1.0 Opening of the Meeting

The twelfth annual meeting of the Participants of the IABP opened at 9:00 on 10 June 2002 in Ottawa, Canada. The Chairman of the IABP, Timothy Goos (TG), called the meeting to order. Wendy Watson-Wright, Assistant Deputy Minister (ADM) of Science, Fisheries and Oceans (DFO), Canada, welcomed meeting attendees. She gave an overview of DFO activities and acknowledged the contributions of the IABP in monitoring the Arctic Basin. The notes for this overview can be obtained from http://iabp.apl.washington.edu/IABP-12/Opening.ppt.

Estelle Couture (EC) provided logistical information for the meeting.

The list of Attendees is shown in Attachment 1.

2.0 Agenda Approval

The draft was reviewed, amended and approved (Attachment 2).

3.0 Review Minutes and Action Items from Eleventh Meeting

Action Items (Actions taken are shown in italics):

3.1 Participants were requested to provide final comments on the Minutes of IABP-11 by 22 June 2001. The Executive will approve the final minutes by 31 July 2001.

Completed.

3.2 Participants were requested to review the IABP web site to:
  • Identify errors, omissions, etc.
  • Provide advice and comments on recommended improvements.

Ongoing.

3.3 Participants were requested to review the IABP CD and send comments to E. Couture.
3.4 The Chair will send a letter to MEDS recognizing the CD as a significant contribution to the IABP.

A letter and plaque acknowledging these contributions were sent to MEDS.

3.5 The Coordinator will contact the owners of buoys with incorrect GTS headers and suggest corrections.

Ongoing. This item should be considered for addition to the Terms of Reference for the Coordinator of the IABP.

3.6 The Coordinator will provide information on deployment opportunities in the Arctic to the DBCP Technical Coordinator for inclusion in the JCOMMOPS deployment opportunities web page. The Coordinator will also add a link on the IABP web pages to this web page.

Ongoing. This item should be considered for addition to the Terms of Reference for the Coordinator of the IABP.

3.7 The Coordinator will request that the owners of position only buoy observations to post their data on the GTS.

Ongoing.

3.8 The Coordinator will contact the buoy manufacturers and owners to investigate the use of the Argos frequency outside of the central bandwidth to take advantage of the 10% discount and better data reception.

Ongoing. Although this discount has been withdrawn, users are encouraged to use this bandwidth to avoid data dropouts.

3.9 MEDS will investigate the feasibility of participating in the DBCP Buoy-QC Guidelines as a center responsible for quality control of position data distributed on the GTS (Item 10.1).

Completed. At the DBCP-17, MEDS agreed to participate as a Principal Meteorological or Oceanographic Center responsible for quality control of GTS buoy data (PMOC) for location data.
3.10 Meteorological Service of Canada (MSC) will investigate the feasibility of participating in the DBCP QC guidelines as a center responsible for the quality control of GTS buoy data in the Arctic.

Incomplete. The MSC agreed to investigate their participation in the DBCP QC guidelines to assure the quality of data for the IABP buoys.

3.11 MSC in collaboration with MEDS will investigate the quality of the position data on SSVX02-CWEG.

Ongoing.

3.12 The DBCP Technical Coordinator will write a letter to MEDS regarding the location quality flag issue.

Completed.

4.0 Coordinator’s Report

Ignatius Rigor reported on: 1.) the status of the buoy array, 2.) deployment plans and opportunities, and 3.) the progress of data management and publications related to the IABP.

The Coordinator’s report is given in Attachment 3, and is available on the web at http://iabp.apl.washington.edu/IABP-12/Coord.ppt.

Discussion

Etienne M. Charpentier (EMC) recommended maintaining a deployment log for the IABP. It was noted that this information is published in the annual buoy reports and will be made available on the web.

Ed T. Hudson (ETH) asked if the Argos ids on the buoy map that overlap could be separated.

5.0 Report from Data Buoy Co-operation Panel (DBCP) (E. Charpentier)

EMC reported on the activities of the DBCP since the last IABP meeting. A status of global buoy programmes was presented. Details regarding current DBCP activities can be found at http://www.dbcp.noaa.gov/dbcp/highlights.html.

EMC identified two items that he wanted the IABP to consider participation in: 1.) Cataloging metadata on buoys, and
2.) Evaluation sub-group.

This report is given in Attachment 4.

Discussion

Participants discussed the Metadata working group of the DBCP. This group is producing a general manufacturer’s specification sheet in order to collect consistent metadata from manufacturers about their buoys. Participants agreed that IR would be the IABP representative to this working group.

Participants discussed the work of the DBCP Evaluation sub-group and the opportunity for the Programme to participate. It was noted that errors in the reporting position of buoys was one of the issues the evaluation group is considering. Participants agreed that the IABP would collaborate with the sub-group concerning the issue of errors in position noted for IABP buoys. Participants agreed that EC would be the IABP representative to this sub-group.

Participants discussed the apparent errors in position of buoys in messages on the GTS from the Edmonton LUT. Participants recommended that the MSC investigate the cause of the issue and implement appropriate processes to quality control these positions. Participants also recommended the Edmonton LUT use the location flag (in buoy code) to indicate the accuracy of the position of the buoy. MSC agreed to conduct this investigation.

6.0 Status Report on Membership and Letters of Intent (I. Rigor)

IR reported that our membership has not changed during the past year. We officially list 24 Participants from 10 different countries, and one international organization, the WCRP (Attachment 1).

IR also reported that he has contacted Dr. Burghard Bruemmer (Met. Institute, U. Hamburg), who deployed 12 buoys in Fram Strait about joining the IABP.

The list of Participants is shown in Attachment 5.

Discussion

Vladimir Ryabinin (VR) asked if the IABP should have a paper or presentation at the 2003 Arctic Science Summit Week in Kiruna, Sweden. It was noted that Roger Colony (RC), Sergey Priamikov (SP) and VR might attend and be able to represent the IABP. TG suggested that a standardized IABP PowerPoint presentation be prepared for participants to use for such occasions, in addition to updated brochures, handouts, or posters.
It was agreed that IR would contact the inactive participants regarding their participation in the IABP.

7.0 Presentations

7.1 T. Agnew

7.1.1 Loss of Decades old sea-ice plugs in the Canadian Queen Elizabeth Islands

Sverdrup Channel and Nansen Sound, along the northwestern coastline of the Queen Elizabeth Islands (QEI) in the Canadian High Arctic, have been blocked by sea ice plugs for several decades. These plugs constitute some of the oldest sea ice in the northern hemisphere and they block these northern channels from intrusions of sea ice from the Arctic Ocean. During the record minimum sea ice cover in the Queen Elizabeth Islands (QEI) in the summer of 1998, both these ice plugs were dislodged and removed from the Queen Elizabeth Islands. The last time this occurred was during another record minimum summer ice cover in 1962. Despite the exceptionally low sea-ice cover in 1998, reconstruction of a 38-year record of minimum sea ice extent from weekly Canadian sea ice charts shows no long term trend to less sea ice in the Queen Elizabeth Islands. Ice conditions for the summers of 1999 and 2000 suggest a return to normal ice conditions in the QEI and reformation of the ice plugs. The absence of any long term trend in sea ice extent and the recovery to normal sea ice conditions in 1999 and 2000 is consistent with large scale sea ice dynamics and atmospheric circulation which on average continuously forces the Arctic ice pack up against the northern coastline of the QEI. It is also consistent with differences in the trends in sea ice cover and length of the melt season between the eastern and western Arctic found in other studies.

This presentation can be viewed at http://iabp.apl.washington.edu/IABP-12/Agnew.ppt.

7.1.2 The passive microwave sea ice concentration record - how reliable is it?'

The recent digitization of Canadian and US sea ice charts has produced an easily accessible and valuable record of sea ice conditions over the northern hemisphere over the last 30-years. An analysis of ice type of information that can be obtained is shown. One interesting result is that the East Coast of Canada has the highest proportion of new and young sea ice types of any Canadian region. This is related to the sea ice regime on the East Coast where sea ice advances unconstrained on its eastern and southern edge opening up the sea ice cover and accelerating
surface sea ice formation. This record is compared to the passive microwave sea ice concentration record over the last 20 years. Results of the comparison using the NASA Team algorithm over the 1979 to 1996 period demonstrates the consistency with which sea ice concentration and sea ice area is underestimated during summer melt and fall freeze-up conditions. This underestimation is considerably larger than previous comparisons using satellite remotely sensed data.

7.2 **Scalable Maps of Arctic – C. Schock**

At the IABP-10 meeting in Alaska, MEDS was asked to enhance their Arctic maps to show more information about each buoy such as WMO id, Argos id, etc. In response, MEDS created a new application to view arctic buoys. This application is based on SVG (Scalable Vector Graphics), a new graphics file format, based on XML, that describes 2D graphics in the form of shapes (e.g., paths consisting of straight lines and curves), images and text. SVG has built in zoom and pan capabilities with no loss in quality on resizing. It follows the DOM (Document Object Model), which can allow for interactive and dynamic applications/graphics. SVG is text-based, created from predefined tags similar to HTML and so can easily be created using any text editor. Other programs are becoming available that give an interface to creating SVG files (ex. Jasc Webdraw) as well as some that can export SVG (ex. Adobe Illustrator). At present, SVG requires a viewer to see SVG files. MEDS used the Adobe SVG Viewer, which is a free download available on the Adobe website. In the future, browsers may have built in SVG support. SVG is quite new and became a web standard in September 2001 by the W3C (World Wide Web Consortium).

The MEDS application shows arctic buoy tracks for the current month and uses javascript and the DOM to give the user an interactive experience. They can click and drag to select an area to zoom in to, or use other zoom in/out buttons, and up/down/left/right pan buttons to adjust their view. A reset to original view is also available. A data table to the right of the map is filled in with metadata taken from table.txt on the IABP website whenever users mouseover a buoy track. Clicking the track will link them to another page with the data for that buoy. At this time, the application is only viewable to Internet Explorer users and will be made available to the public through the MEDS website by the end of June 2002 in both official languages.

This presentation can be viewed at [http://iabp.apl.washington.edu/IABP-12/Schock.ppt](http://iabp.apl.washington.edu/IABP-12/Schock.ppt).

7.3 **The State of the Canadian Arctic Cryosphere during the Extreme Warm Summer of 1998 – B. Alt**
The presentation provided an overview of The State of the Canadian Arctic Cryosphere during the Extreme Warm Summer of 1998. The complete paper can be accessed via http://www.socc.uwaterloo.ca/. The presentation then focused on a few interesting things with respect to ice in the Canadian Arctic islands.

1998 was the warmest year on record in Canada (and globally) with particularly pronounced warming anomalies located over the Canadian Arctic in the spring and fall seasons. This warming had major implications for snow, ice and permafrost (the "cryosphere") in the north e.g. open water formed earlier than had been previously observed, sea ice extent in the Canadian Arctic in September was 25% less than the previous recorded minimum, and there were above normal glacier ablation, snow melt and active layer development. The aim of this project was to carry out a detailed assessment of the response of the Arctic cryosphere to this warming event, to place this event in the context of the known climate variability over the last 3-4 decades, and to understand how some of the observed changes interact with the Arctic climate system.

The summer of 1998 was characterized by a warm southerly flow accompanying a strong surface pressure ridge over western North America which extended across the Mackenzie Delta and the Canadian Arctic Islands to Greenland. These conditions have been linked to the strong El Niño of 1997/1998 by a number of researchers. The above-normal temperatures resulted in rapid retreat of the snow line across North America in April, May and June, and an amplification of the initial warming. The warming was associated with earlier thaw of the "active layer" (the soil layer above permafrost which thaws in the summer) in the Mackenzie Delta region, early snow free conditions in the high arctic, early break-up of lake ice particularly in north-eastern Canada, early and extensive clearing of Beaufort Sea ice, relatively early sea ice break-up in the Arctic Islands and Hudson Bay and early initiation of melt on ice caps in the Arctic Islands. Temperatures remained above normal during the summer in all regions, although in parts of the eastern Arctic conditions were not extreme. The most notable feature of the summer of 1998, however, was the extended period of warmth into the fall season, particularly in the Arctic Islands. This resulted in an exceptionally long melt season, greater thaw penetration (12 cm greater than previously recorded) and probable ice wedge melt in the Mackenzie Delta. The large amount of thawing of the surface layer was associated with surface slides and slumps ("active layer detachments") along the Beaufort Sea coast and in northern Ellesmere Island. The extended fall warming also led to a record late start to the snow cover season over the eastern Arctic, late freeze-up of lakes, the latest recorded date (and extreme percent) of maximum open water in the High Arctic Islands and an extended glacier melt season in the
western and south-eastern High Arctic. Synthesis and analysis of 30 to 40 year time-series of climate and cryosphere variables revealed other summers that were comparable to 1998 in terms of melt intensity (particularly 1962, and for various regions and components 1981, 1971, 1988 and 1995). However, the length of the melt season of 1998 appears to unique in the available cryospheric record.

A number of lag-effects were noted in the study. For example, in the west, the warmth of the 1997/1998 winter and preceding summer (1997) was a major factor in the early sea ice break-up and ground thaw during the spring of 1998, while in the spring of 1999, lake ice broke-up early due to late freeze-up in the summer of 1998. Similarly in the High Arctic, the extensive open water at the close of the summer of 1998 allowed early break-up in 1999 and 2000. The long-term records showed that it takes 2-5 years for the sea ice regime to regain previous coverage after an extreme season. In the north-eastern High Arctic, the summer of 1999 was in fact even warmer than 1998. There are some indications that the distinctive atmospheric circulation conditions (positive AO) which characterized the period from about 1988 may actually have begun to reverse by 1998. In general the 1990 decade showed warming in the western Arctic culminating in the warm summer of 1998, while in the east, several very cold summers during the decade made the conditions of 1998 and 1999 stand out against the general lack of long term warming in the region. It was evident from the study that an extreme season, though it provides many valuable insights into the interactions of climate and the cryosphere, cannot be studied in isolation.

Another important finding of the study was the critical role that individual synoptic events have on the high Arctic cryosphere's response to warming. For example, a strong southerly wind event was responsible for breaking the last of the Nansen plug and for dislodging the Sverdrup plug, and an early snowfall event shut down melt on some of the glaciers and ice caps in the Queen Elizabeth Islands.

This study was the first time the Canadian scientific community has been charged with taking an integrated look at the response of the Arctic cryosphere to warming. This culminated in a special 1-day "Summer of 1998" workshop in Edmonton on February 11, 2001 with important exchanges of information and ideas. A number of areas for follow-on work were identified as a result of this study. These include: studying the frequency of critical synoptic events that have a major impact the northern cryosphere; differing regional responses; and the role of large-scale atmospheric circulation patterns such as the Arctic Oscillation.

This presentation can be viewed at http://iabp.apl.washington.edu/IABP-
7.4 Operational Monitoring of First Year Sea Ice Strength at the Canadian Ice Service – R. DeAbreu

The Canadian Ice Service is now providing a new chart describing the seasonal decrease in first year sea ice strength. First year ice strength is an important control on the break-up of sea ice and the ability of ships to work in and around ice. The prototype Ice Strength Chart regularly reports on the strength of un-deformed first year ice relative to its mid-winter strength and should be used in conjunction with Arctic Regional Charts. The Ice Strength Chart also reports on the condition of the ice surface by estimating the Stages of Melt. The chart utilizes a relationship between air temperature data and ice strength. The chart was developed in, and is currently being validated for, the approaches to Resolute area (Lancaster Sound).

This presentation can be viewed at [http://iabp.apl.washington.edu/IABP-12/DeAbreu.ppt](http://iabp.apl.washington.edu/IABP-12/DeAbreu.ppt).

7.5 Marine Remote Sensing Data Applications Development at the Canadian Ice Service – D. Flett

The Canadian Ice Service (CIS) is the Canadian government organization mandated to provide information on ice conditions to mariners operating in Canadian ice-infested waters. In order to monitor such a vast area over the entire annual cycle of ice formation and break-up, the CIS relies heavily on remote sensing systems to provide the data necessary to generate ice information products. The CIS uses data from a variety of remote sensing sources including optical and passive and active microwave satellites, and airborne remote sensing platforms. These data are received and processed at the CIS in near real-time and integrated and analysed by expert analysts and forecasters in conjunction with surface observations, environmental data (met, ocean, etc.), and model outputs. In the past 10 years, Synthetic Aperture Radar (SAR) has become the primary data source upon which the CIS relies to monitor ice conditions. This started in 1990 with a contracted dual-sided airborne SAR service which was replaced in the early to mid-1990's with satellite SAR data, notably from the ERS satellites and starting in 1996 with RADARSAT. The CIS has developed several products and applications over the last 10 years using these various remote sensing data sources directed primarily at enhancing the use of the data for our internal Operations clients. A few examples include: ice motion tracking, lake/sea surface temperature products, image data fusion methods, integration of
new data sources into Operations (e.g. QuikScat), monitoring ice decay and break-up, and R&D for future multiple polarization SAR sensors.

Two applications development projects are highlighted in more detail: Iceberg Detection using SAR and Marine Winds Information from SAR. The CIS has had an ongoing Panel on Energy R&D (PERD) funded project the last 3 years to investigate the potential of and operationally integrate the used of satellite SAR for our operational iceberg monitoring program. Field validation programs have been carried out during the iceberg seasons to establish the capabilities and limitations of detecting icebergs from RADARSAT. Manual methods for extracting potential iceberg targets and automated algorithms are currently being implemented in our operational environment and will be further tested and evaluated in the years to come, particularly with new systems becoming available, such as Envisat and RADARSAT-2. A second project with funding from the Canadian Space Agency (CSA) has been under way the last 2 years demonstrating the potential of extracting marine wind information from satellite SAR data as an additional information source for marine weather forecasting. An infrastructure for extracting marine winds information from the CIS operational RADARSAT data stream and delivery of image and wind products to 3 participating weather centres has been established. Initial results from this project are encouraging and the weather centres have been generally quite positive in their feedback. Further demonstrations are planned for summer 2002 and winter 2003.

In summary, the CIS is a true operational user of remote sensing data and prides itself on being a showcase example. In the future we intend to focus on improving the use of existing and new remote sensing data sources, expanding our remote sensing products and applications development, and working towards the assimilation of remote sensing observations into ice and marine environmental models.

This presentation can be viewed at [http://iabp.apl.washington.edu/IABP-12/Flett.ppt](http://iabp.apl.washington.edu/IABP-12/Flett.ppt).

7.6 Prediction of Summer Sea Ice Concentration – I. Rigor

The data from the IABP has been essential in the detection of Arctic Climate Change. For example:

1.) Walsh et al. (1996) used the IABP Sea Level Pressure (SLP) fields to show that the pressure over the Arctic had decreased > 4 mb. from 1979-1994; and
2.) Rigor et al. (2000) used the IABP/POLES Surface Air Temperature (SAT) fields to show that the warming trends found over land extend out over the Arctic Ocean. During winter
SAT has warmed over the Eurasian Arctic Ocean, but cooled slightly over the Canadian Arctic Ocean. During spring, the warming trends are significant and cover the entire Arctic Ocean. During fall, warming trends are found over the Eurasian Arctic.

Rigor et al (2000 and 2002) showed that the changes in atmospheric circulation and the SAT trends are related to the Arctic Oscillation. They also showed that the memory of the wintertime AO persists through the following year: spring and autumn SAT and summertime sea-ice concentration are all strongly correlated with the AO-index for the previous winter. It is hypothesized that these delayed influences reflect the dynamical influence of the AO on the thickness of the wintertime sea-ice, whose persistent ‘footprint’ is reflected in the heat fluxes during the subsequent spring, in the extent of open water during the subsequent summer, and the heat liberated in the freezing of the open water during the subsequent autumn.

We now show how the correlation between the wintertime AO and following Summer SIC can be used for prediction. Empirical Orthogonal Function analysis of September SIC shows that the first mode of SIC is strongly correlated to the prior winter AO. This mode is characterized by dramatic decreases in SIC in the East Siberian Sea, with some decreases in SIC in the Chukchi and Beaufort seas. This mode strongly resembles the large-scale trends in SIC noted by Parkinson et al (1999). The second mode has been found to be highly correlated to the Summer (JJA) AO index. This mode is characterized by dramatic decreases in SIC in the Beaufort similar to the large decreases in SIC in the Beaufort in 1998, and slight increases in SIC in the East Siberia Sea. Preliminary results imply that given a strong positive winter AO index (+/- 1 SD of the AO index), large decreases in SIC can be expected in the East Siberian Sea, with slight decreases in the Chukchi and Beaufort seas. However, given that the second mode strongly modifies SIC in the Beaufort Sea, the summer circulation can easily overwhelm the implications of the winter AO for SIC in the Beaufort Sea.

This presentation can be viewed at http://iabp.apl.washington.edu/IABP-12/Rigor.ppt.

**7.7 ICEX buoys – A. Hageberg**

Ms. Anne A. Hageberg reported on behalf of Christian Michelsen Research. She summarized the last year activity and outlined the plans for 2002/2003. 7 ICEXAIR buoys are scheduled for the White Trident mission 02. Ms. Anne A. Hageberg and Mr. Thor Kvinge will participate in the
advanced preparations for the White Trident 02. She further summarized the performance of the ICEXAIR buoys, emphasizing the comparatively long lifetime of the ICEXAIR. CMR will work to improve the lifetime and reliability of the ICEXAIR even further, as the optimum lifetime for the buoys is 4-5 years. This is related to the current deployment strategy of in the White Trident, causing most of the buoys to stay in the area of interest for 3-5 years.

This presentation can be viewed at http://iabp.apl.washington.edu/IABP-12/ICEX02.ppt.

8.0 Status Reports from each Participant

8.1 Meteorological Service of Canada

8.1.1 Canadian Ice Service – L. Desjardins

This report is given as Attachment 6.

8.1.2 Arctic Weather Center – E. Hudson

This report is given as Attachment 7.

8.2 National Ice Center – C. O’Connors

In 2001-2002, the U.S. Interagency Arctic Buoy Program (USIABP) received fiscal support, manpower resources, and other services from six U.S. Government agencies. Presently, the USIABP has 13 buoys operating in the buoy network covering the central Arctic Basin and/or adjoining seas. This number includes 5 Coastal Environmental System (CES) buoys, 8 Christian Michelsen Research (CMR) ICEXAIR buoys.

Accomplishments from the 2001-2002 intercessional period:
1. Continued funding for the IABP Coordinator / Data Management function.
2. Co-location of CRREL Ice Thickness buoys with CES met buoy. Thanks to the efforts of Meteorological Services of Canada (MSC) assets.
3. Deployment of two CES buoys via icebreakers.
5. Provided a CES buoy to the Polar Science Center.
6. Coordination and travel costs for the 2001 White Trident Operation.

Anticipated 2002 USIABP activities include:
1. Coordination of the 2002 White Trident deployment.
2. MSC deployment of one USIABP Zeno buoy
3. Alternate communications study

Discussion:

Christopher O’Connors (CO) asked if the IABP can support the ARGO objective, and if the IABP should be part of the ARGO programme. The general conclusion of the Participants was that the overall mission of ARGO was different from that of the IABP, since the ARGO programme is instrument driven and such instruments are not available for use under the thick pack ice of the Arctic. It was also noted that the ARGO programme is still a pilot project.

On a similar question, VR asked if GODAE could use our oceanographic data? IR will contact users about posting all buoy data on the GTS.

8.3 World Climate Research Programme – V. Ryabinin

The 2002 session of the WCRP Join Scientific Committee took place in March, in Hobart, Australia.

The continuing support by the WCRP of the IABP (and IPAB) was confirmed at the meeting.

The JSC meeting discussed the current state and the general directions of development of the WCRP. A most important initiative is the Global Climate Experiment: an proposal on massive integration of observing systems, data assimilation, and modeling, studies of predictability on a regional basis, from monthly to seasonal time scale.

Current ACSYS and CliC priorities were seen as follows.
1. Conclude ACSYS observational programmes and studies, summarize the results with the goal to achieve realistic representation of Arctic region and corresponding processes in global climate models.
2. Summarize current knowledge of the Arctic climate, its current state and prospects for future.
3. Formulate and guide the CliC observational and modeling activities for determining the role of cryosphere in global climate and its realistic representation in global climate models.
4. Ensure that important ACSYS activities, which are crucial for the success of CliC project and the WCRP as a whole, are continued within CliC.
5. Strengthen links and co-ordination of CliC activities with other WCRP projects and relevant research and observational programmes outside WCRP.

6. Complete the first version of the Initial CliC Implementation Plan and be successful in receiving commitments of potential contributors to the

A possibility of SCAR sponsoring CliC was discussed and received general support. However, the actual level and organization of this support needed further consideration and discussion.

The following meetings have been and are being organized by ACSYS and CliC:

• Sea ice extent and the global climate system, April 2002, Toulouse
• Climate of the Barents Sea Region, April 2002, Toulouse
• CliC/GEWEXGCOS Solid Precipitation Workshop, June 2002, Fairbanks
• Measurements and models of the Arctic Ocean, June 2002, Lamont - Doherty
• ULS (or IPS) workshop, July 2002, Tromso
• Joint NEG/OPP meeting on ice sheets, Fall 2002, Tokyo
• SSG-III, Fall 2002, Beijing
• CliC Science/Commitments Conference, 2003, Geneva
• ACSYS final Conference, 2004, St. Petersburg

This presentation is available at [http://iabp.apl.washington.edu/IABP-12/WCRP.ppt](http://iabp.apl.washington.edu/IABP-12/WCRP.ppt).

8.4 Arctic and Antarctic Research Institute of Roshydromet – S. Priamikov

During the year 2001-2002 period, Arctic & Antarctic Research Institute of Roshydromet in cooperation with US Interagency Arctic Buoy Program (NAVOCEANO) have constructed and deployed 4 Arctic drifting meteorological buoys. Deployment was carried out using Russian helicopters based on Sredniy Island (Severnaya Zemlya Archipelago). Due to the limited radius of the helicopter's flight, buoys have been deployed on pack ice relatively close (200 km) to north-northeast flank of Severnaya Zemlya Archipelago. At this moment, two of the buoys are operating and are located north of Franz Joseph Land. The buoys drift is homogenous and no visible divergence or convergence has observed.

No deployments are planned for this summer. Next year, three AARI/NAVO drifting meteorological buoys will be built and deployed in the Laptev Sea sector.
Work to finalize procedures to get WMO numbers for three IABP coastal buoys continues.

The LUT as given to AARI of Roshydromet on loan basis by NAVOCEANO is helping very much with Arctic buoys design and construction.

8.5 Naval Oceanographic Office – E. Horton

During Operation WHITE TRIDENT last year, NAVOCEANO deployed 7 ICEX Air drifters working out of Point Barrow in the Barents and Chukchi seas. We purchased 4 ice drifters from AARI and they deployed them from an icebreaker using a helicopter for final positioning. These were deployed near Severnaya Zemlya. Plans are well underway for this year's WHITE TRIDENT operation, with another 7 ICEX Air drifters to be deployed. In addition, several prototype AARI ice drifters are being examined for refurbishment. If they are still in acceptable condition, they will be deployed at the next available opportunity. Three ice drifters have been contracted for construction by AARI, and will probably be deployed next spring by icebreaker.

8.6 Marine Environmental Data Service – E. Couture

As the Responsible National Oceanographic Data Center (RNODC) for drifting buoys, MEDS continues to capture, quality control and archive data distributed on the Global Telecommunication System (GTS) in BUOY code.

Issues with MEDS' quality control of location were reported at IABP-11. After discussions, the Participants present at the meeting agreed that MEDS should change their flagging practices. Furthermore, the DBCP technical coordinator was asked to send a letter to MEDS requesting this change. The letter was received and MEDS accepted the request. Implementation of the new flags and reprocessing of the archives will take place in the summer of 2002.

As of June 2002, 85 CD-ROMs of IABP data were left from the 500 that were initially produced. The CDs were distributed mostly to IABP Participants and several were also distributed to the International Programme for Antarctic Buoys (IPAB) Participants and other related organizations (WMO, Service Argos, etc…). Approximately 15 CDs have been requested through the CD’s advertisement page on the web. MEDS will start thinking about producing version 2.0 for 2004.

Web developments for this year include Scalable Vector Graphics (SVG) maps of the Arctic showing data and meta data on each of the buoys. The
deployment of this tool is planned for the end of June 2002 and the information will be updated daily from then on. This application was developed in response to the request made by the Participants at IABP-10 in Alaska to enhance maps posted by MEDS on the web. For more information on SVG maps see item 7.1.

This presentation can be viewed at http://iabp.apl.washington.edu/IABP-12/MEDS.ppt.

Discussion

EC asked if we should prepare Version 2 of this CD? It was decided that we should hold off, and consider only producing a CD every few years. ETH also suggested that the next CD should include selected science papers using the IABP data.

8.7 Polar Science Center (PSC) – I. Rigor

The PSC coordinates the IABP and manages the IABP databases as specified in the Terms of Reference for the Coordinator of the IABP Appendix to the IABP Operating Principles.

The PSC in collaboration with JAMSTEC, PMEL and the University of Oregon conducts annual expeditions each April to the North Pole to take the pulse of the Arctic Ocean and learn how the world's northernmost sea helps regulate global climate. The team establishes a group of buoys, collectively called an observatory, to record data throughout the remainder of the year on everything from the salinity of the water to the thickness and temperature of the ice cover. For more info on the NPEO, please visit http://psc.apl.washington.edu/northpole/. The NPEO can also deploy other buoys for the IABP.

Discussion

NIC plans to provide a CES buoy for the NPEO deployments in 2003.

8.8 Reports from Participants who were not able to attend

8.8.1 AWI – C. Haas

The table and attached maps summarize the state of our buoys, deployed in the last years, and some of them are still in operation. All CMR buoys have been contributed to WT and been deployed by aircraft. This year, we will deploy only one ICEX-AIR with WHITE TRIDENT. We have bought three more buoys, which were planned for deployment in the Laptev Sea, pending research permission to work in Russian waters.
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</table>

CMR = Christian Michelsen Research  
SK = Sellmann & Kruse

**8.8.2 IARC – R. Colony**

Plans to continue contributing to the IABP through the US-IABP.

**8.8.3 JAMSTEC – T. Kikuchi**

- J-CAD 4 deployment as a component of NPEO 2002

On April 26th 2002, JAMSTEC has deployed J-CAD 4 at 88.51N, 76.93E. The J-CAD 4 can obtained the data of SLP, Air temperature, wind speed and direction as meteorological data, just as same as previous J-CAD. In addition, the J-CAD 4 is equipped with 6 CT/CTD, 1 ADCP, and 1 Watson compass as a underwater sensors. The Watson compass provides magnetic heading information using a precision 3-axis fluxgate magnetometer and two clinometers. It is useful to calculate the absolute current velocity observed by the ADCP mounted in the J-CAD. As of now, the data transmission of J-CAD 4 using ARGOS system works very well. The current position of J-CAD 4 is near the Arctic Mid Ocean Ridge (87.278N 44.166E).

The J-CAD information and data can be seen in the following web site.
http://w3.jamstec.go.jp:8338/J-CAD_e/jcadindex_e.htm  
http://w3.jamstec.go.jp:8338/J-CAD_e/jcaddata_frame.htm  
J-CAD trajectories, meteorological, GPS drift, and CTD data is shown in the above web site.

- Deployment plan of J-CAD in 2002-2003

Since this year, JAMSTEC is initiating a multidisciplinary joint field experiment, JWACS (Joint Western Arctic Climate Studies) involving Japan and Canada to understand the role of ocean circulation on the Western Arctic climate system. In this project, J-CAD 5 will be installed in
the Canadian Basin of the Arctic Ocean in September 2002. 6 CT/CTD and 2 ADCP sensors will be mounted on J-CAD 5 to measure an upper ocean condition (temperature, salinity, and ocean current) at the depth from the surface to 250m. Meteorological data will be also obtained from the J-CAD 5.

In 2003, JAMSTEC is planning to deploy one J-CAD (J-CAD 6) as a component of NPEO as well as 2000-02. J-CAD 6 will be equipped with the same sensors as J-CAD 4 that was deployed in April 2002.

8.8.4 PMEL – J. Overland

PMEL has been collaborating with the PSC to deploy buoys at the NPEO, and also plans to deploy some buoys in the Beaufort from the ONR Ice Camp.

8.8.5 Other Participants – I. Rigor

NMI contributed 1 ICEX-AIR for WHITE TRIDENT 2002, and currently has 2 buoys reporting. NPI contributed 1 ICEX-AIR for WHITE TRIDENT 2002, and currently has 1 buoy reporting; and UKMO currently has 2 buoys reporting.

9.0 New Business

9.1 DBCP Meetings

DBCP-18 will be held in Martinique on 14 - 18 October 2002. EC will represent the IABP at the meeting. EC, and EH will also attend. ETH will prepare the report.

Thanks were given to ETH and EC for preparing and presenting last year's report. The full text of this report is given in Attachment 8.

9.2 Summary of Participant contributions (T. Goos)

Contributions further the objectives of the IABP and are defined in the Operating Principles of the IABP, section 6.5.

The Participant Contributions table has been amended to reflect contribution from non-IABP Participants and is given in Attachment 9.

9.3 Location of 13th meeting (T. Goos)
A European venue with coordination with some other Arctic meeting was suggested and preferred by Attendees.

VR reported that WCRP might be able to hold the meeting in February or at the latest at the beginning of March. Another opportunity would be to have the meeting in conjunction with the joint EGS/AGU meeting in April in Nice, France. Another consideration would be the Arctic Science Summit Week in March, in Kiruna, Sweden.

SP also noted that we might be able to hold the meeting at AARI.

The Executive and Coordinator will discuss the options and make a decision in the fall.

10.0 New Directions

10.1 Provisions for withdrawal

A number of Participants have been inactive. The intent of these Participants should be determined. IR will contact these participants regarding their intent.

TG raised the question as to whether the IABP should define a new level of Participant who are less “active”, but who have an interest in the IABP.

It was decided that a new level of Participant should not be defined.

10.2 Evaluation of communication and new sensors for buoys.

The DBCP is interested in knowing about (i) tests and results of data collection systems other than Argos, and (ii) sensor/instrument testing and evaluation.

David Meldrum, vice-Chairman of the DBCP, is conducting an ongoing study on such systems (see http://www.dbcp.noaa.gov/dbcp/1smms.html). The IABP Participants can contribute and benefit from DM’s compilation. Elizabeth Horton chairs the DBCP EVALUATION GROUP.

Discussion

CO agreed to help gather information on other satellite data collection systems and buoy sensor development. IR will compose a web page with specifications on the IABP buoys.

11.0 Review and Approval of the IABP Operating Principles
The Operating Principles were revised and are given in Attachment 10.

12.0 Election of Officers

A nominations committee consisting of ETH and IR determined that all members of the Executive Committee were willing to serve another year. Nominations were solicited from other attendees.

In accordance with the IABP Operating Principles, the following officers were elected:

Chairman: Timothy Goos, Canada
Vice Chairman: Thor Kvinge, Norway
Member: Christopher O’Connors, USA
Member: Ivan Frolov, Russian Federation

Ignatius Rigor was re-appointed as the Coordinator of the IABP.

13.0 Action Items

13.1 IABP Executive will finalize the minutes by 31 August 2002.
13.2 Coordinator will add a deployment log to the IABP web pages (see section 4.0).
13.3 Coordinator will contact inactive Participants regarding their participation in the IABP (see section 6.0 and 10.1).
13.4 Coordinator will ensure that all IABP data is posted on the GTS.
13.4.1 Resolve discrepancy between the list of buoys that on the monthly table and what is received at various met. centers.
13.4.2 Post other geophysical variables on GTS in addition to SLP, and SAT (see item 8.2).
13.5 MSC will investigate the cause of positioning errors from the Edmonton LUT, and use a location flag to indicate the accuracy of the positions of the buoys (see section 5.0).
13.6 ETH and IR will make a standardized IABP PowerPoint presentation for use at various meetings. (see section 6.0).
13.7 CO will investigate the cost of Iridium, Orbcomm, and other satellite data collection options (see item 10.2).
13.8 IR will make web pages for:
13.8.1 Buoy History
13.8.2 Buoy Specs
13.8.3 IABP Citations
13.9 Review ongoing items from section 3.0.

14.0 Draft and Approve Meeting Minutes
Participants reviewed the draft minutes. The draft minutes will be available to all participants for final comment, and will be approved by 31 August 2002.
Attachment 1 – List of Attendees

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Attachment 2 – Agenda

Monday, 10 June 2002
0900 - 1200 IABP Business Meeting
1.0 Meeting Opens -- Chairman, T. Goos
   1.1 Welcome (W. Watson-Wright)
   1.2 Call to order (T. Goos)
   1.3 Meeting Information (E. Couture)
2.0 Agenda Approval (T. Goos)
3.0 Review Action Items from Eleventh Meeting (T. Goos)
4.0 Coordinator's Report (I. Rigor)
5.0 Report from Data Buoy Co-operation Panel (DBCP) (E. Charpentier)
6.0 Status Report on Membership and Letters of Intent (I. Rigor)

1300 - 1600 Technical Session
7.0 Presentations
   7.1 Scalable Maps of Arctic (C. Schock)
   7.2 Prediction of Summer Sea Ice Concentration (I. Rigor)
   7.3 ICEX buoys (A. Hageberg)
   7.4 Operational Monitoring of First Year Sea Ice Strength at the Canadian Ice Service (R. DeAbreu, CIS)
   7.5 Marine Remote Sensing Data Applications Development at the Canadian Ice Service (D. Flett, CIS)
   7.6 The State of the Canadian Arctic Cryosphere during the Extreme Warm Summer of 1998 (T. Agnew, MSC)

1630 Tour and Reception at Canadian Ice Service

Tuesday, 11 June 2002
0900 – 1200 IABP Business Meeting (Continued)
8.0 Status Reports from each Participant (T. Goos)
9.0 New Business (T. Goos)
   9.1 18th DBCP session is planned in Martinique, 14-18 October 2002 (T. Goos)
   9.2 Summary of Participant Contributions (T. Goos)
   9.3 Location of 13th meeting (T. Goos)

1300 - 1430 IABP Business Meeting (Continued)
10.0 New Directions (T. Goos)
11.0 Review and Approval of the IABP Operating Principles (T. Goos)
12.0 Election of Officers (T. Goos)

1500 Tour and Reception at MEDS

Wednesday, 12 June 2002
0900 - 1200 Conclusion
13.0 Review of Meeting and Recommendations (T. Goos)
14.0 Draft and Approve Meeting Minutes
Attachment 3 – Coordinator’s Report

The Coordinator reported on: 1.) the status of the buoy array, 2.) deployment plans and opportunities, and 3.) the progress of data management and publications related to the IABP.

Status of the Buoy Array

On our last meeting, 40 buoys were reporting in the Arctic. Since then, 23 buoys ceased transmitting, and 32 buoys were deployed. Figure 1 shows the current map of buoys.

The buoys that were deployed during the intercessional period are:
- July: NIC deployed 1 CES buoy from the Odin.
- August: 7 by WHITE TRIDENT (ICEX-AIRS contributed by AWI, EC, NMI, US-IABP (3), and UKMO) in August 2001
- September: AWI deployed 3 L&K buoys from the Polarstern. One of these buoys was placed at the NPEO site where all the met. buoys had failed. PMEL deployed 9 buoys in a cluster in the Beaufort Sea from the Sir Wilfrid Laurier.
- March: Burghard Bruemmer from the University of Hamburg deployed 12 buoys in Fram Strait. These buoys are not included in the buoy count.
- April: 12 buoys were deployed at the 2002 NPEO. EC deployed 1 Calib, 1 EC buoy, and 2 collocated buoys from NIC (CES) and CRREL. The CRREL buoy was designed to measure the mass balance of ice.

Figure 2 shows the remaining deployment plans for the year from the Polarstern this summer, and the WHITE TRIDENT deployments this August. The buoys that will be deployed by WHITE TRIDENT were provided by. AWI, EC, NMI, NPI, US-IABP (3).

Deployment Opportunities

We need 7 more buoys for the WHITE TRIDENT mission in 2003.

Other deployment opportunities are provided by EC, PSC, AARI, and by ships operating in the Arctic Ocean.

Data and Publications

- The IABP data have been updated through December 2001 and are available on the web.
- A few copies of the draft of the 2001 buoy report are available. A PDF of this data report and reports dating back to 1995 are available from our web pages.
- We plan to improve the navigation of the web pages this summer, and update the content. We plan to reproduce all the buoy reports as PDF’s, which will be made available on the web. We welcome any suggestions on these web pages.
Figure 1: Buoy Positions on 3 June 2002

- 40 buoys were reporting on 23 May 2001.
- 32 buoys were deployed
- 23 buoys died
- 49 buoys reporting as of 3 June 2003 (not including 12 U. Hamburg buoys.)
# Table 1: Buoy Positions on 3 June 2002

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Figure 2: Remaining Buoy Deployment Plans for 2002

Summer:
- AWI (Polarstern) - 3 Sellmann and Kruse buoys (in Laptev Sea)
- EC - MSC buoy (west of Banks Island)

Fall:
- NAVO WHITE TRIDENT Flight - 7 ICEXAR buoys, contributed by AWI, NPI, NMI, EC, 3 US-IABP
Attachment 4 – Report from the Data Buoy Cooperation Panel

Since the last IABP meeting in Yokohama, June 2001, the DBCP activities were mainly related to the following issues:


More than 50 people attended the DBCP workshop. 48 people attended the main DBCP session, including representatives from 14 countries plus representatives from buoy manufacturers, data telecommunication providers, WMO, and IOC Secretariats, and DBCP Action Groups. 25 presentations were made at the Scientific and Technical workshop.

The Panel decided to extend the terms of references of the SVPB/SVPBW evaluation group to include other types of buoys as well as other technical issues (e.g. Argos message formats) and therefore renamed the group to “DBCP Evaluation Group”.

DBCP implementation strategy was reviewed and commitments in the Southern Ocean discussed (about 80 barometer buoys committed in the region for 2002).

The Panel discussed information exchange and technical issues (QC, GTS codes, Argos system, new communication techniques, GTS distribution of buoy data collected through commercial satellite systems, SVPB upgrade), and particularly, the Panel:

- Acknowledged agreement by MEDS to act as PMOC for location data
- Acknowledged agreement by MEDS to change its flagging practice for location data and agreed to re-process its archives and web site maps accordingly.
- Asked the TC to make a proposal for integrating data buoy, profiling float, and XBT observing systems in a quality control relay mechanism similar to the DBCP QC guidelines. Proposal was then submitted to the JCOMM OPA (see below).
- Asked David Meldrum and TC to investigate impact of data timeliness on programme performances (loss of Lannion STIP data).
- Recommended to include quality control of Argo profiling float data in the Argos development programme (recommendation to the JTA).
- Asked the TC and CLS to prepare a document on the feasibility of using Service Argos as a relay for inserting buoy data on GTS for data collected through other satellite systems and adequately formatted according to WMO regulations.
- Discussed safety issue (i.e. risk of buoy explosion) and issued a set of recommendations to buoy operators and manufacturers (see below).
- Decided to increase the delay before re-allocation of WMO numbers from 3 months to at least 6 months.
- Endorsed the proposal by Canada to establish a North Pacific Action Group

18th DBCP session is planned in Martinique, 14-18 October 2002.

- QC guidelines.

As discussed at the first JCOMM Observations Coordination Group meeting in La Jolla, 24-27 April 2002, the DBCP QC guidelines (quality information relay mechanism) will be integrated within JCOMM and may eventually included other types of in situ marine observing systems such as the VOS. This is an opportunity to modernize the DBCP QC guidelines by using for example dedicated web pages to report on detected problems.

- Argos & Argos GTS sub-system

  a) Olso LUT is now connected to the Argos System. Data collected in real-time in Olso are therefore processed through the standard Argos system, including for location, and GTS distribution purposes. These
data distributed on GTS are therefore consistent with the Argos data collected for the same buoys through other Argos receiving stations (local or global).

b) The new version of the BUOY code was finally implemented at Service Argos on 27 March. Main GTS users and buoy operators were contacted and encouraged to provide Service Argos with new information which can now be coded in the new format (e.g. buoy type, drogue type, anemometer height).

c) GTS buoy data are now delivered to Météo France for global GTS distribution via tcp/ip (instead of X25 dedicated link).

d) The Argos GTS sub-system reference guide was updated to reflect latest improvements with the system. The new guide was published by the DBCP (Revision 1) and can be obtained from the Technical Coordinator of the DBCP.

e) Developments are underway at Service Argos for implementation of the BUFR code within the Argos GTS sub-system. BUFR should be available in the beginning of 2003.

f) Following discussions by the DBCP evaluation group, updated list of DBCP recommended Argos message formats is available from the DBCP web site at: http://www.dbcp.noaa.gov/dbcp/1ramf.html

   o Metadata/Manufacturer's spec. sheet.

Discussion is underway on specifications sheet for manufacturers to fill in upon buoy purchase. This would facilitate collection and access to metadata. The matter was particularly discussed between the EGOS Technical Secretary, Anne Hageberg, and the Technical Coordinator of the DBCP, Etienne Charpentier. Things have been clarified to some extend although work is still required to eventually agree on (i) what metadata are needed, (ii) which metadata are mandatory and which are optional, (iii) what are the metadata that need to be provided by the manufacturer and what are those which need to be provided by the buoy operator, (iv) how the metadata should be provided (structure of spec. sheet), (v) who should eventually make necessary developments, and (vi) who should fund such developments.

   o New Lagrangian drifter design.

The Global Drifter Programme is in the process of redesigning the SVP drifter, including the SVPB by reducing its size in order to lower the cost and therefore increase the number of buoys deployed worldwide at constant budget. While keeping a drag area ratio of about 40, new design will be cheaper, smaller in size (2/3 of original size), drogue diameter will be 60cm, drogue will be 6m long and include 4 sections. 7.5V and 0.5W Toyocom Argos transmitters will be used. Cost is expected to be in the order of $1700 per unit (i.e. standard SST drifter) instead of $2200 at the moment. 50% of the drifters purchased in 2002 should have new design.

   o DBCP web site.

DBCP web site moved. New URL is now http://www.dbcp.noaa.gov/

   o JCOMMOPS.

Following support by the DBCP (DBCP-16) and by SOOP which provide most of JCOMMOPS resources, JCOMM in situ Observing Platform Support Center (JCOMMOPS) concept was discussed and strongly endorsed at the first JCOMM meeting, Akureyri, Iceland, 19-29 June 2001. See description of JCOMMOPS at http://www.jcommops.org/doc/jcommops/jcommops.htm.

   o Safety.

Following explosion in August 2001 of a moored data buoy during maintenance onboard a ship in the Bay of Bengal which resulted in the death of a crew member, the Indian National Institute for Ocean Technology (NIOT) who operated the buoy constituted an expert committee to examine the incident. This committee had concluded that the
explosion was due to the emission of hydrogen and oxygen from overcharged batteries, ignited by an electrical spark. The recommendations of the expert committee were then placed before the Data Buoy Cooperation Panel and the issue was discussed further with the buoy operator, Panel Members, and manufacturers at its 17th session. After discussion, the panel recommended that manufacturers should enhance buoy safety through improved design in the following areas:

- **Batteries are to be placed in a vented compartment, eliminating voids as far as possible, with a double venting arrangement;**
- **Incorporation of an overcharge controller and temperature controlled switch, to disconnect the batteries from the solar panels when required;**
- **Incorporation of an explosive gas sensor and temperature sensor inside the battery compartment and instrument cylinder, with the data to be transmitted once a day, to allow corrective action, or suitable explosive gas testing procedures, to be undertaken on buoy retrieval or servicing;**
- **Incorporation of continuous monitoring of battery charge current and voltage, to be transmitted with the buoy data;**
- **Incorporation of a suitable purging system and procedures.**

Buoy operators and manufacturers are urged to take above information into account. A dedicated web page is available at [http://www.dbcp.noaa.gov/dbcp/safety.html](http://www.dbcp.noaa.gov/dbcp/safety.html)

- **DBCP evaluation group.**

The terms of references of the SVPB/SVPBW evaluation group had been extended to include other types of buoy and to work on other issues such as Argos message format etc. Sub-group works mainly through mail exchange and use the DBCP technical forum ([http://forum.jcommops.org/](http://forum.jcommops.org/)) for basic open discussion, record of those discussions and publication of intermediary or final results. Sub-group presently includes the following people: Elizabeth Horton, Navoceano (Chairperson), Pierre Blouch, Météo France, Sarah North, UKMO, Graeme Brough, BOM, Peter Niiler, SIO, Etienne Charpentier, DBCP, Tony Chedrawy, Metocean, Jeff Wingenroth, Technocean, Gary Williams, Clearwater Instrumentation, Sergey Mothyzev, MARLIN, Louis Vermaak, SAWB, Ron McLaren, Environment Canada, Julie Fletcher, MSNZ, New Zealand, and Satheesh Shenoi, NIO, India. Any other person interested in participating in the evaluation group should contact Elizabeth Horton.

- **DBCP definitions.**

Following recommendations by the DBCP at its 17th session in Perth, the DBCP evaluation group proposed a set of "DBCP Definitions". These included definitions of specific DBCP ocean areas. For example DBA area is defined as the Atlantic Ocean between Arctic Circle and 55S and for southern latitudes between 65W (Drake passage) and 20E (Cape of Good Hope). It includes Norwegian Sea, Labrador Sea, North Sea, and excludes Gulf of Mexico, Caribbean Sea, Hudson Bay, Baffin Bay, Mediterranean Sea, Baltic Sea. NDNA area is defined as DBA North of Tropic of Cancer. Other definitions which are for DBCP use only, include for example resolution (time, horizontal, vertical), useful observation, useful day of observation, early failure/infant failure, required variables, operational and useful life-time, delay, data availability. Details on DBCP definitions can be found on the JCOMMOPS forum under DBCP at [http://forum.jcommops.org/](http://forum.jcommops.org/)
Buoys and those on GTS by country
14 day period ending 05/29/02

Total: 994 buoys. 501 on GTS (i.e. 50.4%)
Table 1: For each variable, number of buoys reporting in BUOY format in April 2002 (GTS reports received at Météo-France), average number of reports per day, and average delay (reception-time - observation time).

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<th>Average Delay (min.)</th>
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<td>Wind</td>
<td>115</td>
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<td>Sub-surface temperatures</td>
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<td>Mainly TIP moored buoys; small number of drifting buoys with thermistor strings</td>
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<td>Waves (height, period)</td>
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<td>66</td>
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Table 2: For each variable, number of buoys reporting in SHIP format (e.g. US and Canadian meteorological moored buoys) in April 2002 (GTS reports received at Météo-France), average number of reports per day, and average delay (reception-time - observation time).

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<td>Waves (height, period)</td>
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Figure 1: DBCP status (drifting and moored buoys) for April 2002.
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<tr>
<td>Alfred Wegener Institut für Polar und Meeresforschung</td>
<td>Christian Haas</td>
</tr>
<tr>
<td>Postfach 12 01 61, D-28359 Bremerhaven, Germany</td>
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<td>Arctic and Antarctic Research Institute</td>
<td>Ivan Frolov</td>
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<td>38, Bering Street, 199397 St. Petersburg, Russian Federation</td>
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<td>Christian Michelsen Research Institute</td>
<td>Thor Kvinge</td>
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<td>Tel: +47 55.12.16.88</td>
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<tr>
<td>Collecte Localisation Satellites, 18 Avenue Edouard-Belin, FR-31055</td>
<td>Christian Ortega</td>
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<td>Toulouse CEDEX, France</td>
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<tr>
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</tr>
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</tr>
<tr>
<td>Pacific Marine Environmental Laboratory</td>
<td>James Overland</td>
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<td>7600 Sand Point Way NE</td>
<td>Tel: +1 206 526 6824</td>
</tr>
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<td>Bldg. 3</td>
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<td>Bin C15700 CB 357940</td>
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Canadian Ice Service Beacon Program

Submitted by Luc Desjardins, Ice Forecaster,
Canadian Ice Service, Meteorological Service of Canada

Overview
The Canadian Ice Service has an active buoy on ice program across Baffin Bay, Labrador Sea and ice permitting the Gulf of St Lawrence. CALIB buoys are used. The Canadian Ice Service recently provided two CALIBs to the International Ice Patrol to drop on icebergs. The Canadian Ice Service also provides a buoy from time to time in support of the Arctic Weather Centre’s IABP activities and relies on the Arctic Weather Centre / the IABP with respect to buoys on ice in the Arctic Basin.

CALIB Buoy
The CALIB is a cylindrical buoy, which can be air-deployed by both the Environment Canada Ice Patrol Dash 7 and the Canadian Forces. A GPS version of a CALIB is also available. For the GPS to work, a stand to keep the CALIB upright is required. Alkaline or lithium batteries are used typically providing energy for respectively 4 months and 9 to 12 months. Position only CALIBs are usually used on the ice of the Gulf of St. Lawrence and Labrador Sea. CALIBs with pressure sensors are typically equipped with the longer living lithium batteries and put on ice in Baffin Bay. The CALIB typically lies on the ice, and after a few storms can be insulated under fresh snow cover. The temperature data is not usually sent to GTS due to significant
Baffin Bay
Canadian Ice Service endeavors to have at least one CALIB deployed each fall on a multi-year floe in Baffin Bay. The deployment is typically done from the Canadian Ice Service Dash-7 operating in the area to support the last icebreaker to depart the Canadian Arctic for the season. The CALIB deployed is lithium battery equipped and routinely has an air pressure sensor. The following figure shows the path of a buoy from November 2001 in northwestern Baffin Bay to May 2002 eastern Hudson Strait.

Labrador Sea
Canadian Ice Service endeavors to track first-year-ice floes to provide ground truthing reports to the Ice Modeling Lab for Model verification/calibration. Deployments are done by the CIS Dash-7 aircraft in one or two waves of three beacons dropped near 54N, 56N and 58N.

Gulf of St. Lawrence
The ice on the Gulf of St. Lawrence has been too thin the past couple of years to safely deploy buoys.

Use of beacons
Canadian Ice Service uses beacons on ice to:
- Compute mean drift for a given period.
- Mark the leading edge of significant old ice concentration in the fall.
- Support scientific experiments such as ice and iceberg model drift verification along the Labrador Coast and ice pressure measurements in the Gulf of St. Lawrence.

Future
The Canadian Ice Service will continue its Baffin Bay, Labrador Sea and Gulf of St. Lawrence buoy activities.
Meteorological Service of
Canada Participant Report for
IABP-12

Submitted by Edward Hudson
Prairie Aviation and Arctic Weather Centre,
Meteorological Service of Canada, Environment Canada
at the Twelfth Meeting of International Arctic Buoy
Programme
Ottawa, Canada, 10-12 June 2002

photo courtesy Brent Sargeant 24 April 2002

Deployments July 2001 to May 2002 (from IABP-11 to IABP-12)
During the period since the June 2001 IABP meeting in Japan, 6 buoys had the Meteorological Service of
Canada (MSC), Environment Canada, “touch” going on ice.

ICEX-AIR, Arctic Basin, August 2001 - ICEX-AIR Argos ID 5300 / WMO ID 48539 was deployed by
U.S. Naval Meteorology and Oceanography Command in their August 2001 White Trident exercise. The
year 2001 deployment was the third year that MSC funded a buoy for the White Trident Exercise.
Status: operating 1 May 2002.

CALIB, northwest of Prince Patrick Island, February 2002 - CALIB Argos ID 11257 / WMO ID 48522
air-deployed by Canadian Forces 22 February 2002 at approximately 78 N 130 W.
Status: ceased operation 6 March, less than 2 weeks later. WMO number re-assigned to “next” CALIB.

CALIB, northwest of Prince Patrick Island, April 2002 - CALIB Argos ID 5303 / WMO ID 48522 air-
deployed by Canadian Forces 5 April 2002 at approximately 78 N 130 W ((same area as 11257).
Status: operating 1 May 2002.

MSC buoy, between Ellesmere Island and north pole at about 86N, April 2002 - MSC buoy Argos ID
5315 / WMO 47538 deployed 17 April at 86 25’ N 76 42”W via Twin Otter landing on ice. This buoy was
deployed at a fuel cache and hence position accuracy beyond which we archive in-house is required.
Class 2 / 3 position service was provided by Service Argos with the positions being auto emailed to First
Air in Resolute and to Ed Hudson in Edmonton. The buoy has taken breaks in transmitting from time to
time. For example, the buoy was not heard from mid day 27 May to morning of 1 June. Transmitter 5313
will be swapped in when the site is next visited and 5313 will remain on ice when the fuel cache is
removed. The WMO number will remain 47538. Service Argos estimated accuracy is:
- Class 3.. within 150 meters
- Class 2.. within 150 - 350 meters and
- Class 1.. within 350 - 1000 meters
Status: 5315 replaced by 5313 _________.

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US National Ice Center CES ZENO buoy and U.S. Cold Regions Research and Engineering Laboratory (CRREL) ice thickness buoy, Arctic Basin west of Ellesmere Island, April 2002

The annual spring deployment flight via Twin Otter landing on ice was conducted 24 April 2002 out of Eureka. Polar Continental Shelf Project provided Twin Otter flying hours in support of the flight. CES Zeno buoy Argos 24293 / WMO 48585 was deployed for the US National Ice Center at approximately 81N 120W. Also deployed at the same site was an ice thickness measuring buoy for the U.S. Cold Regions Research, Argos ID 7956. See photo at right.

Status: CES Zeno operating end of May 2001
Status of data from CRREL ice thickness buoy unknown.

The following map acquired from the IABP web site and dated 3 June 2003 shows buoys with MSC history. Buoys with the MSC “touch” since June 2001 are red dots. Previous buoys with the MSC touch are blue dots. The table on the next page provides more detail.

IABP Brochures, Posters and Reports

Brochures and posters - None produced.

Report - The International Arctic Buoy Programme Chairman’s and Coordinators Report and PowerPoint presentation for the Seventeenth Session of the Data Buoy Cooperation Panel, 26 to
LUT Acquisition, Processing and Transmission of Buoy Data onto GTS

MSC, Edmonton, continues to operate a LUT and put data from a few buoys on GTS. We still have work to do with respect to allowing spurious positions to make it to circuit. We also have a problem with coding pressure tendencies to fix. From time to time we give a code that says pressure is steady but follow it with values implying otherwise.

Shifting LUT from Edmonton to Resolute

When MSC acquires a permanent high speed data link to/from the polar orbiting satellite acquisition and processing system in Resolute, MSC will consider shifting the LUT for the processing of arctic buoy data from Edmonton to Resolute.

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Status of Buoy Data onto GTS
The most recent MSC, Edmonton, monthly ARGOS Summary Report is dated October 2001. No one has requested an update and MSC proposes to cease its production. The report is done by Dennis Oracheski and emailed out. Recipients include Etienne Charpentier, Technical Coordinator, Drifting Buoy Cooperation Panel and, Estelle Couture, Marine Environmental Data Systems, Department of Fisheries and Oceans, Canada.

The summary outlines buoys / data being transmitted to GTS from the ARGOS Direct Readout Stations at CWEG ... Edmonton, Alberta, Canada and CYQX ... Gander, Newfoundland, Canada (data from Gander uses the CHWX identifier). Included is the latitude (deg N) and longitude (deg E) position and the list of sensors for each buoy. The report also includes the “status” of some of the data.

Buoy Strategy and Deployment Plans June 2002 to end of May 2003


2. MSC buoy will be on board Canadian Coast Guard Ice Breaker Louis S. St. Laurent for deployment in September west or northwest of Banks Island in support of the Joint (Canada and Japan) Western Arctic Climate Study. Plan to provide a buoy for study again 2003.

3. Plan to continue landing-on-ice deployment out of Eureka in March or April contingent on continued Polar Continental Shelf Project support and the U.S. National Ice Service allowing us to deploy at least 1 of their buoys on these flights. A minimum of 2 and up to 4 buoys will be deployed with the additional buoys being in-house assembled MSC buoys.

4. Plan to provide a buoy through the April May period for the fuel cache site established about half way between Ellesmere Island and the north pole. Surrounding buoy array will be assessed prior to fuel cache pull-out and the buoy may be left.

5. Do not plan to purchase any more CALIB buoys.

Edward Hudson 780 951-8878
Prairie Aviation and Arctic Weather Centre, fax 780 951-8602
Meteorological Service of Environment Canada
Twin Atria Bldg - 2nd Floor, 4999 - 98 Street
Edmonton, AB, T6B 2X3 edward.hudson@ec.gc.ca
This report summarizes activities of the IABP that have occurred since the report filed September 2000 for the 16th session of the Data Buoy Co-operation Panel.

INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP) ELEVENTH ANNUAL MEETING, YOKASUKA, JAPAN - Members of the International Arctic Buoy Programme met 30 May to 01 June, Yokosuka, Japan, for the eleventh annual business meeting. Host for the year 2001 meeting was the Japan Marine Science and Technology Centre (JAMSTEC). Participants were honored to be the first users of JAMTEC’s International Guest House.

BUOY ARRAY STATUS 04 SEPTEMBER - The buoy array in place 04 September 2001 per the map and sheet posted on the IABP web page - http://IABP.apl.washington.edu - showed 32 buoys on the Global Telecommunication System (GTS) 26 of which gave both surface air pressure and surface air temperature, 5 of which gave surface air pressure only, and 1 of which provided temperature only. Another buoy was added to the array mid September near the north pole. The IABP strives to maintain an array of at least 25 buoys evenly distributed across the Arctic Ocean.

DEPLOYMENTS 2001 - The following outlines some of the deployment strategies that resulted in buoys being deployed 2001.

White Trident August 2001 - The annual White Trident Deployment was conducted by the Commander, (U.S.) Naval Meteorology and Oceanographic Command. This deployment remains the key deployment strategy of the IABP. ICEX-AIR buoys for this years White Trident Exercise were provided by:

- (U. S.) National Ice Centre representing several agencies (3)
- Alfred Wegner Institute for Polar and Marine Research (1)
- Norwegian Meteorological Institute (1)
- U. K. Meteorological Office (1) and
- Meteorological Service of Environment Canada (1).

Buoy on Ice via Environment Canada - April 2001. The photo shows one of the CES Zeno buoys deployed for US National Ice Service 23 and 24 April 2001 to the west of the Canadian Arctic Islands by Meteorological Service of Canada personnel via Twin Otter aircraft landing on ice. These deployments are an annual event and are supported by Polar Continental Shelf Project, Natural Resources, Canada.

Buoy on Ice via Icebreakers in Arctic Basin - September 2001. The US Coast Guard icebreaker Healy and the Alfred Wegener Institute (AWI) for Polar and Marine Research vessel Polarstern were near the north pole summer 2001. An AWI buoy was deployed September as the Healy exited the area.
RECENT PUBLICATIONS

Papers

Buoy reports

CDs
- IABP CD See http://www.meds-sdmm.dfo-mpo.gc.ca/alphapro/rnodc/IABP_CD_e.shtml

PARTICIPANTS OF IABP - Participants of the IABP remain a mix of operational agencies, meteorological and oceanographic institutes, research agencies and non-government organizations that are interested in the Arctic Ocean and who contribute actively to the program.

PROBLEMS WITH RESPECT TO LUT POSITION ACCURACY - A problem was noted with positions as given on GTS by Edmonton processed buoys. Investigation showed that a similar position problem exists with positions given by other LUTS such as Oslo’s.

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Director, Meteorological Service of Canada
Prairie and Northern Region
Environment Canada
Twin Atria Bldg - 2nd Floor
Edmonton, Alberta, T6B 2X3
Canada

Ignatius Rigor, Coordinator IABP
Polar Science Center
Applied Physics Laboratory
University of Washington
1013 NE 40th Street
Seattle, WA 98105
U.S.A
## IABP Participant Contributions† 1999 – 2002

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Alfred Wegener Institute for Polar and Marine Research, Germany</td>
<td>1 ICEX-AIR, 2 Sellmann &amp; Kruse buoys, ADP.</td>
<td>1 ICEX-AIR, ADP.</td>
<td>1 ICEX-AIR for WHITE TRIDENT, ADP.</td>
<td>Deploy 3 Sellmann &amp; Kruse buoys &amp; 1 NIC buoy from Polarstern</td>
</tr>
<tr>
<td>Christian Michelsen Research, Norway</td>
<td></td>
<td></td>
<td></td>
<td>Buoy research and production.</td>
</tr>
<tr>
<td>International Arctic Research Center, University of Alaska Fairbanks, USA</td>
<td>Joined IABP in 2000</td>
<td>Hosted Tenth Annual Meeting</td>
<td>Produced buoy animations.</td>
<td>Partial funder of the US-IABP, scientific and technical advice.</td>
</tr>
<tr>
<td>Japan Marine Science and Technology, Japan</td>
<td>2 J-CAD buoys, ADP.</td>
<td>1 J-CAD buoys, ADP, Hosted Eleventh Annual Meeting</td>
<td>2 J-CAD (1 at north pole, 1 in Beaufort), ADP.</td>
<td>1 J-CAD buoy, ADP</td>
</tr>
<tr>
<td>Marine Environmental Data Service, Canada</td>
<td></td>
<td></td>
<td></td>
<td>Host Twelfth Annual Meeting.</td>
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<tr>
<td>Marine Environmental Data Service, Canada</td>
<td></td>
<td></td>
<td></td>
<td>Data Archive; IABP CDROM; IABP Monthly Inventories, Maps and Statistics (on web).</td>
</tr>
<tr>
<td>Meteorological Service of Canada (MSC)</td>
<td>2 EC buoys, 1 buoy deployed for NIC, 1 ICEX-AIR</td>
<td>3 CALIBs, 2 buoys deployed for NIC, 1 MSC, 1 ICEX-AIR</td>
<td>1 MSC, 2 CALIBs, 1 ICEX-AIR, deployed buoys for NIC, &amp; CRREL.</td>
<td>1 MSC, 2 CALIBs, 1 ICEX-AIR, deploy buoy for NIC.</td>
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<tr>
<td>Organization</td>
<td>Description</td>
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<tr>
<td>National Ice Center / US-IABP, USA</td>
<td>Coordinates and represents the US-IABP (NASA, NOAA NESDIS, NOAA OAR, NOAA OGP, NSF, ONR, USN, USCG). Funds the Coordinator of the IABP. Provides 3-7 ICEX-AIR and CES buoys/year and logistics support. ADP.</td>
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<tr>
<td>Naval Oceanographic Office, USA</td>
<td>Refurbish AARI Air Drop buoys, and 3 more AARI buoys next spring. WHITE TRIDENT buoy deployments. Funds AARI buoy development.</td>
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<tr>
<td>Norwegian Polar Institute, Norway</td>
<td>1 ICEX-AIR, ADP. 1 ICEX-AIR, ADP.</td>
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<tr>
<td>Norwegian Met Institute, Norway</td>
<td>1 ICEX-AIR, ADP, LUT. 1 ICEX-AIR, ADP, LUT. 1 ICEX-AIR, ADP, LUT.</td>
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<tr>
<td>Pacific Marine Environmental Laboratory, NOAA, USA</td>
<td>Deployed 2 buoys at NPEO. Deployed 2 buoys at NPEO. 9 buoys in Beaufort, 6 buoys at NPEO. Buoys in Beaufort, and at NPEO.</td>
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<tr>
<td>Polar Science Center, Applied Physics Laboratory, University of Washington, USA</td>
<td>Deployed 7 buoys @ NPEO. Deployed 4 buoys at NPEO. Deployed 8 buoys at NPEO, &amp; 1 NIC CES buoy. Deploy buoys at NPEO. Data Management and Coordination of the IABP. Research on/using buoy data.</td>
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<tr>
<td>Scott Polar Research Institute</td>
<td>Buoy arrays in Greenland Sea to study Odden and deep convection.</td>
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<tr>
<td>Service Argos, France and USA</td>
<td>Data Collection and support for meetings.</td>
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<tr>
<td>United Kingdom Meteorological Office, United Kingdom</td>
<td>1 ICEX-AIR, ADP.</td>
<td>1 ICEX-AIR, ADP.</td>
<td>ADP on 2 buoys.</td>
<td>ADP.</td>
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<tr>
<td>Woods Hole Oceanographic Institute, USA</td>
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<td>ADP for IOEB</td>
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<tr>
<td>World Climate Research Programme</td>
<td></td>
<td></td>
<td>Travel support for some participants. Scientific advice.</td>
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**Other Contributions† to IABP 1999 – 2002**

† Contributions further the objectives of the IABP and are defined in the Operating Principles of the IABP, section 6.5.

Some abbreviations:
   - ADP: Argos Data Processing
   - IOEB: Ice-Ocean Environment Buoy
   - LUT: Local User Terminal
1. Objective
The objective of the International Arctic Buoy Programme (IABP) is to establish and maintain a network of data buoys in the Arctic Ocean to provide meteorological and oceanographic data for real-time operational requirements and research purposes, including support to the World Climate Research Programme (WCRP) and the World Weather Watch (WWW) Programme. The Programme will build upon cooperation among agencies and institutions with arctic interests.

2. Programme Responsibilities
The IABP will:
2.1. Maintain an observational data network over the Arctic Ocean using data buoys;
2.2. Distribute basic meteorological data (atmospheric pressure, air temperature) and buoy location from the network in real time over the Global Telecommunication System (GTS) of the World Meteorological Organization (WMO) and distribute relevant additional real-time data approved for public dissemination;
2.3. Ensure data from the network are archived; and
2.4. Cooperate with and provide results of the Programme to other related programmes.

3. Observation Programme
3.1. Operational Area
The operational area of the Programme will include the central Arctic Ocean and its marginal seas, excepting Exclusive Economic Zones where agreements of the Coastal States have not been obtained.

3.2. Variables
Basic meteorological variables (See item 2.2) will be measured. Additional variables such as atmospheric pressure tendency, wind speed and direction, snow, and sea-ice properties, as well as subsurface oceanographic characteristics are desirable.

3.3. Basic Network Density
The Programme will strive to establish and maintain a basic network with observational points no more than 500 kilometers apart. As far as practical, buoys will be deployed to achieve and maintain this density over the operational area.

4. Data Acquisition and Distribution
4.1. Transmitters
All buoys in the basic network will be equipped with transmitters to enable transmission of basic meteorological data in real time (synoptic and asynoptic
modes). The preferred approach is to collect and locate data via Service Argos using the TIROS N series of satellites or their replacements.

4.2. Coding
All basic meteorological data and buoy location will be coded in approved WMO code(s).

4.3. Global Telecommunication System
Participants are responsible for inserting data into the GTS in real-time (See item 2.2).

5. Data Archiving

5.1. Operational Archiving
All data transmitted on the GTS will be archived by the Marine Environmental Data Service (MEDS) as the Responsible National Oceanographic Data Centre (RNODC) for Data Buoys, on behalf of both the Intergovernmental Oceanographic Commission (IOC) of UNESCO and the WMO.

5.2. Research Data Base
A uniform, quality-controlled data base for surface meteorology and ice motion has been established at the Polar Science Center, University of Washington for use by the arctic research community, and is maintained by the Coordinator. Periodically these data will be submitted to World Data Centre A (Glaciology), World Data Centre B (Sea-Ice), and to MEDS.

6. Management Structure

6.1. Participants
Programme Participants can be operational agencies; meteorological and oceanographic institutes; research agencies; data centres; and non-governmental organizations interested in the Arctic Ocean and contributing actively to the Programme. Participants will indicate their participation in the Programme by means of a Letter of Intent.

On an annual basis, the Participants will review the membership to identify potential new Participants and to re-affirm the intent of existing Participants. Participants who chose not to re-affirm their participation will be deemed to have withdrawn.

Participants may withdraw from the Programme with a letter to the Chairman of the IABP.

A Participant who is unable to attend may designate a Participant to act as Proxy at an annual meeting by notifying the Chair in advance of the meeting.

6.2. Election of Programme Executives
The Programme is coordinated by the Participants. The Participants will arrange for the implementation of the Programme within the framework of the Programme Objective.

On an annual basis, the Participants will elect a Chair and Vice Chair and appoint a Programme Coordinator. The Chair, Vice Chair, and two
representatives elected from the Participants will form the Executive Committee. Elections will be held at annual meetings of the Participants and will be decided by a simple majority if a quorum of Participants is present. A quorum will consist of a simple majority of Participants. If a quorum is not present at the annual meeting of Participants, elections will be by unanimous vote.

A Participant who is unable to attend the annual meeting may register a proxy vote delivered by an attending Participant if such authority is signified in writing to the Chair.

6.3. Executive Committee

The Executive Committee will be responsible for the day-to-day management of the Programme within the guidelines set at the annual meeting of Participants. The Executive Committee will provide guidance and direction to the Coordinator.

6.4. Coordinator

The Coordinator will act as the focal point for the Programme and will carry out the directives of the Executive Committee during intercessional periods. Specific responsibilities and duties of the Coordinator are contained in Appendix 1.

6.5. Funding Provisions

The Programme will be self-sustaining, supported by contributions of equipment, services (such as communications, deployment, archiving, and scientific or technical advice), coordination, and monetary contributions. As necessary, the Participants will establish a budget to implement the Programme. Other funding arrangements made between the Participants will be recognized as contributions to the IABP if they further the Objective of the Programme.

6.6. Programme Review

The management structure and operation of the Programme will be reviewed at the annual meeting of Participants. The operating principles and procedures will be reviewed and updated as necessary at the annual meeting.

7. Meetings

An annual meeting of the Participants will be held at a location to be determined by the Participants.
APPENDIX 1 to
The International Arctic Buoy Programme (IABP) Operating Principles

Terms of Reference for the Coordinator of the IABP

The Coordinator is appointed at the annual meeting of the Participants and is directed by the Executive Committee. The Coordinator's specific responsibilities are as follows:

1. To monitor and receive appropriate Argos and non-Argos data from the buoy network and to prepare a monthly status report of buoys;
2. To stay informed of the activities of non-Argos buoy programmes and other field operations and to make those data available, as possible;
3. To liaise with Principal Investigators and managers of individual buoy programmes in the Arctic Ocean;
4. To arrange for the maintenance of a research quality data base of ice motion and surface meteorological data, and to submit through the World Data Centre A (Glaciology) to World Data Centre B (Sea-Ice) and MEDS;
5. To develop a deployment strategy to maintain an optimum buoy network in the Arctic;
6. To identify and coordinate opportunities for buoy deployment;
7. To liaise on technical aspects of buoy deployment;
8. To prepare an annual summary of resources committed to the Programme;
9. To liaise with the Technical Coordinator of the Data Buoy Cooperation Panel to ensure that; a) the proper quality control of arctic data is maintained and; b) the data are distributed over GTS;
10. To arrange for the purchase of buoys and ancillary equipment, as authorized;
11. To arrange for the payment of Argos data acquisition and Argos processing fees, as authorized;
12. To prepare and distribute an annual data report;
13. To maintain a distribution list for monthly status reports and annual data reports;
14. To respond to requests from the international arctic science community for reports on arctic climatology, global change, and advice on experiment design;
15. To maintain a web page that promotes the IABP, provides access to the IABP datasets, and provides news and information to the Participants and general community;
16. To organize the annual meeting of Participants, present a report of the preceding year’s activities, and prepare a plan for the following year; and
17. To promote the IABP so as to attract potential Participants.

NOTE: Additional contractual duties of the Coordinator that may be required in the future will be approved through the Executive Committee.