Appendix B

Interagency Arctic Research Policy Committee

5-Year Plan Collaboration Teams: 2015 Summary of Accomplishments and 2016 Priorities

INTERAGENCY ARCTIC RESEARCH POLICY COMMITTEE

5-YEAR PLAN COLLABORATION TEAMS

2015 SUMMARY OF ACCOMPLISHMENTS AND 2016 PRIORITIES

The accomplishments described here represent highlights for each IARPC collaboration team during FY 2015, presented in order of appearance in the 5-Year Plan. Each team also has contributed an update on priorities for the coming year. The latest milestone updates can be obtained from the secretariat and are available online on the member side of the IARPC Collaborations website.

IARPC Collaboration Teams

Sea Ice Collaboration Team

Distributed Biological Observatory Collaboration Team

Chukchi & Beaufort Seas Ecosystem Collaboration Team

Glaciers & Fjords Collaboration Team

Terrestrial Ecosystems Collaboration Team

Wildfires Collaboration Team

Atmosphere Collaboration Team

Arctic Observing Systems Collaboration Team

Arctic Data Collaboration Team

Modeling Collaboration Team

Arctic Communities Collaboration Team

Human Health Collaboration Team

These Federal agencies comprise IARPC: Department of Commerce (DOC), Department of Defense (DOD), Department of Energy (DOE), Department of Health and Human Services (HHS), Department of Homeland Security (DHS), Department of Interior (DOI), Department of State (DOS), Department of Transportation (DOT), Environmental Protection Agency (EPA), Marine Mammal Commission (MMC), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF, Chair), Office of Management and Budget (OMB), Office of Science and Technology Policy (OSTP), Smithsonian Institution (SI), and United States Department of Agriculture (USDA).

Sea Ice Collaboration Team (SICT)

Accomplishments

To advance the SICT's goal of continuing and expanding Arctic sea ice observations to understand freezing and melting processes, from March through May 2015, the NASA Operation IceBridge project flew 10 missions over the Arctic Ocean—a total distance of 25,000 km. By May 2015, Operation IceBridge posted the Quicklook ice freeboard, ice thickness, and snow depth data at the National Snow and Ice Data Center (NSIDC). Scientists also made available a pan-Arctic sea ice thickness product of blended IceBridge and CryoSat-2 data for March 2015. Operation IceBridge overflew several validation sites where snow depth, ice freeboard, and ice thickness were being measured by scientists on the ice. Scientists are using these and other in situ data to validate the airborne measurements, and the larger-scale airborne data will help them to develop and improve algorithms for deriving ice freeboard and ice thickness from Cryosat-2 data and ICESat-2.

Researchers at NASA, NSIDC, the National Ice Center (NIC), and the Naval Research Laboratory (NRL) of the ONR made significant progress in using remotely sensed sea ice products to improve numerical ice predictions. In one case, a blended, high resolution sea ice concentration product assimilated into the Navy's ice forecasting systems reduced the overall pan-Arctic ice edge error by 36 percent for a year-long period, while the error reduction during the summer melt season was 56 percent, compared to results using ice concentration derived from lower resolution, single sensors. In the second case, assimilating a blended, high-resolution sea ice concentration product into the Navy's ice forecasting systems yielded June ice edge error reductions of 8 to 49 percent, depending on region, relative to the assimilation of data from lower resolution, single sensors.

In summer and autumn 2015, NRL and NOAA provided sea ice, wave, and weather predictions to the R/V *Sikuliaq*, the USCGC *Healy*, USCG Arctic Domain Awareness airborne missions, and a NOAA/BOEM marine mammal survey based in Barrow, Alaska. The goal was to improve prediction capability by providing forecasts to a variety of users who return feedback on the forecasts' accuracy and operational value of the predictions to identify areas for model improvement.

Understanding sea ice predictability and improving prediction at seasonal time scales is the goal of the interagency (DOE, NASA, NOAA, NSF, ONR) Sea Ice Prediction Network (SIPN). One of the network's tools is the Sea Ice Outlook, which received a record number of predictions—a total of 105 from June through August—of average sea ice extent in September 2015. NISDC declared a sea ice minimum extent of 4.4 million km^2 on 11 September 2015; the average September extent was 4.63 million km^2. Both values are the fourth lowest in the satellite record (1979-present). In June, July, and August, 6, 6 and 7 Sea Ice Outlook predictions, respectively, fell within ±5 percent of the average extent (a range of 463,000 million km^2, almost the area of California). Only two organizations sent predictions that were in that range each of the three months.

Priorities for 2016

ONR's "Sea State and Boundary Layer Physics" Department Research Initiative conducted its main field experiment in October 2015 aboard the R/V *Sikuliaq* in the Beaufort and Chukchi seas. Operation IceBridge will conduct further sea ice missions over the Arctic Ocean in winter/spring 2016. The Sea Ice Outlook and Sea Ice for Walrus Outlook will continue, and the SIPN will organize a workshop in May 2016.

Distributed Biological Observatory Collaboration Team (DBOCT)

Accomplishments

The DBOCT completed Year 6 of sampling in DBO/Chukchi regions 1 through 5 and began expanded sampling in new DBO/Beaufort regions 6 to 8. Colleagues from 14 projects representing 6 countries contributed to field sampling efforts. The DBOCT provided a framework to focus and coordinate sampling and analytical efforts that link biological changes to physical drivers in the Arctic. In a key science achievement, researchers could track shifts in benthic community biomass and structure associated with measures of annual sea ice persistence in the five DBO/Chukchi regions[1]. An important physical oceanographic achievement, through occupation of the DBO region 5 (Barrow Canyon), was the observation of the seasonal freshening and warming of sea water transiting northward on the eastern and surface layers of the Chukchi Sea, with the maximum temperature observed in September. DBOCT members presented these accomplishments at the second DBO Data Workshop, the 2015 Arctic Science Summit Week in Toyama, Japan, and at other national and international venues.

To provide a foundation for data sharing among DBO contributors and collaborators, the team issued Data Policy and Release Guidelines and initiated the DBO Data Archive at the Earth Observing Laboratory, University Corporation for Atmospheric Research. The guidelines are essential for the long-term success of the DBO. To complement the archive, a DBO data workspace was added to the Alaska Ocean Observing System website. When added to the existing collection of sea ice, sea surface temperature, wind, cloud fraction, and ocean-color images on the NASA Satellite Data Visualization Portal, new sea surface height and salinity images of the DBO region will enhance available data products.

Internationally, the DBO continues to benefit from organizational support provided by the Pacific Arctic Group (PAG), to include sampling in Russian Arctic waters, via the Russian-American Long Term Census of the Arctic program. Discussions within PAG led to the development of a Canadian DBO region in the Beaufort Sea, as well as an agreement to establish a Pacific Arctic climate ecosystem observatory that will be sampled in concert with DBO activities in the Chukchi Sea. These achievements in international cooperation lay the groundwork for a truly pan-Arctic biological observatory. Discussions are continuing with Canada's ArcticNet program office to include their western Beaufort and Arctic Archipelago time-series lines within the DBO framework, and the Institute of Marine Research (IMR) in Norway is considering DBO lines in the northern Barents Sea as part of their annual ecosystem surveys.

Priorities for 2016

The DBOCT will complete a decadal DBO Implementation Plan. The plan will focus on preparing periodic assessments on the physical and ecological state of the Pacific Arctic marine environment, using, in addition to DBO-generated data, information from projects supported by the NSF, BOEM, NASA, North Pacific Research Board (NPRB), and others. The DBOCT will seek linkages to complementary sampling programs, including transects identified by the Arctic Council Conservation of Arctic Flora and Fauna/Circumpolar Biodiversity Monitoring Program. The updated DBO Implementation Plan will suggest ways to foster connections with existing community based observation networks.

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[1] Grebmeier et al. 2015. *Progress in Oceanography*; [2]Itoh et al. 2015. *Deep-Sea Research I*

Chukchi & Beaufort Seas Ecosystem Collaboration Team (CBCT)

Accomplishments

To capture information on existing research in the Chukchi and Beaufort seas, the CBCT completed several information-gathering activities in 2015. CBCT members created a Gantt chart illustrating the temporal overlap of projects in the Chukchi and Beaufort seas, and also provided a detailed inventory of those projects that includes their degree of relevance to the five priority research themes identified in an earlier document, "Framing Arctic Marine Research Initiatives: A Framework for Coordinated Marine Ecosystem Research in the U.S. Chukchi and Beaufort Seas." The inventory will serve as a source of public information for those interested in opportunities to collaborate or leverage resources.

Research teams launched a number of interdisciplinary marine science programs in the Chukchi and Beaufort seas, due in large part to the activities of the CBCT. A consortia of entities, many of which include Federal and private partners, fund these efforts. The Marine Arctic Ecosystem Study (MARES) led by the Bureau of Ocean Energy Management (BOEM) is centered in the Beaufort Sea and includes international collaborations and public-private partnerships. In partnership with BOEM and the North Slope Borough/Shell Baseline Studies Program, the NPRB issued a call for pre-proposals in May 2015 to initiate an ecosystem program centered in the Chukchi Sea that will include the northern Bering Sea and Bering Strait. The CBCT plays a central role in coordinating the activities of these programs.

The CBCT established a Chukchi/Beaufort Marine Steering Group (CBMSG) to maintain awareness of the direction and progress of ecosystem programs such as MARES. The CBMSG provides advice to the broader CBCT about areas where additional work is needed. It also exposes instances when proposed activities might duplicate ongoing work. The CBCT was informed about existing partnering mechanisms through presentations from the National Oceanographic Partnership Program (NOPP) and the National Fish and Wildlife Foundation during 2015. Different mechanisms and options were discussed after those invited talks.

Priorities for 2016

To complement the discussion initiated by the co-chairs on partnering mechanisms, the CBCT is planning a presentation on the MARES NOPP partnership. Challenges, opportunities, alternatives and lessons learned will be discussed. This presentation will address the entire IARPC community.

Because the team seeks to improve efficiency in planning and using resources (e.g., icebreakers), the CBCT seeks interaction with the newly created IARPC logistics group. In working to improve coordination among ongoing projects, the CBCT hopes to make progress towards meeting the broader milestones of the CBCT.

Improved integration of marine ecosystem research can be achieved through tasking the CBMSG to inform the team about opportunities to direct future investments in areas that address the CBCT members' interests, and facilitating the organization of an information integration conference.

Glaciers and Fjords Collaboration Team (GFCT)

Accomplishments

Organized to enhance interagency collaborations on land ice loss process studies targeting specific dynamic regimes, the GFCT revised one of its milestones during 2015 to encourage discussion on a variety of processes and parameterizations in addition to Earth system models. NASA began a long-term study, Oceans Melting Greenland, which includes modeling and observations of the impacts of warming ocean waters around Greenland and the degrading ice sheet. NSF initiated a related study of historical data analyses and modeling of the warming oceans around Greenland, as well as an observational and modeling study of plume dynamics in an Alaskan fjord where fjord waters meet a glacier face. With NASA funding, researchers collected side-looking multi-beam echo sounding observations of fjord bathymetry and submerged ice faces of three west Greenland glaciers. The data reveal cavities undercutting the base of the calving faces at sites of subglacial water discharge predicted by a hydrological model. These observations are consistent with models of ice melt in which this discharge transports warm Atlantic waters to the ice faces.

An NSF-funded paleo-study of Petermann Glacier, involving scientists from the United States, Canada, Denmark, Sweden, and the United Kingdom, completed its planned field work based from the R/V *Oden* in September. The Community Earth System Model (CESM) Land Ice Working Group continues to manage collaboration between agencies and academic scientists to develop a community ice sheet model, which incorporates the results of recent process studies, for use in Earth system models. The ice sheet model, CISM 2.0, was publicly released on GitHub in October 2014.

The International Greenland Ice Sheet-Ocean Interactions (GRISO) Network, a self-organized, international, open network of scientists, grew out of the U.S. Climate Variability and Predictability (CLIVAR) working group. GRISO's goals are often commensurate with those of the Study of Environmental Arctic Change (SEARCH) Land-Ice Action Team and GRISO maintains close coordination with that team. The June 2013 U.S. CLIVAR workshop recommended a planning strategy for obtaining long-term time series of critical in situ glaciological, oceanographic, and atmospheric parameters to provide information on the time-evolving relationships between different climate forcings and the glacier flow, called the Greenland Ice-Ocean Observing System (GrIOOS). To further advance discussions regarding the design and implementation of a GrIOOS, the SEARCH Land-Ice Action Team will meet in San Francisco on 12 and 13 December 2015. These activities complete the milestones assigned to the GFCT.

Priorities for 2016

Participation in the GFCT monthly meeting will increase largely through broadened inclusion of members from the non-Federal scientific community. Long-term monitoring of the Greenland ice sheet and its glaciers will continue through NASA's Operation IceBridge. The glacier-fjord collaboration team will endeavor to expand its international linkages both directly and through synergies with the newly formed SEARCH Land Ice/Sea Level Rise Action Team and the expanding activities of the GrIOOS working group. Interagency discussions will continue to look for collaborative opportunities when budgets permit.

Terrestrial Ecosystems Collaboration Team (TECT)

Accomplishments

To better assess the impacts of climate change on Arctic terrestrial ecosystems, the TECT completed two milestones, initiated three, and made significant progress on the remainder.

To enhance potential future coordinated approaches to understanding ecosystem changes in the Arctic, TECT reviewed and summarized 6 administrative, cross-agency and inter-disciplinary documents. These included "The Arctic in the Anthropocene: Emerging Research Questions," and "Collaborative Opportunities," developed by the Alaska Climate Change Executive Round-Table (ACCER). The TECT review is available for comment and updates on the member side of the IARPC Collaborations website.

The TECT completed an assessment of existing tools and methods for measuring and mapping the effects of cryosphere changes on Arctic ecosystems and communities, and posted it to the member side of the IARPC Collaborations website. The spreadsheet includes legacy deep borehole permafrost temperatures and long-term climate (site) data, water related databases, information on terrestrial components, remote sensing imagery, coastal erosion, and geochemical and geophysical surveys.

Due to the importance of the boreal region in providing fresh water and organic inputs to the Arctic Ocean, two new milestones were created to address the completion of a circumboreal vegetation map. The map will provide baseline ecological documentation of boreal watersheds. The TECT added a third milestone to address a pan-Arctic analysis of permafrost dominated Arctic and boreal regions. This milestone will increase our understanding of the magnitude and distribution of permafrost carbon stores, and to identify areas of permafrost that are potentially most vulnerable to carbon loss with continued warming.

Priorities for 2016

The TECT will continue to finalize metadata standards for data archiving and to acquire elevation data through the cooperative actions of State and Federal agencies.

The team also will continue to advocate for use of traditional knowledge in ecosystem and climate science, a challenging milestone since traditional knowledge is often proprietary for local inhabitants. The TECT created a proposed process model and initiated discussions to involve six of the IARPC collaboration teams: Terrestrial Ecosystems, Arctic Data, Modeling, Arctic Observing, Arctic Communities, and Chukchi-Beaufort Seas. Discussions will continue, and researchers will focus on past and contemporary knowledge and patterns of use.

The TECT will coordinate with the Permafrost Carbon Network (PCN) to conduct a pan-Arctic assessment that will identify gaps in our understanding of the magnitude and distribution of permafrost carbon stores, and identify permafrost areas potentially most vulnerable to continued warming. The PCN synthesizes and links existing research about permafrost carbon and climate in a format that can be assimilated by biospheric and climate models and that will contribute to future assessments of the Intergovernmental Panel on Climate Change.

Wildfires Collaboration Team (WCT)

Accomplishments

The WCT built on previous analysis, focusing on promoting research that fills in knowledge gaps in Arctic fire science. The team held eight meetings, some of which featured webinars. Laura Bourgeau-Chavez, Ph.D., Michigan Tech Research Institute and Arctic-Boreal Vulnerability Experiment (ABoVE) scientist, presented "Remote Sensing of Subsurface Organic Moisture: State of the Science, Sensors, Potential Application to Fire Danger Index Validation." Later in the year, USGS Alaska Science Center scientist Rachel Loehman led discussion on the state of knowledge of wildfire emissions in tundra and northern boreal forests. WCT's milestone progress included the Bureau of Land Management funding a graduate student to study wildfire impacts to indigenous Arctic communities under University of Alaska, Fairbanks' (UAF) Resilience and Adaptation Program.

WCT added a new milestone to convene an international, interdisciplinary workshop with remote sensing scientists, ecologists, hydrologists, agency fire managers, and decision-makers discussing new opportunities to use remote sensing in boreal/Arctic wildfire management and science. Members of the WCT, with other subject matter experts and lead Alison York from the Alaska Fire Science Consortium (AFSC), developed a proposal for NASA's Applied Science Program to seek workshop support. One webinar was co-hosted with AFSC: "The Climate Has Changed, Have We? Reflections on 50 Years of Fire Management in Alaska."

In August 2015, NASA selected 21 proposals for the initial research investigations to begin the ABoVE field campaign—a large-scale study of ecosystem responses to environmental change in western North America's Arctic and boreal region and the implications for social-ecological systems. Several of the selected proposals focus on topics related to wildfires. In the coming year, this program should begin contributing to progress in achieving several WCT milestones.

Priorities for 2016

The WCT will continue a focus on remote sensing of fires and fire effects in high latitudes and their potential management application as well as modeling efforts to understand climate-fire forcings and their effect on communities and fire management in the North.

If funded, the "Opportunities to Apply Remote Sensing in Boreal/Arctic Wildfire Management and Science Workshop" will be held 9-10 March 2016 at UAF in association with Arctic Science Summit Week.

Atmosphere Collaboration Team (ACT)

Accomplishments

The Arctic Monitoring and Assessment Program (AMAP) recently completed its "Summary for Policy-makers: Arctic Climate Issues 2015," which presents the policy-relevant findings of the AMAP 2015 assessments of short-lived climate forcers (SLCF). Efforts involved new observations and modeling to enlighten the processes by which SLCFs affect Arctic warming, enabling mitigation through policy.

Scientists sampled the Arctic atmosphere during ground and airborne campaigns. DOE's Airborne Carbon Measurements Experiment (ACME) provided transects and vertical profiles of gases, aerosol, cloud, and atmospheric state properties on Alaska's North Slope. DOE also sponsored a campaign to test unoccupied aircraft systems (UAS) platforms. The DOE Atmospheric Radiation Measurement (ARM) facility completed a second year of a long-term deployment of its Oliktok Point, Alaska facility, which complements the Barrow-based DOE/ARM and NOAA observatories to capture the range of variability along the North Slope. The Oliktok Point site also provides FAA-approved special-use airspace so flights with manned or unmanned aerial systems can probe the over ocean atmosphere away from the coast. The DOE has funded an Oliktok Point Site science team to conduct relevant research using these and new measurement approaches.

A workshop sponsored by the International Arctic Science Committee (IASC) with support from NOAA focused on the joint observation-modeling issues of understanding the changing composition of the Arctic atmosphere, with an emphasis on identifying the collaborative efforts required to improve critical knowledge in the decade ahead. This group has developed into an initiative called the air Pollution in the Arctic: Climate, Environment and Societies (aPACES) under the auspices of the International Global Atmospheric Chemistry project. This initiative pursues semi-routine vertical profiling in the Arctic atmosphere using UAS. To this end, NOAA has developed several miniaturized ozone and aerosol sampling instruments for UAS.

Through the NSF-supported International Arctic Systems for Observing the Atmosphere (IASOA) radiation working group, scientists developed multi-year datasets of radiation and cloud radiative forcing at Summit Station, Greenland to evaluate the European Center for Medium-Range Weather Forecasting Reanalysis-Interim performance and NCAR's Cloud Earth System Model cloud parameterizations. The IASOA aerosol working group added new products to the World Data Center for aerosols and has also developed a pan-Arctic correction scheme for consistent processing of seven aethalometers. The FAA continues to develop its climate tools to study aviation effects on global and regional climate, including the Arctic.

Priorities for 2016

The ACT will synthesize observations and models for evaluations and cooperation with the newly formed IARPC Systematic Improvements to Reanalyses of the Arctic (SIRTA) working group, and advance aerosol-cloud interaction efforts and observational needs assessments for methane, aerosol, cloud, and atmospheric state properties to provide the spatial and temporal coverage needed to address the most pressing questions regarding the drivers of change in the Arctic.

Arctic Observing Systems Collaboration Team (AOSCT)

2015 Accomplishments

The AOSCT was on hiatus between March and August due to a changeover in agency observing program management. The team reviewed best practices for observing programs and projects that have made progress on sustaining observations or integrating observations in innovative ways. Programs included the Portal for the Arctic Adaption Exchange of the Arctic Council's Sustainable Development Working Group (SDWG), which maps community identified indices onto existing observational resources. The team also reviewed Alaska's Terrestrial Ecosystem Observing Network (TEON) effort to coordinate the design and implementation of a terrestrial environmental monitoring network in northern Alaska, intended to detect and forecast effects of a changing climate, hydrology, and permafrost regime on wildlife, habitat, and infrastructure in northern Alaska. The latter discussion highlighted those aspects of observing network development that can fall through institutional cracks between agencies. In particular, a patchwork of meteorological stations on the North Slope of Alaska maintained by plural agencies was identified as a valuable resource for TEON work, though harmonizing the stations for greater network value falls outside of the responsibility of any agency.

The AOSCT team also focused on developing a pilot "Arctic Observing Assessment" (AOA), led and funded by NSF as a contribution to the joint goals of the IARPC and Sustaining Arctic Observing Networks (SAON). Accessible through the Arctic Hub, the AOA maps relationships between societally significant observing priorities, as defined by northern residents and other stakeholders, to the observing and knowledge resources (or lack thereof) that help them to address those priorities. The AOSCT reviewed initial feedback on the priority areas and also provided information about available products and observations.

Belmont Forum Arctic Observing and Research for Sustainability awards were made by NSF and BOEM in partnership with international funding agencies. Research teams include a breadth of stakeholders, including indigenous communities, local governments, industry, and nongovernmental organizations.

When the AOSCT reconvened under new leadership in August, initial meetings focused on Community Based Observing (CBO) in response to Arctic Executive Steering Committee (AESC) interests in promoting best practices for these networks and enhancing their application, where appropriate, throughout Arctic communities. Through the AESC interests, the AOSCT developed a framework document to guide white paper inputs towards the 2016 Arctic Observing Summit (AOS) in Fairbanks, AK. At this meeting, CBO will be a focus.

Priorities for 2016

The AOSCT will continue to serve as a forum for community engagement and preparation for the AOS. In addition, the Arctic Observing Open Science Meeting (AOOSM) will have ongoing support to develop results and recommendations from their November 2015 meeting. Supporting on-going dialog across CBO groups, in particular communicating best practices, will also remain important. The challenge of developing a true cross-agency vision for an AON will remain part of the evolving conversation. AOSCT will endeavor to identify agency champions to assume leadership on promoting cross-agency observing system harmonization similar to those identified by TEON.

Arctic Data Collaboration Team (ADCT)

Accomplishments in 2015

The ADCT is unique for several reasons. It was the last IARPC collaboration team to convene, and as a result has had just seven meetings, of which the first four were open only to Federal members. Additionally, while some teams started with many, the ADCT had only a single milestone. The Federal only meetings focused on defining what the team could accomplish together, assembling an inventory of Federal Arctic data activities identifying more than 20 activities and investments among 8 agencies.

The ADCT identified the Alaska Data Integration working group (ADIwg) as a core activity. Two large NSF-funded data activities, Advanced Cooperative Arctic Data and Information Service and Polar Data Coordination Network, also were of interest, as they will help ADCT explore how large data activities can be leveraged with other agency investments and non-Federal activities. Stan Smith of USGS reported on the completion of a releasable version of the "ISO Metadata Developer's Toolkit" and Peter Pulsifer of the NSIDC provided a brief on the current status of progress on the development of an international polar data coordination network. Both of these activities support ADCT milestones.

In April, the ADCT began evaluating the milestones for clarification, identifying Federal and non-Federal activities to leverage in the near-, mid-, and long-term. One such activity was to assist the Office of Science and Technology Policy in establishing the new Arctic theme within the Climate Data Initiative and Climate Resilience Toolkit resources. IARPC teams provided input to the Arctic theme and sub-themes, created the theme narrative, provided subject matter experts to review narrative content, identified initial new Arctic data set content, provided preliminary review of candidate data content, and recommended new toolkit content. The theme was successfully introduced at the end of August 2015.

Priorities for 2016

Now open to non-Federal collaborators, the ADCT will identify a co-lead from a non-Federal organization and will continue to serve as a forum for data collaborative engagement and building trust among the communities of data providers and users. The ADCT plans to expand the current inventory list of Arctic data sources, assess the lessons learned from current ongoing collaborative projects, and engage in activities such as the Climate Data Initiative and the Climate Resilience Toolkit. In addition, the ADCT will assess several approaches to data management and sharing to identify a set of priorities and strategies. These include the need to improve data sharing, make use of existing resources, and improve sustainable engagement by stakeholders.

Modeling Collaboration Team (MCT)

2015 Accomplishments

Modeling provides two important benefits to scientific research and decision making: it allows the community to capture and evaluate the state of the art in understanding processes and interrelationships, and it provides a mechanism by which current understanding can be used to project future states. As such, modeling crosscuts most topics in IARPC's 5-year plan; as a result, the MCT defined over 25 milestones to improve understanding of regional Arctic climate. In addition to focusing on next-generation models for the Arctic, the MCT contributed significantly to integrating models and observations.

MCT activities contributed to improving individual model components for ice sheets, sea ice, and permafrost. For example, new parameterizations for melt ponds, ice hydrology, and ridging were included in sea ice models. Other examples include the recent efforts in several modeling centers to develop and couple ice sheet models in the global and regional models.

As an example of interagency coordination in Arctic modeling, agencies invested in improvements to the coupled Regional Arctic System Model (RASM). With funding from DOE, ONR, and NSF, RASM, grantees worked on complementary goals that enhance Arctic system understanding holistically.

The MCT identified recent dedicated field campaigns that inform modeling efforts by enhancing knowledge of Arctic processes. PRN and Next-Generation Ecosystem Experiments-Arctic focus on permafrost, to synthesize and link existing research about permafrost carbon and climate in a format that can be assimilated by biospheric and climate models. NASA's ABoVE links field-based, process-level studies with geospatial data products derived from remote sensors to improve the analysis and modeling capabilities needed to understand and predict Arctic ecosystem responses and societal implications.

Further, recent model inter-comparisons have helped to identify improvements in modeling high-priority Arctic processes. The inter-comparison effort for ice sheets (ISMIP6) focuses on evaluating ice sheet models in a common framework. The POLARCAT Model Intercomparison Project evaluated the capability of global and regional atmospheric chemistry and transport models to simulate the chemistry and composition of the Arctic atmosphere. Finally, the SIPN continually analyzes model predictions of sea ice against the observed extent to inform the need for improved processes.

Finally, MCT members organized a session for the fall 2015 AGU meeting titled "Advancing Science of the Arctic System: Exploring the Past and Present to Predict the Future."

Priorities for 2016

The MCT will implement a restructuring of the current milestones, and work to further integrate Arctic modeling activities and progress across the Federal agencies. Recent workshop results and discussion points to a growing need to coordinate our assessment of Arctic system modeling to better understand the sensitivities of these models and improve the representation of coupled processes that are critical to the emerging Arctic environment.

Arctic Communities Collaboration Team (ACCT)

2015 Accomplishments

The ACCT goal of encouraging research on the impact of warming climate on communities and ecosystem services advanced along many fronts in 2015. Per its imperative, the ACCT focused on information sharing and outreach, primarily in Alaska, rather than initiating or coordinating research. ACCT members presented work at several Arctic conferences.

To support the establishment of observing networks, BOEM initiated a social indicators project in coastal Alaska, and NSF funded "Arctic-FROST," an international, interdisciplinary research network aimed at improving health, human development and well-being while conserving ecosystem structures, functions and resources. ACCT identified projects and indigenous local observers for environmental observation and for data record preservation projects. The TECT will address incorporating indigenous knowledge and observing into monitoring environmental parameters.

Vulnerability research advanced with projects on social indicators for rural Alaska, and studies of how the social sciences inform decision-making. NASA's ABoVE program began studying ecosystem and societal vulnerability and resilience to the changing Arctic. Several Arctic Science, Engineering, and Education for Sustainability programs continued with support from BOEM, EPA, NSF, and USGS.

ACCT's food security work included a North Slope Borough subsistence mapping project and an ICC-Alaska report in collaboration with TECT. Further, Smithsonian research on the history, timing, and causes of animal "crashes" among major subsistence species advanced knowledge as well.

To help preserve indigenous language and heritage, ACCT sponsored a webinar on indigenous Arctic language status and practical steps to encourage use and continuity. The inauguration of the U.S. Arctic Council chairmanship provided an opportunity for IARPC demonstrations of Arctic vitality at the Smithsonian's Arctic Spring Festival in May; several native language programs were featured together with cultural and natural history programs, exhibits, performances, and films. The Alaska State Indigenous Language bill (HB 216) led to efforts to monitor language status and recommend policy. The Smithsonian's "Recovering Voices" programs featured Alaskan topics, and new research on links between oral history, language, archaeology, and climate change were the subject of an NSF-funded Smithsonian research program in Yakutat Bay. The Smithsonian also published a 20th century history of Chukotka. The Arctic Council has also initiated its own Arctic Languages Vitality Project.

The NPS, NSF, Smithsonian, and other agencies have issued publications and new heritage and language programs. However, the bulk of this work is being carried out by or in collaboration with Native organizations, universities, nongovernmental organizations, and others.

Priorities for 2016

Future ACCT activities will expand collaborations with the Arctic Observing and Health teams, and pursue initiatives linked to U.S. Arctic Council chair priorities.

Human Health Collaboration Team (HHCT)

Accomplishments in 2015

With encouragement from the HHCT, the State Department included three health priorities in initiatives framing the United States' approach to the Arctic Council chairmanship (a 2 year appointment that began in spring 2015). HHCT's priorities are behavioral and mental health, and suicide prevention; water sanitation and health; and the merits of taking a "One Health" approach to addressing climate change and health[2]. HHCT also recommended continuing international collaborations and engaging indigenous communities and tribal groups in research.

The International Circumpolar Surveillance and research network published a consensus statement on treatment of *Helicobacter pylori* infections in high-prevalence regions of the Arctic[3].

Priorities for 2016

Arctic Council health priorities will continue to influence activities in 2016. The water and sanitation initiative will be featured at the Alaska Health Summit (2-4 Feb), at the Arctic Science Summit Week in March, and at a special international workshop on innovations in water service delivery to be held in Anchorage in the fall of 2016. The RISING SUN mental health initiative will feature another metrics-defining scientific advisory group meeting in April 2016, followed by further community engagement sessions later in the year. The One Health initiative will undertake a survey of activities and capacities in the Arctic region in anticipation of a presentation to the SDWG in 2017. Additional collaborations for the Alaska One Health group will continue with quarterly meetings to connect partners and to evaluate new events and trends.

The International Circumpolar Surveillance (ICS) network anticipates publication of its summary of Tuberculosis rates and surveillance evaluations. The ICS research network is undergoing similar evaluations of surveillance for potentially climate-sensitive infectious diseases and of viral hepatitis among Arctic nations.

Research on reducing occupational injury risk will be conducted or reported in 2016 for commercial fishermen, commercial pilots, and oil spill response workers.

The Alaska Local Environmental Observer (LEO) network will introduce a new application to facilitate tracking and reporting observations of environmental change; this should expand the reach of the network and facilitate expanded use of the observations. The Maternal Organics Monitoring (MOM) study will continue planned activities; MOM anticipates final analysis of organohalogen results, which will be linked to childhood outcomes and infant Apgar scores.

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[2] Ruscio BA, Brubaker M, Glasser J, Hueston W, Hennessy TW. "One Health - a Strategy for Resilience in a Changing Arctic." .*Int J Circumpolar Health*. 2015 Sep 1;74:27913. doi: 10.3402/ijch.v74.27913

[3] McMahon B, Bruce MG, Koch A, et al., "The Diagnosis and Treatment of *Helicobacter Pylori* Infection in Arctic Regions with a High Prevalence of Infection: Expert Commentary." *Epidemiology and Infection* 2015. doi 10.1017/S0950268815001181