**Arctic Observing Open Science Meeting**
**17 – 19 November 2015**
**Seattle, Washington, USA**

# Parallel Session Summary

## Community Based Monitoring

*Session Chairs: Lillian Alessa and Sandy Starkweather*
*Rapporteur: Matthew Druckenmiller*

**Presentations included the following:**

1. "An Interoperable System for Sharing the Results of Community Based Monitoring" by Peter Pulsifer (University of Colorado Boulder)
2. "Best Practices for Community-based Observing Networks and Systems (CBONS) – standards, quality assurance, protections and data interoperability" by Andrew" Kliskey (University of Idaho)
3. "Historical Ecology for Risk Management: Youth Sustainability for Coastal Observers of Barrow" by Anne Garland (Applied Research in Environmental Sciences Nonprofit, Inc.)
4. "Tracking the state and use of coastal ice in Alaska communities through collaborative observations" by Hajo Eicken (University of Alaska Fairbanks)
5. "Citizen Science at the North Pole: Tourists as a Data Resource" by Alex Cowan and Lauren Farmer (Poseidon Expeditions)

**Question 1: What scientific or operational advances have been facilitated by the network(s) of Arctic observations?**

Broadly, it was acknowledged that community-based systems are critical to the detection and observation of change in the Arctic and have the potential to play an important role in helping agencies to meet their missions. This includes defining indicators, understanding their relation with other factors (interoperability), devising responses to changing environments and critical events, and informing adaptation decision-making. A few examples that emerged from the session illustrated how community networks are extremely dynamic and can detect changes in anything from fish and animal populations to physical systems like sea ice and shoreline erosion.

A key scientific and operational advance that was identified is *context*. Community-based systems are critical to establishing the context of observations in a way that autonomous observational networks cannot, because of the ability to observe "co-identified" indicators within a coupled human-environment system (Kliskey et al.). The role of tools to support context was one subject of the talk from the Pulsifer et al. on ELOKA[1] where "interactive maps allow users to visualize geographic data while at the same time linking to associated multimedia that provides an extended view and understanding of space and place." While Eicken et al. illustrated a success of SIZONET[2] was using hybrid (geophysical & traditional) methods to track diverse changes to the sea ice. The traditional knowledge insights and subsequent indicators were developed over centuries of observing these systems in context.

During the discussions the idea of capacity building emerged as an important advance as well. The Bering Sea SubNet Program kept detailed metrics on their observers and where they go in terms of employment and degrees.

All talks to some degree discussed the issue of interoperability. Pulsifer et al. provided a few definitions some examples of advancements made on this front.

- Property of a product or system, whose interfaces are completely understood, to work with other products or systems, present or future, without any restricted access or implementation.
- Task of building coherent services for users when the individual components are technically different and managed by different organizations (Wikipedia)
- Semantic interoperability: the ability to effectively exchange meaning between information systems

While it was also acknowledged that advancement has been made in the interoperability of diverse community observing systems, there remain significant challenges. These are discussed further in the section question.

**<u>Question 2:</u> What opportunities exist to address new science questions, operational challenges, or questions of Arctic communities through enhanced collaboration and a robust interagency observing system?**

The concept of interoperability emerged as a key area for methodological progress in community observing. In this context, the idea of ***interfaces*** came up. Like context, interfaces speak to the ability to not just exchange numbers but to exchange meaning. While ontologies are often identified as an important part of this mapping, it was also acknowledged that they are time consuming to develop and maintain. A number of examples were provided where an interface might be machine to machine and based on well-defined standards, there is often a need for institutional or human interfaces as well. The extent to which social sciences (e.g. human ecology) can inform this work was an important point.

The human interface also brought the discussion towards issues of relationship building and trust. The use of traditional knowledge, in particular, but more

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[1] Exchange for Local Observations and Knowledge of the Arctic
[2] Seasonal Ice Zone Observing Network

generally any human shared observation requires high trust environments, fair compensation for knowledge (paying observers) and time. One contributing factor to trust that was discussed was the extent to which communities are legitimately involved in the problem framing to begin with.

One opportunity identified for moving community observing forward was through APECS and their desire to reach out to more indigenous youth in scientific partnerships. It was noted that APECS is moving into the domain of data management as well and these are very complementary domains.
Some tangible examples of agencies that are seeking greater involvement from community observers include the Park Service. There they are developing projects to train people in local response and response plan creation, which they are hoping this feeds into Arctic ERMA. Traditional knowledge is a big part of this. Further NOAA's Distributed Biological Observatory (DBO) is looking for ways to link with CBM activities, specifically at Point Hope and Barrow. They are interested in working with communities to find out what questions they have. For example, marine mammal or sea bird diet and body condition could be a topic for exchange with local communities. They can also work with local people to identify what washes up after storms and whether that matches what we're observing offshore through instrument based observing.

**<u>Question 3:</u> How have observing activities contributed to the science needs of mission agencies or stakeholders?**

A common thread among the presentations and the discussion concerned the power of community-based observing for early warning, hazard identification, ecosystem management, adaptation and resilience efforts. Many agencies (DHS, DOC, DOD, etc.) share a stake in these efforts.

For example, SIZONET worked "jointly with the Alaska Native Tribal Health Consortium and informed the development of a freeze-up observation protocol."

The work presented by Garland also underscored the importance of these systems for risk management. Further, it was noted the NOAA, with its mission for fisheries management can benefit extensively from these networks, but must consider how complex caveats about observations can be captured.

Representatives from NOAA National Weather Service wanted to better understand at an operational level how efforts like SIZONET might translate into improved forecasts. It was noted that in some cases, community members are already tracking their own information in databases like ELOKA. But it was emphasized that integration is still hampered by lack of communication between agencies and communities. There needs to be improved interfacing to integrate.