International Arctic Buoy Programme

by
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The International Arctic Buoy Programme (IABP) has maintained a network of buoys in the Arctic Basin since 1979. These buoys measure sea level pressure (SLP), surface air temperature (SAT), and other geophysical quantities. The data are transmitted and collected through Argos satellite system. The IABP strives to maintain a network of at least 25 buoys evenly distributed across the Arctic Ocean. These buoys have expected life spans of 1 to 2 years, and more than 5000 buoy-months of data from over 500 buoys have been collected (Figure 1).

The IABP data are used for both operations and research, e.g. forecasting weather and ice conditions, validation and forcing of climate models, validation of satellite data, and for studies of climate change. For operations, the data are made available to the forecasting community through the Global Telecommunications System. For research, the data are analyzed at the Polar Science Center of the University of Washington, which also coordinates the IABP. The data and more information on the IABP can be obtained from http://IABP.apl.washington.edu/, or from the World Data Center for Glaciology at the National Snow and Ice Data Center in Colorado.

The IABP provides the largest compilation of observations from which we can estimate climatology and study changes in climate. For example, Fig. 2 shows the Beaufort High in SLP, which drives the anti-cyclonic Beaufort Gyre in ice motion as estimated from the buoy data from 1979 – 1998. The SAT data have been included in global SAT climatologies (e.g. Jones et al. 1999).

Some of the changes in Arctic climate that have been detected using the IABP data are:

1.) Walsh et al. (1996) showed that the circulation in the Arctic had undergone a distinct change in the late 1980's.
2.) Rigor et al. (2000) showed SAT has warmed in the eastern Arctic, while a slight cooling is noted in the west. These trends are most significant during spring (Fig. 3).
3.) Rigor et al. (2001) shows that the changes in SLP, sea ice motion, and SAT are related to the Arctic Oscillation (Thompson and Wallace, 1998).

The success of the IABP depends on maintenance of the buoy network. The buoys have finite life spans, and a tremendous amount of resources are required to purchase and deploy buoys. In the past the program was able to seed the buoy network in the Beaufort Sea and the large gyre circulation would carry to buoys out to cover the Arctic Ocean. However, given the recent predominance of high AO conditions reducing the Beaufort Gyre, maintaining the buoy array in the east Arctic has been more difficult. Therefore, increased support for logistics and continued development of the Russian buoy program are necessary.

Given the complex nature of Arctic climate, the IABP also realizes the need to develop and deploy buoys with more sensors, e.g. CTD’s, anemometers, radiometers, and thermistors strings. The cost to attach additional sensors to a buoy is small in comparison to the cost of the logistics to deploy a buoy, but the benefits to the operational and research communities can be significant.

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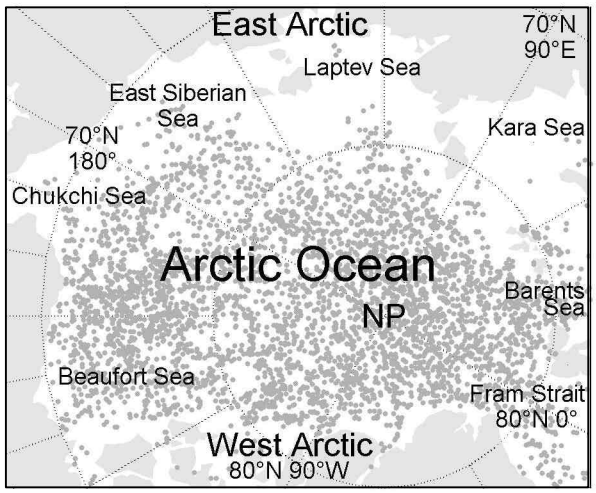

Figure 1. Monthly buoy positions from 1979 – 1998.

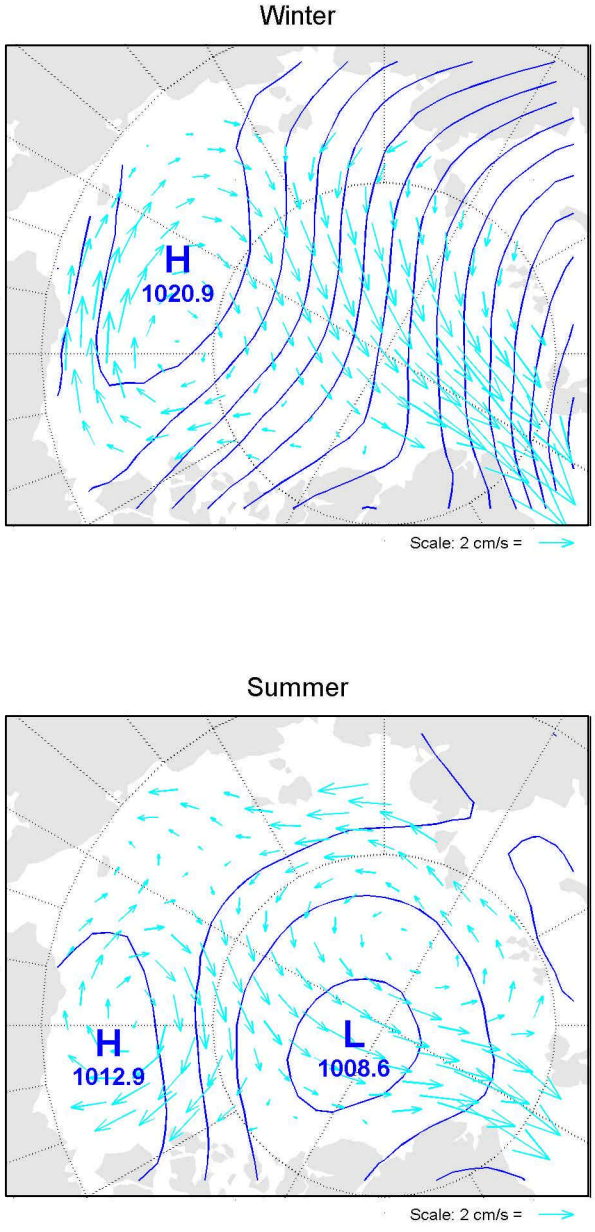

Figure 2. Winter and Summer mean fields of SLP and ice motion from 1979 – 1998.

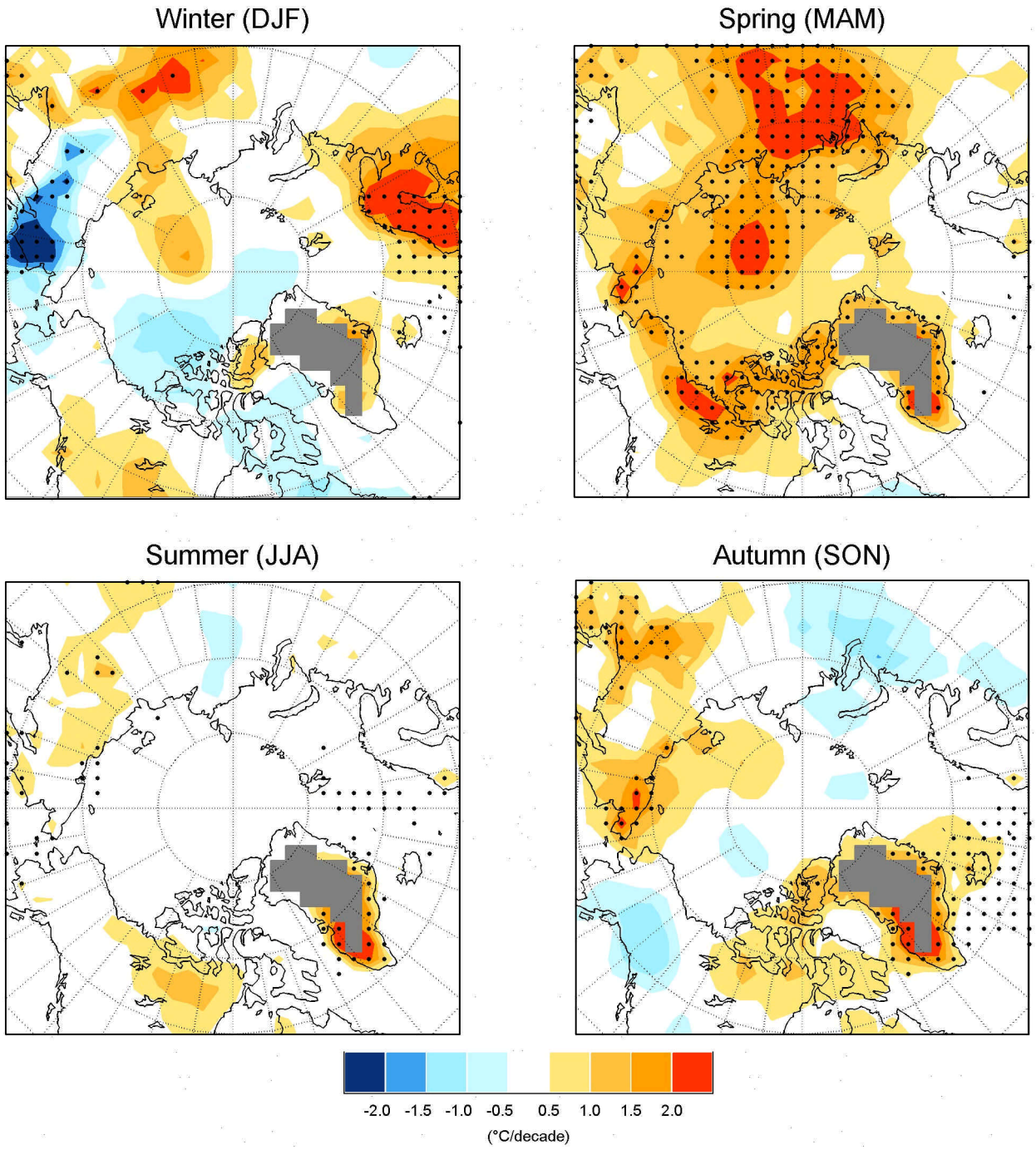

Figure 3. Seasoal surface air temperature trends from IABP/POLES data set for 1979-1998. The black areas indicate trends significant at 99%. (Adapted from Rigor et al., 2000).