

Seasonal Ice Zone Observing Network (SIZONet): Integrating input from local, indigenous ice experts, a coastal ice observatory and measurements of ice decay into a forecast of coastal ice break-up

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The seasonal ice zone observing network (SIZONet, www.sizonet.org) collects data of use both to the scientific community and key stakeholders. Here, we are presenting an example from the SIZONet observatory site at Barrow, on how these two information needs may overlap in a coastal Alaska setting. Decay and break-up of coastal sea ice is a key event in the seasonal cycle, of importance to a range of physical and biological processes. It also controls the access to and from the coast by boat, important for subsistence hunters and industry in coastal Alaska. Ice observations by local Iñupiaq ice experts and informal interviews with other knowledgeable ice users helped define the key stages of break-up. They also helped identify the aspects of break-up important to ice users, namely the point at which boats can be launched through any potentially remaining grounded ice ridges.

Examination of ice observatory data (coastal radar and webcam, www.gi.alaska.edu/BRWICE) and satellite imagery, in conjunction with observations by local experts, helped chart the progress of ice decay and break-up during the past decade. Key stages in ice decay were identified (onset of melt, appearance of melt ponds, melt-out of level ice, potential ungrounding and dynamic removal of ice, removal of remaining grounded ridges) and examined in relation to key environmental variables and driving forces. Examination of surface albedo data showed that onset of pond formation is the key event that starts ice decay and occurs mostly around the same date (June 5) at Barrow. Based on this analysis a semi-empirical approach for forecasting ice break-up was developed that relies on the cumulative and average downwelling shortwave flux to chart the progress of ice decay. At a certain point of ice decay, dynamic events (rapid changes in sealevel followed by offshore flow) can help speed up ice removal. This model provided insight into the progression of different melt season “types”, such as the sunny and light ice season years of 2004 and 2007 with unusually early break-up mid/late June.

For 2009, as part of the sea ice outlook (www.arcus.org/search/seaiceoutlook) we forced this model with 14-day forecasts from the Weather and Research Forecasting (WRF) model (courtesy of Jing Zhang and Jeremy Krieger at UAF) and were able to obtain remarkably good and consistent forecasts for the break-up date (within ± 2 days of the observed event). Considering the challenges facing 14-day weather forecasts, it remains to be explored whether this is mere coincidence or indicative of predictive capability. However, as a means to tracking decay stage (e.g., through a decay index that allows ice users to assess how many days are likely to pass until break-up) this approach may be of use.