Figure 1: Schematic of generic subsurface mooring supporting an upward-looking ADCP and pressure gauge, and names of variables used in ice draft calculations. The mooring may also support separate instruments to measure temperature and/or conductivity, however, they are not shown here for simplicity.
Figure 2: (a) Time series of error velocity (cm/s), with black showing initial selection of ice periods (the velocity data has been high-pass filtered with a running 24-hr boxcar filter). The other panels show cumulative histograms (with the percentage on the y axis and the value of the data on the x axis) of (b) variance of error velocity ($10^{-3}$ cm$^2$/s$^2$), (c) squared variance of surface vertical velocity (cm$^4$/s$^4$), (d) surface speed (cm/s), (e) surface backscatter intensity (RDI relative backscatter units, or BSU), and (f) surface signal correlation (no units). In the histograms, the black and gray lines contain data from the time periods shown in black and grey in panel (a) respectively, and the dashed lines contain data from the entire dataset. The vertical black lines in panels (b) - (d) show the threshold values as described in the text. The variance of vertical velocity is squared in panel (c) to expand its range.
Figure 3: Daily mean sea ice concentrations (%) at the C3 mooring site estimated using the ADCP data and methods described in the text (black line) and the two estimates made using the NASA Team (NT; blue line) and Boot-Strap (BS; red line)) algorithms applied to SSM/I data (top panel). Scatter plots of NT vs. BC and ADCP vs. BS ice concentrations are shown in the middle panels, with crosses showing the mean and standard deviation in each 10% bin with more than 5 values. Note the consistent difference between NT and BS estimates at this site. Histograms of BC and ADCP concentration values in the same 10% bins shown in the bottom panels.
Figure 4: Time series of sound speed corrections to the nominal 108-m range estimate based on a) pressure alone (dash line), b) pressure and salinity (dotted curve), and c) pressure, salinity, and the mixed layer (ML) temperature profile. The thick black line at the bottom shows the approximate period of nearly complete ice cover.
Figure 5: Linear regression of temperature measured at 99 m with a CTD and the mixed layer depth based on the CTD density profile.
Figure 6: Comparison of observed and modeled sound speed correction on August 26, 2002. Panels are (left to right): temperature, salinity and sound speed. The black line is the modeled profile, and the grey line is the observed profile. Units: °C, psu, and m/s.
Figure 7: Standard deviation of zero-crossings $\sigma_{zc}$ versus standard deviation of residuals $\sigma_n$ of the synthetic profiles created in the Monte Carlo simulation (circles) and linear fit (line).
Figure 8: Uncertainty in ice draft estimate. Upper panel shows time series of the two main components and their sum, the total uncertainty; lower panel shows histogram of these time series. In both panels, light gray line is the empirical fitting uncertainty, dark gray line is sound speed uncertainty, and black line is total uncertainty.
Figure 9: Detail of nearly ice free period in April, 2002 showing the strong presence of tides in the corrected ADCP range $h_I$ (gray), which compare well with the tides derived from hydrostatics $h_0$ (black) computed using eqn 2.
Figure 10: Ice draft observed at C3 in Marguerite Bay, 2002-2003 (upper panel). The black line is a 24-hour running average and the grey line indicates the daily maximum and minimum values within this average. Lower panel shows the cumulative percentage of monthly average ice draft distributed into 1-m bins (e.g. ice drafts exceeded 5 m approximately 10% of the time in August).
Figure 11: Transect of ice thickness measured at ice station Robert in Marguerite Bay by the Perovich group on August 5 through 9, 2001. The snow-ice complex has been divided into four classes: snow (grey on top), snow with water (wicked; dark grey), water (light grey), and ice (black). Along this transect, the ice had a mean thickness of 71.4 cm, with a minimum and maximum thickness of 19 cm and 235 cm, and standard deviation of 50.3 cm. (This figure kindly supplied by D. Perovich.)