-based increasingly important
Observing Subsystem – gaps

- Many gaps can be identified: deep ocean measurements; under ice; coastal winds; repeat coastal spatial surveys; automated fisheries assessments; biogeochemical variables in general,...
- Gaps exist and can be filled in in-situ and remote sensed networks
- Technology on-ramp gap: dual use in both research and operations
Observing Subsystem Challenges

• How is adequacy of existing observing assets best assessed and gaps best defined? Should it be done by variable? By priority? By geographic location? Some mix of these? Who/how? What is the national process for doing this?

• How should the technologies to fill gaps be identified? Should we advocate for standards or common practices across scales as a way to improve efficiency and reduce cost? Or will this stifle innovation?

• How do we promote bringing new technologies into IOOS while maintaining an operational output?

• Given a large gap in biogeochemical and ecosystem automated observing, should a dedicated effort be made to advance these technologies?
DATA MANAGEMENT AND COMMUNICATIONS
The year is 2022...

Your trip is scheduled for 0800 tomorrow. If you arrive an hour earlier we have a much better shot at catching the big fish. Click here to confirm https://fisherman.org/reschedule?id=Ghf59s
Services, services, services. Who has responsibility for distributing data?

- Observing System Operators/Data Providers
- Data Assembly Centers (Regional/Thematic?)
- Archives
- Modeling Centers
- Anyone really,
DMAC - gaps

- Ongoing discussion of the structure and responsibilities of Data Assembly Centers including relationships to Archive Centers
- Commitments and prioritizing build out (Regional DACs on board, what are our expectations of the large federal systems?)
- Interoperability – must be true for all subsystems but relies on clear definition within DMAC
- Adequacy – what are realistic expectations of the subsystem? Much exists now.
DMAC Challenges

- Explore the number, type, and functionality of DACs needed to support the IOOS DMAC Subsystem.
- Encourage closer coordination between Regional Associations and the data centers in Federal agencies.
- Make Web services distribution the primary standard for disseminating IOOS information.
- Adopt Quality Assurance of Real-Time Ocean Data (QARTOD) as a starting point for QA development within U.S. IOOS.
- Improve and formalize processes for collecting and prioritizing data requirements, and assessing progress against the core variables.
MODELING AND ANALYSIS
Analysis, modeling and applications: status

• Significant advances have made modeling pervasive in coastal research, emergency response, decision making (grids, cpus, numerics, bcs, forcing, dynamic, paramerizations, DA)
• One advance deserves special attention: the ability to measure the impact of observations on performance (e.g. impact of glider vs. mooring)
• Advanced 3D & 4DVAR forecast systems are now being used in several regions
• IOOS sponsored modeling testbeds have helped advance metrics, paramerizations, best approaches for specific environmental/regional issues. (and unexpected benefits in R2O, O2R)
Analysis, modeling and applications: gaps

• We don’t have a system view that fuses modeling and observations (modeling viewed as a downstream activity)
• Few regions have defined priorities in terms of performance metrics or used models to assess or optimize the observing system
• IOOS-sponsored modeling testbeds have been limited regionally and functionally
• We do not have a IOOS/US/GOOS modeling plan
Analysis, modeling and applications: challenges

- How to expand testbed activity?
- How do we best spread best tools and techniques to other regions?
- How to make an IOOS/US/GOOS modeling plan?
- Can we evolve IOOS toward optimal system design, driven by regionally-defined societal needs specified in terms of performance metrics, and taking into consideration limited observational and computational resources?
Analysis and applications: Challenges

• Should analysis of ocean state be a funded, ongoing activity?
• Should application development be a funded, ongoing activity?