AUTONOMOUS PLATFORMS IN THE ARCTIC OBSERVING NETWORK

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INTRODUCTION

Rapid Arctic environmental change, recently exemplified by the 2007 summer sea ice minimum, poses broad shifts in global climate and events socioeconomic and environmental impacts extend beyond the Arctic itself. Arctic change must be monitored and understood both due to the Arctic’s role in global climate and to inform efforts directed at managing and mitigating impacts. The Arctic Observing Network (AON) must provide both immediate measurements and an evolving understanding Arctic change and real-time data for environmental forecasting. Fortunately, the AON can exploit new, autonomous observing technology that has transformed ocean observing at lower latitudes. Endurance-extended Ice-Based Observations (IBOs), floats, gliders and remotely operated vehicles (ROVs) are being developed for observing and relaying data from remote regions, facilitating broad spatial coverage over decades. The new technology used in combination with conventional instruments offers varied approaches for different challenges. Ongoing efforts are yielding systems to expand the suite of autonomously observable physical and geochemical properties. This is an opportune time to promote their use in the Arctic.

TECHNOLOGY OVERVIEW

Autonomous platforms address the challenges of Arctic observing by providing:

- Remote access
- Low-cost
- Mobility and adaptability for operations across key sections and straits.
- Capability to yield sensors to expand the suite of autonomously observable physical and geochemical properties.
- The ability to operate in the challenging marginal ice zone and shallow shelf environments that may demand real-time data access.

SCIENCE AND STAKEHOLDER NEEDS

The AON must balance needs for information and products relevant to stakeholders against those relevant to change. Data needs can be considered in three overlapping categories:

- Policy:
  - Governance and science understanding environmental change, long-term planning, disaster reduction, regulation and environmental protection Large (Pan-Arctic) geographic scope, timescales of decades or longer.
  - Decreasing ice extent restricts area accessible to IBOs and shortens lifespan for many instruments.
- Strategy:
  - Government, science, industry and communities. Medium-term planning (up to 10 years) for observing systems and technologies is a basic tenet of try ing to design shipping or design of offshore platforms.
  - Observing systems that may require remote sites, with timescales of decades to centuries. Data access in near real-time (days) to yearly, with value placed on long records.
- Persistence:
  - Establishing a legacy of observing in the Arctic. The what is the best route for a change through (stress)? Geographically focused or regional times weighted during human activities. Short timescales, high demand for real-time access with limited access for long records data often life short.

SCIENTIFIC REQUIREMENTS

• Buoy hulls capable of surviving breakup and freeze-in under development.
• Decreasing ice extent restricts area accessible to IBOs and shortens lifespan for many instruments.
• Incorporate enhanced autonomy for making unassisted mission decisions
• Mobility and adaptability for operations across key sections and straits.
• Low-cost profiling floats characterize large scale circulation, watermass distributions.
• Adaptability- respond to changing environment (marginal ice zone)

AUTONOMOUS PLATFORMS WITHIN AON

Policy and Science:

Access, persistence and scale of data provided by autonomous platforms is driven in part by the economic viability of fundamental variables (e.g. sea ice and drift, sea level, ocean current, temperature and salinity, basic marine chemistry) and the ability to sustain long-term observing across decades. The SEARCH Implementation Plan (SEARCH, 2003) and the AOSB-CLiC Observing Plan (AOSB, 2005) lay out a strategy for observing the marine environment using autonomous platforms.

Strategic: Autonomous platforms offer flexible access and operation to the challenging marginal ice zone and shallow shelf environments that may demand more intensive observations. These studies would be nested within the larger array.

Tactical:

The flexibility and real-time reporting offered by autonomous approaches allows rapid implementation of new observing missions with simple real-time access. Autonoous instrument packages of long-term deployments could also be Reporesented in response to changing needs. Real-time data access demands capabilities for timely, processing, analysis and dissemination.

AON can exploit the complementary capabilities of the various autonomous platforms, (e.g. to meet emergency response needs), by coordinating joint data and operations. Data access and use of the observing system requires a comprehensive, Arctic-wide oceanographic and communications system.

SUMMARY

Autonomous floats, gliders (IBOs, AUVs) and moorings provide scalable, flexible, cost-effective ocean observing technologies for AON. Floats, gliders and moorings are at providing year-round observations, while other platforms can deliver more targeted tactical information to emergency response. Gliders and floats can be deployed over the long-term, while modernized radio sondes and robotic AUVs can be used in near real-time to survey the marginal ice zone. Gliders and floats can be deployed over the long-term, while modernized radio sondes and robotic AUVs can be used in near real-time to survey the marginal ice zone. Glider and float measurements can be used to relay data from platforms operating beneath the ice. Gliders and floats can be deployed to relay data from platforms operating beneath the ice. Gliders and floats can be deployed to relay data from platforms operating beneath the ice. Gliders can be deployed to relay data from platforms operating beneath the ice. Gliders can be deployed to relay data from platforms operating beneath the ice. Gliders can be deployed to relay data from platforms operating beneath the ice. Gliders can be deployed to relay data from platforms operating beneath the ice. Gliders can be deployed to relay data from platforms operating beneath the ice.