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Observations for climate: Monitoring changes in Arctic sea ice thickness, mass balance and marine mammal activity

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The overarching goal of this work is to continue and expand the critical network of observations aimed at monitoring and understanding changes in the thickness and mass balance of the Arctic sea ice cover. We want to explore what Arctic sea ice thickness changes are taking place and how these changes occur. Central to the project is a sea ice thickness observing system consisting of an array of drifting ice mass balance buoys (IMBs) and a sea floor mounted ice profiling sonar (IPS) located on the Chukchi Plateau. In 2008, the instrumental suite on the IPS mooring was expanded to include an AURAL broad-band sound recorder for detection of vocalizations by marine mammals. Since NOAA began its support of this project in 2003, a total of 50 IMBs have been deployed in the Arctic Ocean and the IPS site has been visited 8 times to service the mooring, with 100% data recovery. A seasonal version of the IMB (SIMB) has been developed and introduced into the array, allowing an extension of observations into the region of thinner and more dynamic seasonal ice. Data collected from the IMBs, SIMBs and IPS are made widely available via the web site: http://imb.crrel.usace.army.mil/. Taken together, the elements of this network are providing significant and diverse contributions to our understanding of the complex Arctic environment. Analyses of the IMB data have show that solar heat input to the ocean is strongly correlated to the bottom melting of the sea ice cover in regions of low ice concentration (e.g. near the ice edge). The IMB data have been used by the scientific community to develop instruments (e.g. satellite and airborne) that remotely observe changes in ice thickness. They have also been combined with other Ice-Based Observatory data to investigate freshening of the upper ocean. Data from the IMBs are featured in a K-12 outreach effort, the Adopt-A-Buoy Program. While still a relatively short record, monthly mean draft data from the IPS suggests little change in the thickness of the seasonal ice over the period of observation. The lack of trend in seasonal ice is a stark contrast to the dramatic decline of multi-year ice thickness in the western Arctic. Early results from the AURAL recorder mounted on the IPS reveal regionally-dependent acoustic habitats, with the differences related to contrasts in sea ice cover, temperature and general patterns of ocean circulation.