ARCSS Program | Message from the ARCSS Committee

ARCSS Note #9: Arctic System Synthesis Workshop Summary - 7 May 2007

Arctic System Synthesis Workshop:
New Perspectives through Data Discovery and Modeling
2–4 April 2007
Bell Harbor International Conference Center
Seattle, Washington

Dear Colleague:

We are pleased to announce the completion of a 2.5-day workshop supported by the National Science Foundation's Arctic System Science (ARCSS) Program entitled New Perspectives through Data Discovery and Modeling. This letter briefly summarizes and integrates the general recommendations emerging from the workshop as well as previous planning activities. A detailed community-reviewed report is planned for publication this fall.

Workshop Background
The main motivation for this meeting was the increasing focus on synthesis in the ARCSS Program, particularly with respect to integrating and modeling large, complex, and disparate data sets to answer questions about how the Arctic functions as an integrated system. The arctic research community has recognized the need to better support synthetic modes of inquiry, which we define to include approaches such as intercomparison studies, data integration and assimilation, arctic and Earth system modeling, and cross-disciplinary data merging that will improve arctic system understanding, predictions, and provide policy-relevant information. The ARCSS Committee has taken a number of steps over the past several years to provide community leadership in this area, including organizing this community workshop.

Workshop planning began in earnest following an e-Town Meeting in March 2006, at which new ideas were solicited from the community on improving the utility of arctic system data and modeling. The workshop also built on results from an AGU town meeting in December 2006 as well as an e-Town Meeting in late March of this year. Extensive background material on this effort can be found at **http://www.arcus.org/ARCSS/2007_data/index.html (http://www.arcus.org/ARCSS/2007_data/index.html)**.

Workshop Goal, Focus, and Participation
The specific goal of this workshop was to:
Bring together data provider and data user communities to identify innovative approaches on data management and assimilation, recent developments in technology, and modeling activities that will advance arctic system synthesis and understanding.

Workshop discussions were organized around a set of guiding questions:

1. What are the data and modeling needs to advance synthesis-focused arctic system science?
2. What's currently working and what is needed in terms of applying data and modeling for analysis to advance science? What are the keys to success?
3. What are the practical steps forward as far as mechanisms, approaches, tools and procedures, organization, standards, and related issues?

More than 50 invited and self-nominated community participants attended the meeting, representing a variety of expertise and disciplines, including perspectives on: natural, social, and physical sciences; field-based, remote sensing, and modeling approaches; data management; science-policy linkages; and education and outreach. In addition, nearly 35 community members participated online through a webcast and online bulletin board. The workshop featured four "vision" talks on the subjects of data provision, information management, data synthesis across the natural and social sciences, and education and outreach; the remainder of the dialogue combined group plenary and breakout discussion.

Workshop Recommendations
Workshop participants discussed numerous data and modeling strategies that could be implemented to promote arctic system synthesis, improved scientific understanding and prediction, and increase the utility of scientific results to policymakers, educators, students, and the public.

A central recommendation that arose from the workshop was the creation of a new framework to foster data and model integration. This framework – The Arctic Synthesis Collaboratory – is envisioned as an "umbrella" concept that fosters interactions among arctic scientists and other stakeholders; integrated data analysis and modeling activities; outreach, education, and policy-relevant resources; and training and development of the arctic science community.

The Arctic Synthesis Collaboratory would encompass many different activities, which can be categorized into four integrated functions:

1. Community Network and Synthesis "Meeting Grounds,"
2. Data and Modeling Support,
3. Education, Outreach, and Policy, and
4. Scientist Training and Development.

Discussions at the workshop focused on this four-part vision as a broad approach to addressing community needs; it is envisioned that the next step in its development would focus on implementation, including linkages with cyberinfrastructure experts and industry to outline the supporting structure, tools, phasing, and management of the Collaboratory.

Each of the four Collaboratory functions could be established virtually as a distributed set of activities, and also could take advantage of existing facilities that might sponsor some of the identified activities. Fundamentally, the Collaboratory serves as a partnership-building mechanism across the many communities served, building on the spirit of collaboration and teamwork in the arctic system sciences community. The

Collaboratory would provide substantial opportunity for individuals and groups to interact and execute synthesis studies, education, and outreach. A brief description of each integrated element follows:

1. Community Network and Synthesis "Meeting Grounds"
A network that links individuals, groups, organizations, and synthesis activities distributed across the nation would enable scientists to collaborate on synthesis (single, dual or multidisciplinary approaches), develop policy-relevant information and resources, foster new research initiatives, and build interdisciplinary skills. A distributed network would enable participation and cooperation at multiple levels — from individual scholars to institutions.

Examples of specific activities could include: online searchable scientist directories, virtual synthesis activities, virtual and in-person synthesis workshops, visiting expert program, shared digital library, discussion forums, etc. These community activities would build upon existing resources available through relevant organizations or agencies.

2. Data and Modeling Support
The Collaboratory would be designed with the appropriate cyberinfrastructure, information technology, data discovery and handling, and modeling resources to enable efficient combination of data and models to promote inquiry-based synthesis science and a wide array of applications. These could be housed at either individual or multiple venues, capitalizing on particular strengths that a particular facility could bring in terms of synthesis-supporting services. Cyberinfrastructure and related tools to support the Collaboratory would be adaptable to new developments and flexible for a variety of applications.

Needs identified by the community include: an efficient process for researchers to submit data and metadata to a long-term archive; minimal delay in the online availability of submitted data and metadata; standardized, open, and interoperable metadata and data formats; a coherent and comprehensive venue for data discovery, whereby data can be searched through a number of user-friendly methods; recovery of stored or historical data; links to existing data archives and centers; model synchronization; a method for authentication of data quality; identification of high-priority datasets to be integrated; and tools for integration of data and models and analysis across multiple data sources, scales, and formats.

3. Education, Outreach, and Policy
Education, outreach, and policy elements are a critical part of the Collaboratory to increase public understanding of arctic science and to provide decision-makers with relevant and timely information about the Arctic.

Examples of activities and needs include: easy-to-use data exploration tools geared to non-scientists; audience-appropriate downloadable maps and graphics; a virtual news-conferencing center; "late breaking environmental news" catalog; online directories to facilitate interactions between reporters, scientists, and stakeholders; information on individual arctic science projects and programs; researcher profiles; and K-12 lesson plans and educational resources. These activities could be coordinated through a portal structure such as an Arctic Virtual Outreach Center (AVOC) with a focus on outreach and communication to non-scientist communities.

4. Scientist Professional Development
As state-of-the-art data sets, models, and synthesis tools will emerge from the Collaboratory, it will be important that the community gain expertise in new synthesis tools and approaches. Scientists at all career levels – from undergraduates to established scientists – need to keep pace with the newest developments in synthesis data integration and modeling as well as training in system-level, interdisciplinary science.

Professional development activities could include web-based courses, short classes, online curriculum materials, or exchange programs for both students and established researchers on issues related to novel tools or methods in arctic science, policy implications of arctic system science, or training in cross-disciplinary analysis and approaches.

Next Steps and Implementation
A draft report will be generated from the findings of this workshop and earlier planning events. The draft will be circulated to the wider community for review and revised for final publication in fall 2007.

We believe that the Arctic Synthesis Collaboratory outlined above will provide a cohesive, engaging, and inclusive framework to advance synthesis-focused arctic system science. While the April workshop outlined a vision for the framework and supporting functions, further discussion amongst the arctic community and relevant agencies is needed on how to translate this vision into action through a clear implementation and coordination plan.

We welcome any and all inputs to these recommendations and the strategic planning document. Workshop background materials, agenda, participant list, and presentation downloads can be found at **http://www.arcus.org/ARCSS/2007_data/index.html (http://www.arcus.org/ARCSS/2007_data/index.html)**.

Sincerely:

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