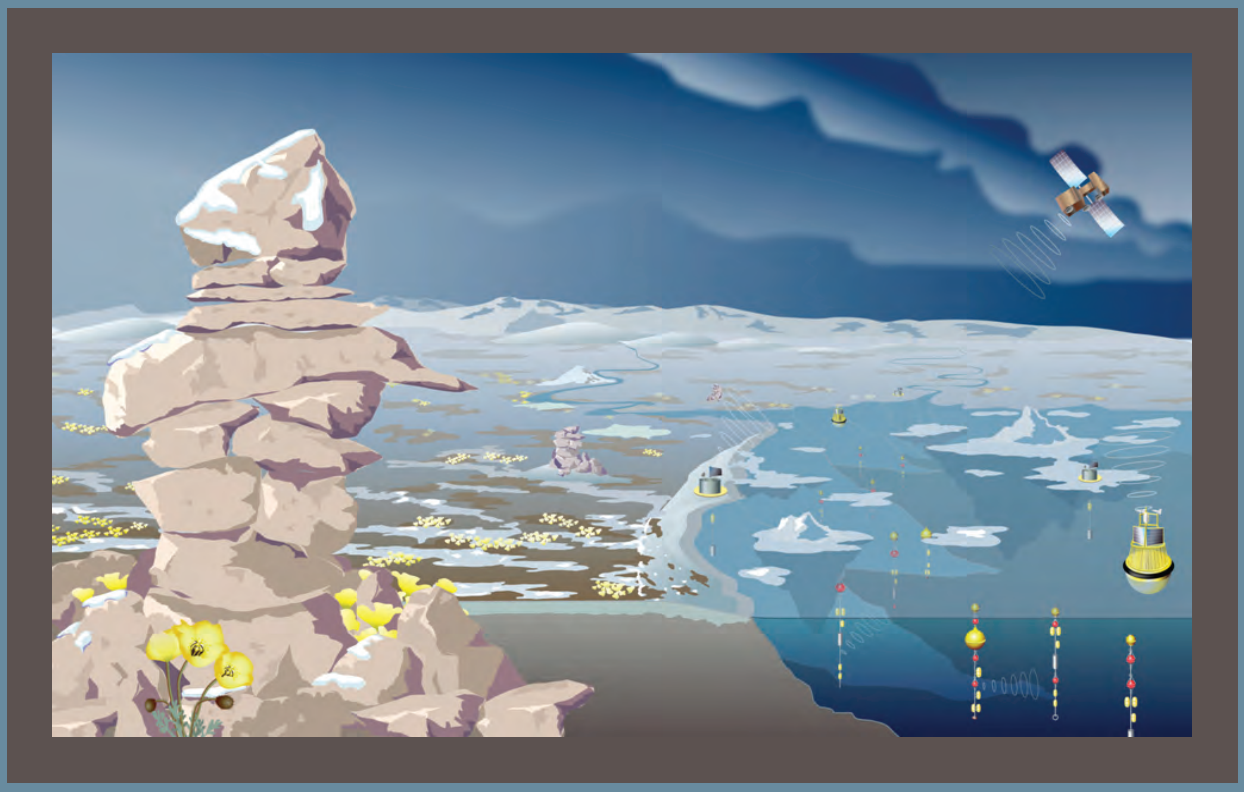

Arctic Observing Network (AON): 2009 Status Report and Key Recommendations

Results from the third AON PI Meeting; 30 November - 2 December 2009; Boulder, CO

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Section I: Executive Summary

The third Arctic Observing Network (AON) PI meeting provided an opportunity to review observing system status and accomplishments at the close of the International Polar Year (IPY) 2007–2009 and to develop recommendations for refining, enhancing and sustaining the network in the years to come. Sponsored primarily by the National Science Foundation, with additional support from the National Oceanic and Atmospheric Administration and several other agencies, the AON included over 40 projects at the start of 2010. Meeting participants included AON investigators, agency representatives, international partners, and outside experts familiar with observing system implementation. Project status summaries in the Appendix of this report provide an overview of scientific accomplishments, linkages, and plans for the coming years.

Accomplishments

Overview presentations on the status of projects in the different thematic areas highlighted the following accomplishments:

1. **Atmosphere:** Building on strong international collaborative frameworks and synergies, atmospheric observations within the AON have wide geographic coverage throughout the Arctic as well as through the depth of the atmosphere. Key atmospheric chemistry measurements are integrated into this program thanks to significant methodological advances made under the AON.
2. **Ocean and sea ice:** Relying increasingly on autonomous, advanced measurement technologies, the ~15 ocean and sea ice programs collected Arctic-wide data helping to explain the causes underlying the record sea ice minimum of summer 2007 and track the response of the Arctic system to this extreme.
3. **Hydrology and cryosphere:** With three of the eight projects pan-Arctic in scope, through AON we now have baselines of hydrological and biogeochemical fluxes against which ongoing and future changes can be compared. Progress is good towards assessing the thermal state of the permafrost throughout the Arctic in a highly collaborative international program.
4. **Terrestrial ecosystems:** Through the development of several regionally distributed flagship sites that tie into past long-term research programs, baseline data are being collected to evaluate the impact of changing precipitation patterns and other climatic factors, as well as disturbances such as tundra fires, on land cover.
5. **Human dimensions:** The single funded human dimensions project evaluated the research value of existing data sets and developed community indicators to assess and inform environmental-change adaptation strategies.

Recommendations on Next Steps

Key recommendations for consolidation of the AON include:

1. An optimal balance needs to be found between flagship observatory sites and distributed observing networks within the AON.
2. Optimization of an AON capable of sustained, decadal-scale observing will require improved coordination between the agencies that support Arctic observations.
3. Ongoing AON design efforts need a community-based mechanism for identifying new observing priorities and reprioritizing existing activities should environmental change or advances in understanding render them unimportant.
4. Improved standardization and coordination of measurements.
5. Despite progress in developing robust, reliable

oceanographic instrumentation to measure biological and biogeochemical variables from moorings and mobile platforms, integration of biological, chemical, and physical measurements remains challenging and requires attention.

6. More rigorous efforts to integrate human dimensions into network design are both necessary and feasible given new statistical models that facilitate integration of data from different domains.
7. Participants recommended promoting and aiding the northward expansion of established, lower-latitude observing systems that offer the potential to meet some AON needs.

Participants highlighted the following needs that extend across all disciplines:

1. Creation of an international collaborative framework.
2. Better integration of remote sensing into the AON.
3. Collaborative workshops to address key questions that bridge disciplines and increase cohesion of the network.
4. Historical data rescue.
5. Establishment of a community-based Arctic regional climate model.

Participants also identified several near-term issues that must be addressed to foster the evolution of diverse AON components into a sustained, integrated international observing system:

1. System design efforts must be undertaken that (a) draw both from bottom-up approaches driven by individual projects and incremental refinement of measurement sites based on data, model results, and local expertise, and (b) top-down efforts driven by rigorous approaches to observing system design and optimization such as Observing System Simulation Experiments (OSSEs) and other modeling or synthesis efforts.
2. Implementation of a sustained, integrated observing network may prove challenging under existing support mechanisms. AON may need to look towards the methods that other large observing programs have successfully employed to build comprehensive, highly integrated networks. Approaches include reliance on steering committees for additional guidance, strong partnering with government agencies capable of supporting sustained measurements, and development of guidelines and practices that foster coordination.
3. AON must develop effective approaches for partnering with industry and a broad range of federal, state and local agencies to sustain long-term observing activities.
4. At the international level, AON should look to existing organizations, such as the World Climate Research Program's Climate and the Cryosphere (CliC) Program, to provide guidance for implementation and optimization.

Agency Coordination

Interagency coordination and collaboration will play a critical role in shaping an effective, sustainable AON. Although NSF currently supports the majority of AON activities, the network must evolve to serve the observational needs of a wider range of clients. Moreover, sustained observing over decadal timescales will require support from and transition of some AON components to organizations capable of hosting operational activities. This report includes summaries of science and measurement activities and priorities from organizations whose portfolios include Arctic interests.

International Collaboration and Coordination

Recommendations for fostering international coordination include:

1. An inventory of the growing web of international agreements could lead to multi-lateral science agreements, anchored within different agencies in the U.S.
2. AON researchers should contribute where appropriate to international topical data sets and archives.
3. Researchers should take advantage of existing agency programs dedicated to improving international collaboration.
4. A permanent international ice station could serve as a much-needed central Arctic platform for a wide range of observations and as a focal point for international collaboration.