B02-O15

SIZONET: MULTI-PURPOSE, MULTI-PLATFORM OBSERVATIONS TO INFORM RESPONSES TO AN ARCTIC SEA ICE COVER IN TRANSFORMATION

Hajo Eicken *(University of Alaska Fairbanks, United States)*
Andrew R. Mahoney *(University of Alaska Fairbanks, United States)*
Dyre O. Dammann *(University of Alaska Fairbanks, United States)*
Joshua Jones *(University of Alaska Fairbanks, United States)*
Stefan Hendricks *(Alfred Wegener Institute, Germany)*
Yasushi Fukamachi *(Hokkaido University, Japan)*
Kay I. Ohshima *(Hokkaido University, Japan)*
Christian Haas *(York University, Canada)*
Sebastian Gerland *(Norwegian Polar Institute, Norway)*
Alexandr Makshtas *(Arctic and Antarctic Research Institute, Russian Federation)*

heicken@alaska.edu

The Seasonal Ice Zone Observing Network (SIZONet) combines different approaches and platforms to track the state, variability and long-term evolution of the Arctic sea-ice cover. Network design builds on the concept of hazards and services provided by the ice cover to people and ecosystems. SIZONet is a dual-purpose network that integrates observations of key variables (ice thickness and properties, ice dynamics and seasonality in relation to ocean and atmosphere forcing) with data serving those impacted by a changing ice cover. This approach helps guide measurement priorities and selection of sampling sites. Through our international collaboration we are working towards best practices and observation protocols, and have compiled relevant information in a textbook on sea-ice field measurements[1].

SIZONet comprises (i) community-based observations of ice uses and hazards in Alaska, with plans to expand into the Canadian Arctic; (ii) measurements of the state and dynamics of coastal landfast and drifting ice with in situ sensors and coastal radar; (iii) hydrographic measurements from moored instruments; (iv) buoy deployments; and (v) airborne and surface electromagnetic induction measurements (EM) of ice thickness. The network is designed to capture the state of the seasonal ice zone at sites indicative of long-term trends and variability while being disproportionately important for human activities and ecosystems. By combining Lagrangian (measurements along trajectories through buoy deployment and remote sensing) with Eulerian approaches (flagship sites; airborne surveys linking network elements) we assess causes and impacts of change in a highly advective system. Elements of the international network include the nascent Canadian Arctic Sea Ice Mass Balance Observatory (CASIMBO), the Hydrometeorological Observatory Tiksi and Ice Base Cape Baranov in Russia, and long-term observations in the Svalbard region.

Data collected at Barrow, Alaska on sea-ice changes and implications for coastal communities, industrial activities and marine mammals illustrate our approach. Indigenous knowledge and local observations helped determine sensor deployments and - in conjunction with geophysical measurements - illuminate transformations in a region most strongly affected by sea-ice change. Ice use and ice trail surveys revealed a trend towards reduced shorefast ice stability and more dynamic ice-shoreline interaction. Lower ice stability is due to reduced multiyear ice advection out of the Canadian Arctic (tracked upstream by the Canadian SIZONet partners) and destabilization of coastal ice by strong currents and advection of warm water. A pan-Arctic survey of potential ice hazards[2] suggests that large-scale circulation patterns in conjunction with regional deformation processes make the region north of Barrow one of the ice hazard “hot spots” in the Arctic, with implications for resource development and ecologically important feeding grounds downstream. Data and information products from this work are available without restrictions and shared through multiple channels (seaice.alaska.edu/gi/data), with the CliC Arctic Sea Ice Working Group providing guidance on best practices and standards.

---

[1] Eicken et al. (2009) Field techniques for sea ice research. University of Alaska Press.
[2] Eicken & Mahoney (2015). Sea ice: Hazards, risks, and implications for disasters. In: Ellis & Sherman (eds.) Coastal and Marine Hazards, Risks, and Disasters; Elsevier.