SUMMARY REPORT

The Eight Annual
International Arctic Buoy Programme Meeting

Seattle, Washington, USA

29 - 31 July 1998

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SUMMARY REPORT

Eight Annual International Arctic Buoy Programme (IABP) Meeting
Seattle, Washington, USA
29 - 31 July 1998

1.0 Opening of Meeting

The Eight Annual Meeting of the International Arctic Buoy Programme (IABP) was opened at 1300 on 29 July 1998, at the *Applied Physics Laboratory,* University of Washington, Seattle, Washington, USA.

1.1 The Chairman of the IABP, Brian O'Donnell, called the meeting to order.

1.2 Ignatius Rigor, representing the Applied Physics Laboratory at the University of Washington, Seattle, gave a brief introduction and offered a tour of the facilities at a time convenient to the attendees. The Attendees are listed in *Attachment 1.*

2.0 Agenda Approval

The agenda was reviewed, and changes were made to accommodate additional presentations under item 9.0 *New Business*. The final version is presented as *Attachment 2.*

3.0 Approval of the Minutes from the 7th Annual IABP Meeting

Roger Colony, IABP Coordinator, presented the minutes for the 7th Annual Meeting held in St. Petersburg, Russia. Victor Savtchenko brought up the issue of language consistency in the minutes. This was discussed, and the minutes were approved.

4.0 Review and Approval of the IABP Operating Principles

4.1 The Operating Principles of the IABP were discussed fully. It was noted that the Operating Principles had undergone a change of style in the years since its inception. The Participants were reminded that, at IABP-7, the word *drifting* was changed to *data* to better reflect that fact that also shore-based buoys were represented.

4.2 It was recommended that paragraph 2.2 be changed slightly so that the reader would have a better understanding of what was included in the words *meteorological data.* It was also recommended that paragraph 3.2 be reworded to say *meteorological variables* rather than *meteorological data,* and *sea-ice properties* was changed to *sea-ice characteristics.* A change of style in items 2.2 and 3.2 were recommended. A revised version of the Operating Principles reflecting these and other editorial changes can be found in *Attachment 3.*

5.0 Coordinator's Report

Roger Colony showed the IABP buoy locations as of 28 July 1998 and summarized the IABP activities during the year. The complete report of the IABP Coordinator is given in Attachment 4.

5.1 Dick Moritz gave an overview of the Surface Heat Budget of the Arctic (SHEBA) project and its use of buoys, including IABP.

5.2 Ignatius Rigor presented two examples of the use of IABP buoy data: 1) predicting the drift of the SHEBA ice camp, and tracking the position and deformation of the SCICEX survey area; and 2) informing that the IABP surface air temperature (SAT) assimilation of Phil Jones' global climatology. Two papers on the IABP SAT have been submitted, and a third paper on the variations in SAT will be presented at the IABP conference next week.

A discussion about whether or not to continue holding the IABP meeting annually was held. It was noted that having an annual meeting is essential to the success of the group and that going through the reports of the Participants every year has allowed IABP to keep improving the programme and maintaining quality. Pending further discussions, the Programme and Participants will meet annually.

Roger Colony informed the attendees about his informal contact with a group in Japan who wants to put buoys in the Sea of Okhotsk. These would not be IABP buoys, but it was suggested that he could use its contacts to help this group.

Roger Colony concluded with information that this would be his last year as coordinator for IABP and asked the Executive to consider his request to find a replacement for him.

6.0 Report from the Data Buoy Co-operation Panel

Etienne Charpentier presented a report on behalf of the DBCP where he summarized its activities during the year. The complete report of the DBCP is given in *Attachment 5.*

7.0 Status Report on Membership and Letters of Intent

The membership list of IABP Participants was reviewed. One new Participant was added, which means that a total of 25 institutes, universities, agencies and private companies are formally committed to the IABP (*Attachment 6).*

8.0 Status Report from Each Participant

8.1 Environment Canada

Attachment 7.

8.2 US Interagency Arctic Buoy Program/National Ice Center.

Presently, the US Interagency Arctic Buoy Program (USIABP) receives fiscal resources and services from eight U.S. Government agencies. As of 24 July 1998, the USIABP has 13 buoys operating in the Central Arctic basin and/or adjoining marginal seas. This number includes six coastal environmental buoys, four CMR ICEXAIR buoys, one Metocean TOGA tower buoy, one Polar Ocean Profiler, and one ice beacon. Meteorological data from all 13 buoys are being distributed in real time via the Global Telecommunications System. Other contributions include: WHITE TRIDENT aerial assets, funding for the IABP Coordinator/Data Management function and coordination for the NICOP AARI buoy development initiative.

8.3 Marine Environmental Data Service.

Marine Environmental Data Service (MEDS), Canada, captures, conducts preliminary quality control and archives the data from GTS as part of its mandate as the Responsible National Oceanographic Data Center (RNODC) for drifting buoys. In addition, such data are periodically submitted to the World Data Center-A (glaciology) to establish a uniform quality controlled data base. The archive at MEDS is used to derive statistics on buoys and data from the sensors mounted on them. Statistics from the area north of 60ºN were presented. The Coordinator will work with MEDS to decide on a set of statistics that will adequately reflect the quality and quantity of data from IABP.

8.4 Christian Michelsen Research.

A total of 19 ICEX/ICEXAIR buoys have been deployed under the IABP in the period 1996-1998. In 1996, six air deployments were made, in 1997, four air deployments and in 1998, seven air deployments and two ship deployments are scheduled. All but one

of these will be operational by August 1998. During the period 1997- July 1998, a total of seven ICEX/ICEXAIR buoys ceased to operate. Their operational lifetime ranged from 205 to 1174 days, with an average of 688 days.

8.5 World Climate Research Programme.

Under the Arctic Climate System Study (ACSYS), WCRP implements the Sea-Ice Models Inter-comparison Project (SIMIP). The IABP data are used by SIMIP to validate the sea-ice modules of coupled sea-ice/atmosphere/ocean global climate models. A science and coordination plan of a new WCRP activity entitled "Climate and Cryosphere" (CLIC) is under development by a WCRP (JSC/ACSYS) CLIC Task Group. WCRP provided funding to support the printing of the IABP brochure (June 1997 version). WCRP also provided necessary funds to support the participation of several sea-ice experts in the IABP-8, the IABP mini-conference, and the workshop on Sea-Ice Charts.

8.6 Service Argos.

Argos is implementing several changes beginning with launch of NOAA-K and the first Argos-2 instrument. System improvement will continue with NOAA-L, M, N, and the Japanese ADEOS II.

8.7 Naval Oceanographic Office.

The Naval Oceanographic Office received seven ICEXAIR buoys from the Christian Michelsen Research Institute (CMR) in late June. Thor Kvinge and Torleif Lothe of CMR, accompanied by Chris O'Connors and Dave Benner of the U.S. National Ice Center, travelled to NAVOCEANO to prepare the drifters for deployment during an August survey in the Barents Sea.

NAVOCEANO continues to work closely with the Arctic and Antarctic Research Institute to expand Arctic data collection capabilities. In addition, NAVOCEANO provided two Polar Ocean Profiler (POP) buoys and funded Argos costs to support SHEBA.

8.8 Department for Navigation and Oceanography, Ministry of Defense of Russian Federation.

Oleg Korneev attended the meeting as representative for the Head Department of Navigation and Oceanography and as the Chair of Hydrometeorological and Hydrograhical Service MV Frunze Naval College . He suggested modifying the objective analysis method and adding the interpolation procedures for cases when distance between buoys and coastal meteorological stations is more than 800 km. (Attachment 10). The Participant's approach will be reported during the upcoming Sea-Ice Workshop August 5-7, 1998.

8.9 UK Meteorological Office.

The ICEXAIR buoy, Argos number 1261, purchased by the UK Meteorological Office in March 1996 and deployed in August 1996 is still operational after two years. On 24 July, it was located at 77º 40' North and 31º27' West.

Two other ICEXAIR buoys, 1351 and 3004, were recently under test at NAVOCEANO at the Stennis Space Center, Mississippi. These buoys will be air dropped in August 1998 at locations determined by the IABP. An additional ICEX buoy has now been purchased from Christian Michelsen Research as next year's contribution to the IABP. It will be available for deployment any time after February 1999.

8.10 Arctic and Antarctic Research Institute (AARI) and Roshydromet.

During the IABP intersessional period, AARI constructed seven Arctic drifting meteorological buoys, as described in Attachment 9 of the IABP-7 Summary Report. The specific feature of this type of buoy is air temperature measurements on 1.5 meter height. It would allow the collection of more realistic temperature means than other kinds of air-droppable arctic meteorological buoys.

Four buoys were sent to the USA for laboratory testing, including cold room tests. These buoys will be deployed for field tests in natural conditions in the Arctic (Point Barrow) and Antarctica (McMurdo Station).

Three other buoys are planned to be deployed in the northern parts of the Laptev, Kara and Barents Seas, respectively, in the period August – September 1998.

The construction of these buoys was funded jointly by NAVOCEANO and Office of Naval Research-Europe (ONR).

In August 1997, a new Local User Terminal (LUT) was installed at AARI. The LUT provides active tracking of Argos platforms via NOAA satellites. This unit was loaned to AARI by NAVOCEANO as part of IABP-cooperation.

9.0 New Business

9.1 DBCP Implementation Plan.

The Technical Coordinator of the DBCP presented the proposed DBCP implementation plan. This plan, which will be formalized at the next DBCP session in October 1998, will be part of the GOOS/GCOS implementation strategy plan. IABP Participants are invited to comment and suggest amendments by 30 August 1998 to the Technical Coordinator of the DBCP. Full text of the draft plan may be viewed at the DBCP web site under Global Implementation menu item (http://dbcp.nos.noaa.gov/dbcp).

9.2 Report on IPAB

Attachment 8.

9.3 Review IABP-IPAB connections.

The merits of merging the IABP and IPAB were discussed at length. It was recommended that items of common interest should be explored by the coordinators.

9.4 Reports and Representation at the DBCP Annual Meeting.

IABP submissions to, and participation in, the annual Data Buoy Cooperation Panel (DBCP) meetings was discussed. For the past few years, an IABP Chairman/Coordinator Report has been submitted for the annual (DBCP) meeting, but there has been no formal representation by the IABP at the DBCP meetings. It was the consensus of the IABP meeting that attendance of, and a presentation by, an IABP Executive member (or a delegated person) at the annual DBCP meeting was important. The Fourteenth Session of the Data Buoy Cooperation panel will be held in Miami, USA, 12 to 16 October, 1998. A presentation at both the Scientific and Technical Workshop of the Fourteenth Session of the DBCP Panel and at the session itself is desirable. David Benner expressed an interest in attending the DBCP meeting.
Attachment 9 is the IABP Chairman/Coordinator's report submitted for the 1997 DBCP meeting. Subsequent IABP meeting minutes will include such reports.

9.5 MEDS Proposal for IABP CD-ROM.

A proposal to develop a CD-ROM containing IABP data was presented. It was recommended that MEDS work with Ignatius Rigor and Ed Hudson to produce such a product.

9.6 IABP Poster.

IABP posters and brochures to date were discussed. Brochures for the October 1998 DBCP meeting and the May 1998 WMO meetings are needed. Ed Hudson asked for contributions -- photos in particular -- for future brochures and posters. Participants were reminded that the bear pictures are for IABP promotional use only, and that they should always acknowledge the photographer (Donald G. Barton) when using the pictures.

9.7 Review of GTS processing of IABP data.

The need for access to more real-time LUT data was expressed and discussed.

9.8 Location of 9th IABP annual meeting.

The location and time of IABP-9 meeting will be decided by the Executive.

10.0 Reports on Related Programmes (GCOS, GOOS, OOPC, etc.)

Monitoring of the ice covered seas was among the agenda items for the third meeting of the Ocean Observations Panel for Climate (OOPC) held in Grasse, France, 6-8 April 1998. Roger Colony was invited to participate and to make recommendations for climate monitoring of the Arctic Ocean. He reported that OOPC and the associated programme (GODAE) might be the best avenue for a connection between the climate monitoring community and the IABP. The OOPC report (in draft form) can be found on the web *http://www.bom.gov.au/bmrc/mrl/nrs/oopc_3/oopc3rpt.html*. Information on GODAE can be found at.*http://www.bom.gov.au/bmrc/mrlr/nrs/oopc/godae/homepage.html.* Participants were reminded that within the GOOS/GCOS action plan for existing bodies, buoy deployment issues will be addressed via the DBCP implementation plan. Since IABP is an Action Group of the DBCP, it is important that its own deployment strategy issues be addressed in that plan. Those issues will be discussed at the next session in October 1998.

11.0 New Directions

An open discussion about the direction of the Programme was held. Roger Colony suggested a new direction: Oceanographers noticed significant warming of the Arctic Ocean and the erosion of the layer of cold water extending from the surface to 200 m. Is this a signal of climate change or a signature of natural climate variability? Study of variability of the Arctic Ocean will probably be a major focus study by the US National Science Foundation. The IABP Participants recommended the use of POP buoys to monitor upper ocean temperatures and salinity, and suggested the search for a dedicated person within IABP to be the principal investigator to funding agencies to support deployment of POP buoys.

12.0 Election of Officers

12.1 In accordance with the IABP Principles, elections to the following officers took place:

Chairman:	Tim Goos, Canada
Vice Chairman:	Thor Kvinge, Norway
Member:	Dave Benner, USA
Member:	Ivan Frolov, Russia

12.2. Ignatius Rigor was appointed Coordinator for the IABP Programme.

13.0 Review of Meeting and Recommendations

The Operating Principles were reviewed and a few style changes were made as noted in paragraph 4.0.

14.0 Approval of Meeting Minutes

The draft Summary Report was reviewed and approved pending proposed changes.

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ATTACHMENTS

Attachment 1

List of Attendees

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Agenda

INTERNATIONAL ARCTIC BUOY PROGRAMME

Eighth Annual Meeting
Applied Physics Laboratory, University of Washington
Seattle, Washington, USA, 29-31 July 1998

Wednesday, 29 July

1300 - 1700 IABP Business Meeting

1. Meeting Opens -- Chairman, B. O'Donnell
   - 1.1. Call to order
   - 1.2. Welcome and Meeting Information (I. Rigor)
2. Agenda Approval (B. O'Donnell)
3. Approval of Minutes of the IABP 7th Annual Meeting - 1997 (R. Colony)
4. Review and Approval of the IABP Operating Principles (R. Colony)
5. Coordinator's Report (R. Colony)
   - 5.1. IABP Buoys at SHEBA Station (R. Moritz)
   - 5.2. IABP with SCICEX (I. Rigor)
   - 5.3. Surface Air Temperatures (I. Rigor)
6. Report from Data Buoy Co-operation Panel (DBCP) (E. Charpentier)

Thursday, 30 July

0900 - 1200 IABP Business Meeting (Continued)

7. Status Report on Membership and Letters of Intent (R. Colony)
8. Status Reports from each Participant (B. O'Donnell)
9. New Business (B. O'Donnell)
   - 9.1. DBCP Implementation Plan (E. Charpentier)
   - 9.2. Report on IPAB (V. Savtchenko)
   - 9.3. Review IABP-IPAB connections (R. Colony)
   - 9.4. Reports and Representation at the DBCP Annual Meeting (E. Hudson)
   - 9.5. MEDS Proposal for a IABP CD-ROM (S. Narayanan)
   - 9.6. IABP Poster (E. Hudson)
   - 9.7. Review of GTS processing of IABP data (E. Hudson)
   - 9.8. Location of 9th meeting

1330 - 1700 IABP Business Meeting (Continued)

10. Reports on related programmes such as GCOS, GOOS, etc. (R. Colony)
11. New Directions (B. O'Donnell)
12. Election of Officers (B. O'Donnell)
13. Review of Meeting and Recommendations (B. O'Donnell)

1800 Service Argos Dinner at the Salmon House 401 NE Northlake Way (walking distance from APL)

Friday, 31 July

0900 - 1200 Conclusion

14. Draft and Approve Meeting Minutes of the Eighth Annual Meeting -Seattle

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August 3-4, 1998: International Arctic Buoy Programme mini-conference commemorating the first 20 years.
August 5-6, 1998: Workshop on Sea Ice Charts.

INTERNATIONAL ARCTIC BUOY PROGRAMME

Operating principles

(Revised, July 1998)

1.0 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 those agencies and institutions with arctic interests.

2.0 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) 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.

3.0 Observation Programme

3.1 Operational Area

The operational area of the Programme will include the central Arctic ocean and its marginal seas, excluding economic zones except where agreements of the Coastal States have been obtained.

3.2 Variables

Basic meteorological variables 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.

4.0 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 the approved WMO code for data buoys.

4.3 Global Telecommunication System

Data will be inserted by Service Argos into the Global Telecommunication System (GTS). Data collected by Participants by other means may also be inserted into the GTS.

5. 0 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) and the World Meteorological Organization (WMO).

5.2 Research Data Base

A uniform, quality-controlled data base for ice motion and surface meteorology has been established for use by the arctic research community. Periodically these data will be submitted to World Data Centre A (Glaciology), World Data Centre B (Sea-Ice), and to MEDS.

6.0 Management Structure

6.1 Participants

Participants in the IABP will be operational agencies; meteorological and oceanographic institutes; research agencies; 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.

6.2 Election of Programme Executives

The Programme will be 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 at least nine 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.

This edition of the operating principles and procedures of the IABP incorporates corrections made at the Fourth Annual Meeting of the IABP, Helsinki, Finland, June 1994. It includes an updated Letter of Intent to join the IABP. It also includes the Terms of Reference for the Coordinator of the IABP. (See Appendix 1)

7.0 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 will facilitate the implementation of the IABP. The Coordinator will be appointed at the annual meeting of the Participants and will be directed by the Executive Committee. The Coordinator's specific responsibilities will be 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 buoy positions;
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 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 WMO, WCRP, and the International Arctic Science Committee (IASC) for reports on arctic climatology, global change, and advice on experiment design;
15. To prepare and distribute a bimonthly newsletter of activities and plans;
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.

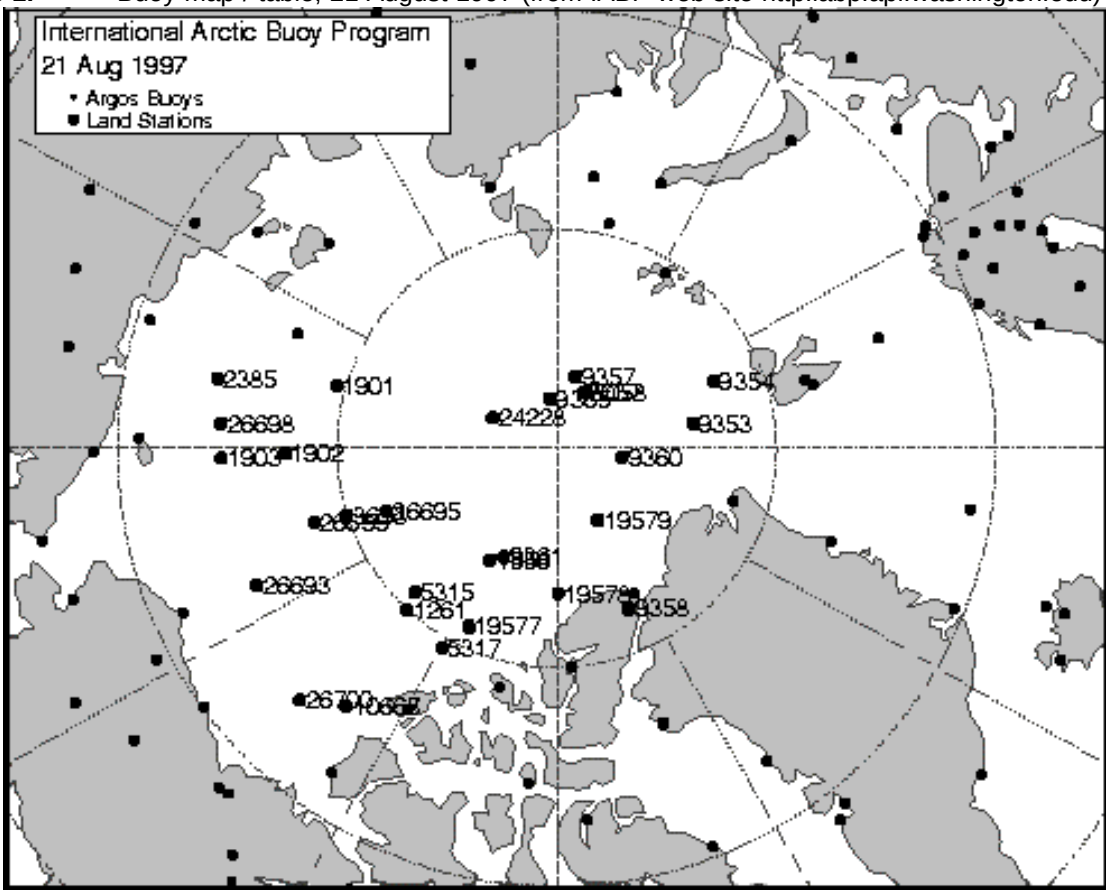
Attachment 4

Co-ordinator's Report

There were 27 buoys operating in the Arctic at the time of the last report (IABP-7). Since then, 23 buoys have been deployed, of which 13 around the SHEBA ice camp. Fifteen buoys have ceased to operate, three of these are around the SHEBA ice camp. There are currently 38 buoys operating, 11 of which are at the SHEBA ice camp. The buoys around SHEBA are spaced less than 500 km apart, and if we were to count these as one buoy, then there would currently be 27 buoys. *Figure 1* with table show the positions of the buoys actively reporting.

The Polarstern is currently in the Laptev where two ICEX buoys and one AARI buoy will be deployed in August. In addition, seven ICEXAIR buoys will be deployed via WHITE TRIDENT, two CES buoys will be deployed via submarine, and two AARI buoys will be deployed from the vessel Federov in September. *Figure 2* shows the updated buoy array and expected fall deployment via the *Federov.*

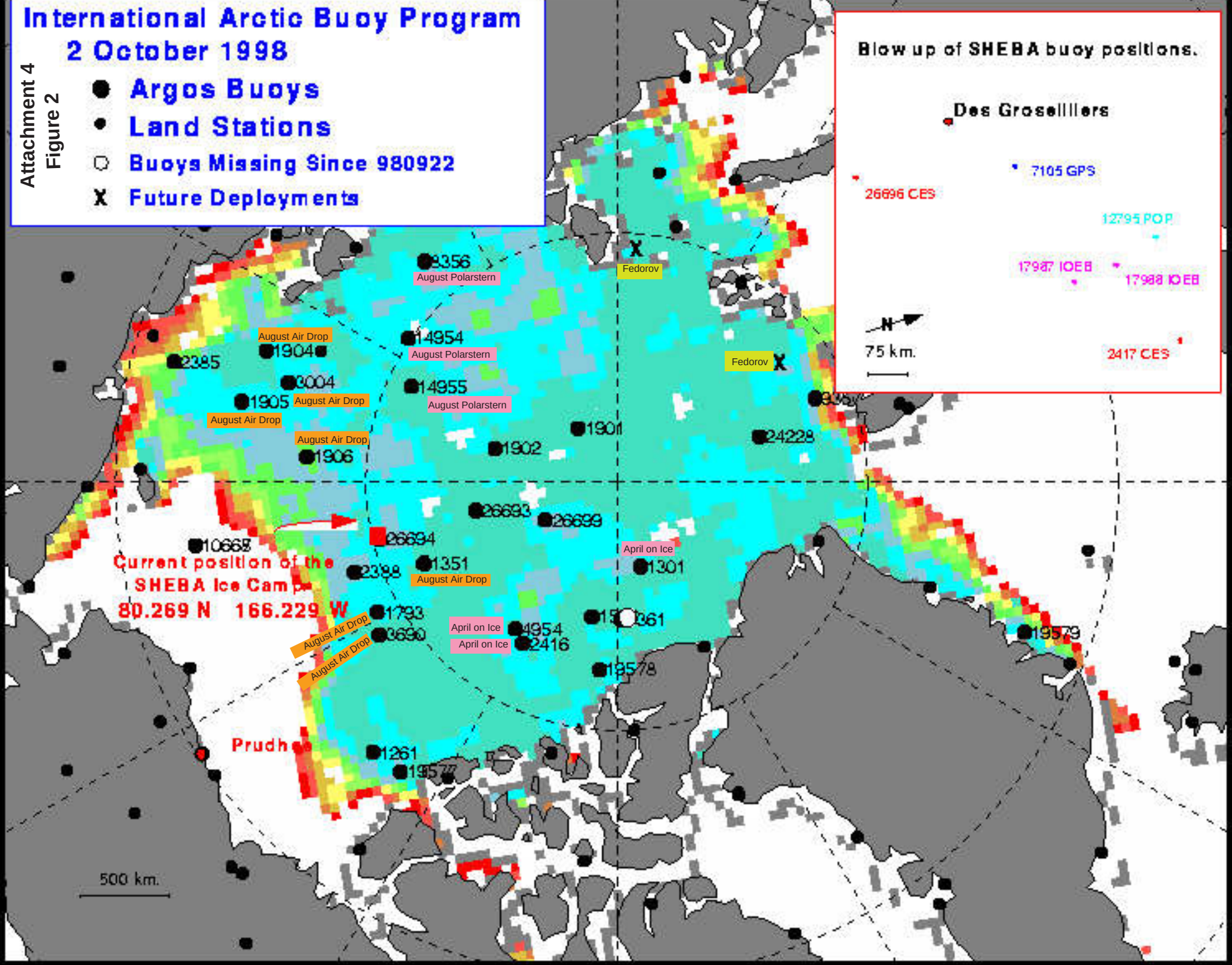
Figure 1. Buoy map / table, 21 August 1997 (from IABP web site http:iabp.apl.washington.edu)



DATE DEPLOYED	ARGOS ID	WMO ID	YPR NUMBER	GTS HEADER	POSITION LAT	POSITION LONG	DATA BYTES	P	T	BUOY DESCRIPTION
Aug 96	1261	48102	484	SSVX01-LFPW	79.962	-132.758	16	Y	Y	ICEX-AIR
Aug 96	1556	48111	314	SSVX01-LFPW	84.063	-120.909	16	Y	Y	ICEX-AIR
Aug 97	**1901**	**25521**	**557**	**SSVX12-KARS**	**79.584**	**163.940**	**21**	**Y**	**Y**	**ICEX-AIR**
Aug 97	**1902**	**25522**	**557**	**SSVX12-KARS**	**77.632**	**-178.850**	**21**	**Y**	**Y**	**ICEX-AIR**
Aug 97	**1903**	**25523**	**557**	**SSVX12-KARS**	**74.722**	**-178.320**	**21**	**Y**	**Y**	**ICEX-AIR**
Aug 97	**2385**	**25549**	**1053**	**SSVX12-KARS**	**74.228**	**168.326**	**17**	**Y**		**ICEX-AIR**
Aug 95	3693	48092	314	SSVX01-LFPW	79.970	-162.319	16	Y	Y	ICEX-AIR
May 97	**5315**	**48525**	**627**	**SSVX02-CWEG**	**80.794**	**-134.563**	**4**	**Y**	**Y**	**CALIB Buoy**
Oct 96	5317	48523	627	SSVX02-CWEG	79.493	-119.758	4	Y		CALIB Buoy
Aug 96	8057	63664	919	SSVX01-LFPW	87.181	64.755	32	Y	Y	Metocean
Aug 96	8058	63665	919	SSVX01-LFPW	87.074	62.205	32	Y	Y	Metocean
Aug 96	9353	63666	919	SSVX07-LFPW	83.701	10.524	12		Y	AARI
Aug 96	9354	25569	919	SSVX07-LFPW	82.229	23.232	12		Y	AARI
Aug 96	9357	63663	919	SSVX07-LFPW	86.601	75.227	22	Y	Y	Metocean
Aug 96	9358	63661	919	SSVX07-LFPW	81.997	-65.854	22	Y	Y	Metocean
Aug 95	9360	63662	919	SSVX07-LFPW	86.983	-7.581	16	Y	Y	ICEX-AIR
Aug 95	9361	25571	919	SSVX07-LFPW	84.485	-115.966	20	Y	Y	ICEX-AIR
Aug 96	9365	25570	919	SSVX07-LFPW	87.696	97.807	25	Y	Y	ICEX
May 92	10667	48531	1016	SSVX02-CWEG	74.846	-129.122	32	Y	Y	IOEB
May 92	10668	48531	1016	SSVX02-CWEG	74.846	-129.122	32			IOEB
Aug 96	19577	47601	1053	SSVX12-KARS	80.938	-116.139	16	Y	Y	ICEX-AIR
Aug 96	19578	47602	1053	SSVX12-KARS	83.391	-89.544	16	Y	Y	ICEX-AIR
Aug 96	19579	48518	1053	SSVX12-KARS	86.232	-60.086	16	Y	Y	ICEX-AIR
Jul 96	24228		9053		86.781	154.398	32	Y	Y	Seimac
Mar 96	26693	48578	1053	SSVX02-CWEG	74.983	-155.371	32	Y	Y	Zeno Ice Buoy
Sep 96	26695	25548	1053	SSVX02-CWEG	81.747	-159.767	32	Y	Y	ICEX-AIR
Jul 96	26698	48572	1053	SSVX02-CWEG	74.675	175.726	32		Y	Zeno Ice Buoy
Jul 96	26699	48573	1053	SSVX02-CWEG	78.459	-163.007	32			Zeno Ice Buoy
Apr 97	**26700**	**48579**	**1053**	**SSVX02-CWEG**	**73.611**	**-135.503**	**32**	**Y**	**Y**	**Zeno Ice Buoy**

NOTE: 1997 Buoys deployed before 21 August are shown in bold type.

Attachment 4
Figure 2



Report of the Data Buoy Co-operation Panel

A) 13th session of the DBCP

- DBCP-13 session was held in La Réunion Island, 13-17 October 1997. A scientific and technical workshop was associated with the DBCP session, stressing in applications of buoy data in both meteorology and oceanography. Workshop presentations will be published within the DBCP document series. The Panel decided to organize a similar workshop in association with the next DBCP session, Miami, 12-16 October 1998. Written IABP report submitted by the IABP Coordinator has been circulated among DBCP session Participants and reviewed.

B) 17th session of the JTA

- JTA-17 session was held in La Réunion island on 20-22 October 1997. About 1111 PTT. Years had been submitted by the Representatives of Countries (ROC) for 1998 (as compared to 1158 projected for 1997 based on the first 9 months of the year). The meeting agreed that Representatives of Countries (ROC) had essentially a fixed amount of money to pay to Argos for 1998, the total of which would most likely cover Argos operating costs for that year, based on an unchanged cost per PTT year. It also agreed that for this amount each ROC would be allowed a 35% increase (bonus) in PTT year usage, nominally 35% without further charge or penalty. This increase could be compounded over two years. The JTA did not adopt a long term ALIP. It was, however, decided that those platforms already deployed at the 70% discount rate would be allowed to continue at this rate for their full lifetime.

  The basic Argos PTT. Year tariff rate for 1988 was finally unchanged at a level of FF 26000.

C) User requirements

- Some of the requirements expressed by the users, including IABP, which had been presented and discussed at the 12th DBCP session and then included within the Argos development programme (JTA-16) have been developed and implemented: Argos data bank extended from 4 to 10 days, remote and automatic technical file access for GTS platforms (via Email, see documentation at http://www.argosinc.com/gts_tf.htm), and connection of Local User Terminals in Cape Town and La Réunion (to substantially decrease delays in the South Atlantic and Indian oceans respectively). The Panel decided that providing Argos users with data on CD ROM should now be a top priority and urged Service Argos to propose and implement a solution as soon as possible. This has been realized as of May 1998.

- Data flow monitoring tools are now available in the context of the DBCP web server in co-operation with Météo France, NWS and MEDS. Basically, users can access GTS data of the preceding week via the web. Most recent data are yesterday's data. Only GTS Bulletin header, WMO number, date of observation, delay, and presence of sensors are indicated (for confidentiality reasons, we chose not to provide location & sensor data on the web). These tools make it easy for a user with no GTS access to rapidly check that a buoy is actually reporting on GTS and how many reports are being received.

D) Implementation strategy

- The panel is developing a comprehensive implementation strategy plan for itself and its action groups, in support of the requirements of both global Programmes and also national/regional projects. Such an implementation strategy would be essential input to the development of a comprehensive GOOS/GCOS implementation strategy. A draft implementation strategy plan was discussed at the 13th Panel session and then at the GOOS/GCOS implementation Workshop on Ocean Observations, 3-6 March 1998, Sydney, Australia. DBCP Action Groups, including IABP, are invited to submit comments or propose amendments to the DBCP Chairman with copy to the Technical Coordinator of the DBCP. The final draft of the strategy should be prepared for adoption at the 14th DBCP session.

- In this plan, the DBCP recognizes the autonomy of its action groups and does not seek to impose any additional level of management or control. Among principal actions proposed in the implementation strategy plan we have:

  Compilation of a detailed climatology of drifter tracks as a basis for forecasting network dispersion and re-seeding requirements.

  Development of co-operative deployment and re-seeding strategies which optimize expenditure of available resources.

  The Panel will continue to emphasize the added value that will accrue to the operational agencies through the deployment of buoys, such as the SVP-B, that satisfy the requirements of both the oceanographic and meteorological communities.

  Promoting further research and development on new sensors to observe variables such as salinity, rainfall, wind, heat flux, ocean color and CO_2.

  Encouraging buoy operators to become involved in the work of the Panel and its action groups and to seek new national contributions to buoy programmes.

  Monitoring data flow on the GTS so that problems relating to the delivery of buoy data to end users may be identified and resolved at an early stage.

  In recognition of the economies of scale that will flow from global annual procurements of the size indicated by the WWW and OOSDP observing network requirements, the Panel and its action groups will enter into negotiations with the buoy manufacturers and the communications service providers to establish prices that will then be available to individual buoy operators.

  The Panel will act as a focus for the exchange of practical information on the performance of the various satellite communication systems, and will sponsor evaluation trials of new equipment and systems as they become available.

  The Panel will seek adequate resources to ensure the continued employment of its Technical Coordinator.

E) GTS codes

- BUFR: The Panel formally submitted the document reflecting DBCP views on encoding buoy data in BUFR to CBS for discussion by CBS in 1998. Copies of the document can be obtained from the Technical Coordinator of the DBCP.

- BUOY: CBS decided to add field Q_a in group 6 of Section 0 and group 2 of section 4 of FM 18-X BUOY. Implementation date was 5 November 1997. Q_a field reflects Argos Location Quality Index (0: =1500m, 1: <1500m, 2: <500m, 3: <250m), is optional and can be coded '/' if this information is not available. Hence Local User Terminals are not concerned by this new field because they do not compute its value. For practical reasons Argos centres effectively implemented the change as of 16 December 1997.

F) SVPB early failures

The DBCP decided to investigate why about 25% of recently deployed SVPB failed shortly after deployment. Records from buoy manufactures containing information on buoy batches, transmitter type, model version, plus information from GDC on deployment method (ship, air) will be compiled in order to tentatively find causes of the problem. Action is also taken care of by the International Buoy Programme for the Indian Ocean (IBPIO).

G) Information exchange

- IABP web. site can also be accessed via the DBCP server.

- DBCP web. Server (*http://dbcp.nos.noaa.gov/dbcp*) has been updated to include National reports and DBCP Action Group annual reports. IABP annual report for 1997 has been included in the server under Global Implementation menu item. IABP is invited to continue submitting its annual reports in electronic form to the Technical Coordinator of the DBCP for inclusion in the server.

- IABP members are also invited to submit national deployment opportunities in electronic form for inclusion in the related DBCP server pages (only South Africa and USA did submit ship routes maps).

- It is planned to add recovery methods of buoys in the DBCP web. Server. IABP is therefore invited to share its experience in that regard and to submit documents preferably in electronic form.

- New DBCP publications:

  - DBCP Document No. 8: Guide to moored buoys and other ocean data acquisition systems (by Eric Meindl);

  - DBCP Document No. 9: DBCP annual report for 1996.

  - DBCP Document No. 10: Proceedings of technical presentations made at the 12th session of the DBCP, “Development in buoy and communications technologies”.

  - DBCP Document No. 11: DBCP annual report for 1997.

All these publications can be obtained from the Technical Coordinator of the DBCP.

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Environment Canada Participant Report for IABP-8

Report submitted by Edward Hudson, Arctic Weather Centre, for the Summary Report of the Eighth Meeting of the International Arctic Buoy Programme, Seattle, U.S., 29-31 July 1998. (edward.hudson@ec.gc.ca 403 951-8878 fax 403 951-8872)

Deployments June 1997 to July 1998 inclusive (period since IABP-7 to present)

During the period since the IABP-7 meeting (June 1997), three CALIBs were deployed via air-drop and three buoys were deployed for the U.S. National Ice Centre via Twin Otter landing on ice. A member of the US National Ice Centre, Chris O'Connors, accompanied the first of the two on-ice flights out of Eureka (06 April 1998 - Two buoys deployed). Prior deployments (1995, 1996, and 1997) were done from Environment Canada's Mould Bay facility, but that facility was mothballed in June 1997. The 1998 on-ice deployments marked the 3rd consecutive year that Polar Continental Shelf Project provided support in the form of Twin Otter flying hours, and, it was the fourth year of on-ice deployments for Environment Canada technician Mark Pyper.

July 1997 **air deployment by Canadian Forces**	**April 1998** **on-ice deployment of buoys for U.S. National Ice Centre via Twin Otter operated from Eureka landing on ice**	**June 1998** **air deployment by Canadian Forces**
CALIB no #'s activated 21 July 1997 **approx. 72N 139W** **X failed on deployment**	**CES ZENO-3200** Argos 4954 / WMO 48580 06 April **82° 08'N 128° 03' W**	**CALIB** Argos 5300 / WMO 48526 13 June 1998 **73.9 N 138.8 W** **X transmission stopped mid July**
	CES ZENO-3200 Argos 2416 / WMO 47523 06 April **82° 06'N 117° 30' W**	**CALIB** Argos 5318 / no WMO # 13 June 1998 **74.9 N 134.6 W** **X pressure failed on deployment**
	MetOcean Toga Argos 1301 / WMO 48581 10 April **85° 02'N 125° 23' W**	

STATUS 09 JULY 1998

The 09 July 1998 buoy map / status sheet from the IABP homepage shows that CALIB 5300, CES ZENO's 2416 and 4954, and MetOcean Toga buoy 1301 were operational.

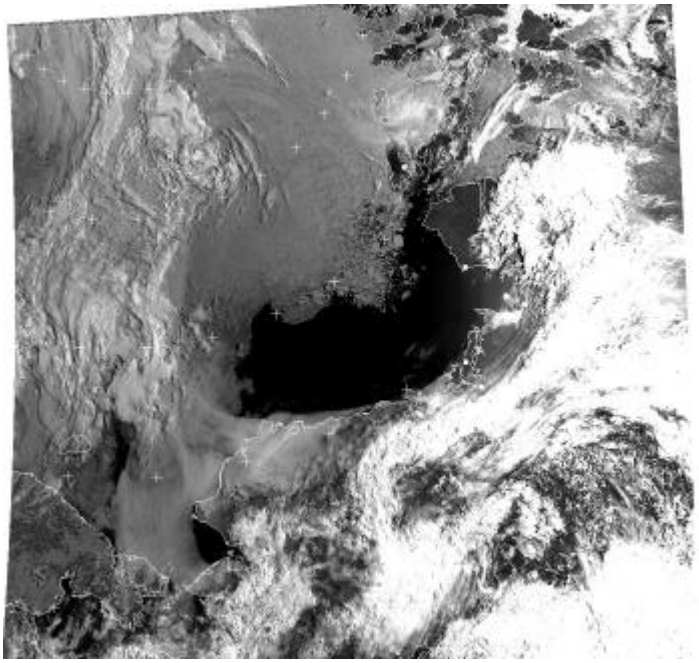
IABP BROCHURES AND POSTER

Brochures - The IABP brochure was updated June 1997 and copies provided to Victor Savtchenko for distribution at WMO meetings. The brochure was updated again October 1997 and copies were distributed at the ACSYS Polar Processes and Global Climate Conference, Orcas Island, November 1997. WMO (Victor Savtchenko) provided funding support for the October 1997 printing.

Poster 1998 - A poster to commemorate the evolution of Arctic Basin data collection and to advertise the mini-conference *The Arctic Buoy Program - Scientific Achievements from the First 20 Years* and the mini-workshop *Sea Ice Charts of the Arctic - Scientific Achievements from the first 400 Years* was prepared and distributed. The map plots used on the poster were provided by Ignatius Rigor, Polar Science Center.

NO MORE CALIB AIR DROPS THIS SUMMER OR FALL

Per the satellite photo 23 July, the southeastern Beaufort is not receptive at present to additional CALIB air-drop deployments. There is a considerable amount of open water and northwesterly blows continue to feed ice into this melt zone. We need floaters!



OTHER DEPLOYMENTS IN CANADIAN WATERS - NOW

As part of the North Open Water (NOW) Project, buoys have been deployed by the researchers of the project in Kane Basin / Northern Baffin Bay. The author notes, for example, that the IABP 09 July 1998 status sheet shows a Seimac buoy Argos ID 3981 in the southern Kane Basin.

ACQUISITION, PROCESSING, AND TRANSMISSION OF ARCTIC BASIN BUOY DATA

Environment Canada, Prairie and Northern Region, Edmonton, continues to acquire, process, and transmit onto GTS the buoys in the Arctic Basin of Canadian origin, the meteorological data from the IOEB buoys and a few buoys belonging to the US National Ice Centre.

STILL SEEKING A POLAR ORBITING SATELLITE RECEPTION STATION AT RESOLUTE

Endeavors to have a polar orbiting satellite reception station in Resolute to, among other things, acquire data from the buoys on the Arctic Basin, continues. Institute Maurice-Lamontange, Fisheries and Oceans Canada, Mont-Joli, Québec did activate a reception station at Resolute this spring to acquire SeaWifs data for the sea color. Use of this system by Environment Canada to get real time AVHRR data to Edmonton is being investigated.

DEPLOYMENT PLANS AUGUST 1998 TO JUNE 1999

CALIBS air-drops - Due to ice conditions, the array of buoys that are proposed from *White Trident,* and the array of buoys in place 'upstream' the Canadian Beaufort, no CALIB air-drop deployments are expected this fall. A spring drop will be considered.

Landing on-ice - Twin Otter deployment flight(s) are anticipated out of Sachs Harbour or Eureka late March or early April 1998 to deploy buoys. The buoy array in place and ice conditions at that time will dictate where the deployment is done from and the number of buoys deployed.

WCRP International Programme for Antarctic Buoys

The IPAB presently has 19 Participants from 12 countries, contributing drifters, deployment opportunities or data collection and processing.

The first three and a half years of the Programme have resulted in the deployment of 54 drifters around the Antarctic continent, collecting over 33 buoys years of data. The minimum specifications for a drifter to be included in the IPAB are that, as well as getting position data, the platform must be equipped with sensors to measure atmospheric pressure and, for buoys in water, sea surface temperature.

Figure 1 shows tracts of all drifters deployed as part of the Programme. The majority of data being collected are in the Weddell Sea or off the coast of Antarctica. This is principally to use the fact that most drifters are deployed for individual institution programmes, with the data being forwarded to the IPAB. Location is therefore often directed towards the aims of the deploying institution.

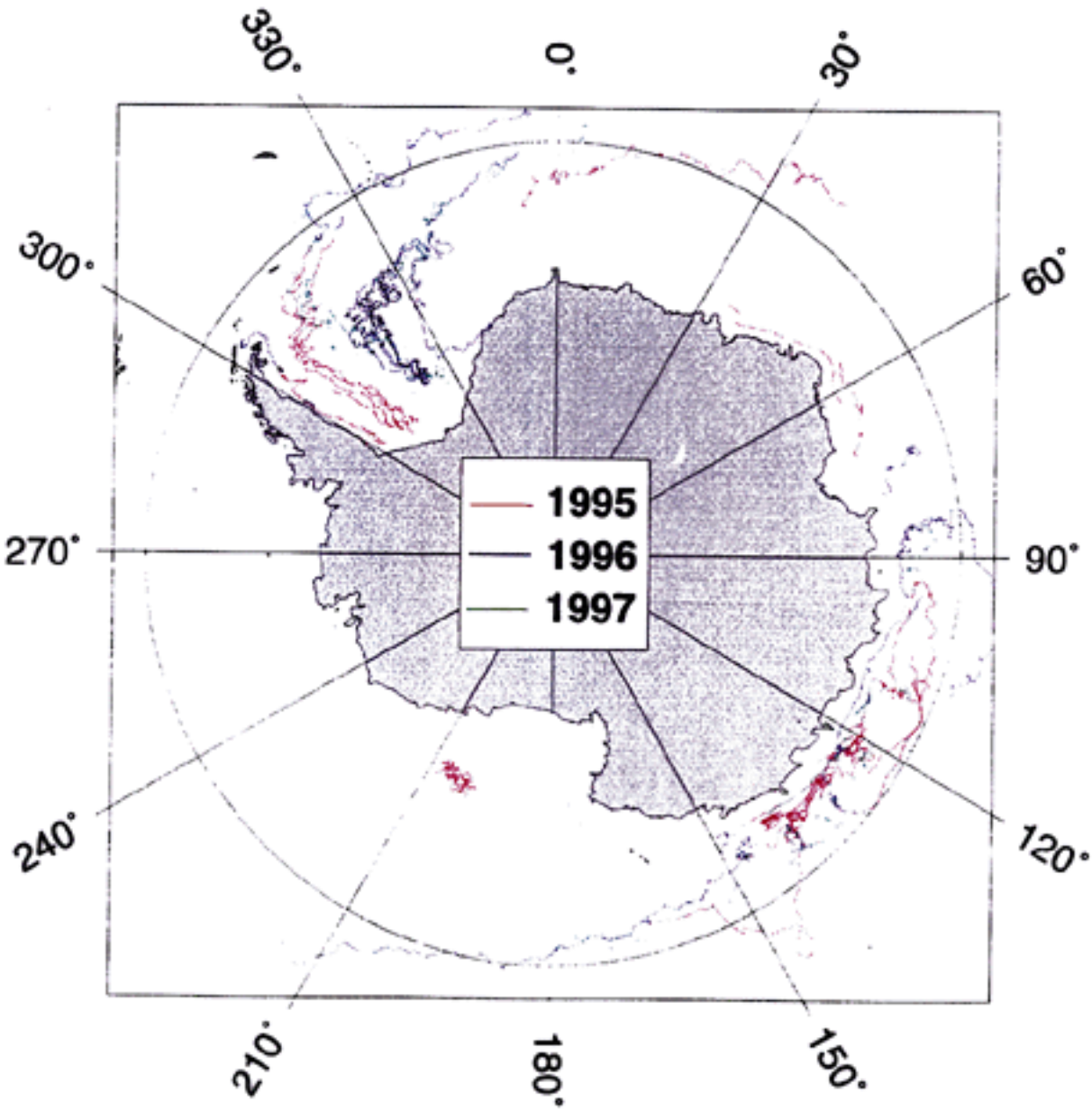
Figure 2 shows a plot of the number of active drifters per month since the start of the IPAB. After the commencement of the Programme, the numbers increased. The last three years have seen a slow decline in the number of active drifters, in spite of an annual surge due to new deployments. Even at the peak, the 22 active drifters fell far short of the required number of drifters per year. The principal reason for this is the divergent pack ice drift northwards. Deployment coordination under the IPAB, however, meant that, unlike in previous years, there have not been any periods with no drifters. The number of drifters planned for 1998 points to a significant increase in the number of active buoys.

All basic meteorological data from drifters included in the Programme are routed by Service Argos directly onto the Global Telecommunication System (GTS) operated by WMO. From there they are taken for archiving and distribution by the Marine Environmental Data Service (MEDS) as the IOC Responsible National Oceanographic Data Centre for Drifting Buoys. A research data archive is maintained by the IPAB Coordinator.

List of Figures

Figure 1. Tracks of drifters deployed under IPAB since commencement of Programme

Figure 2. Number of active IPAB drifters per month.


330°
0°
30°
300°
60°
270°
90°
240°
120°
210°
180°
150°
1995
1996
1997

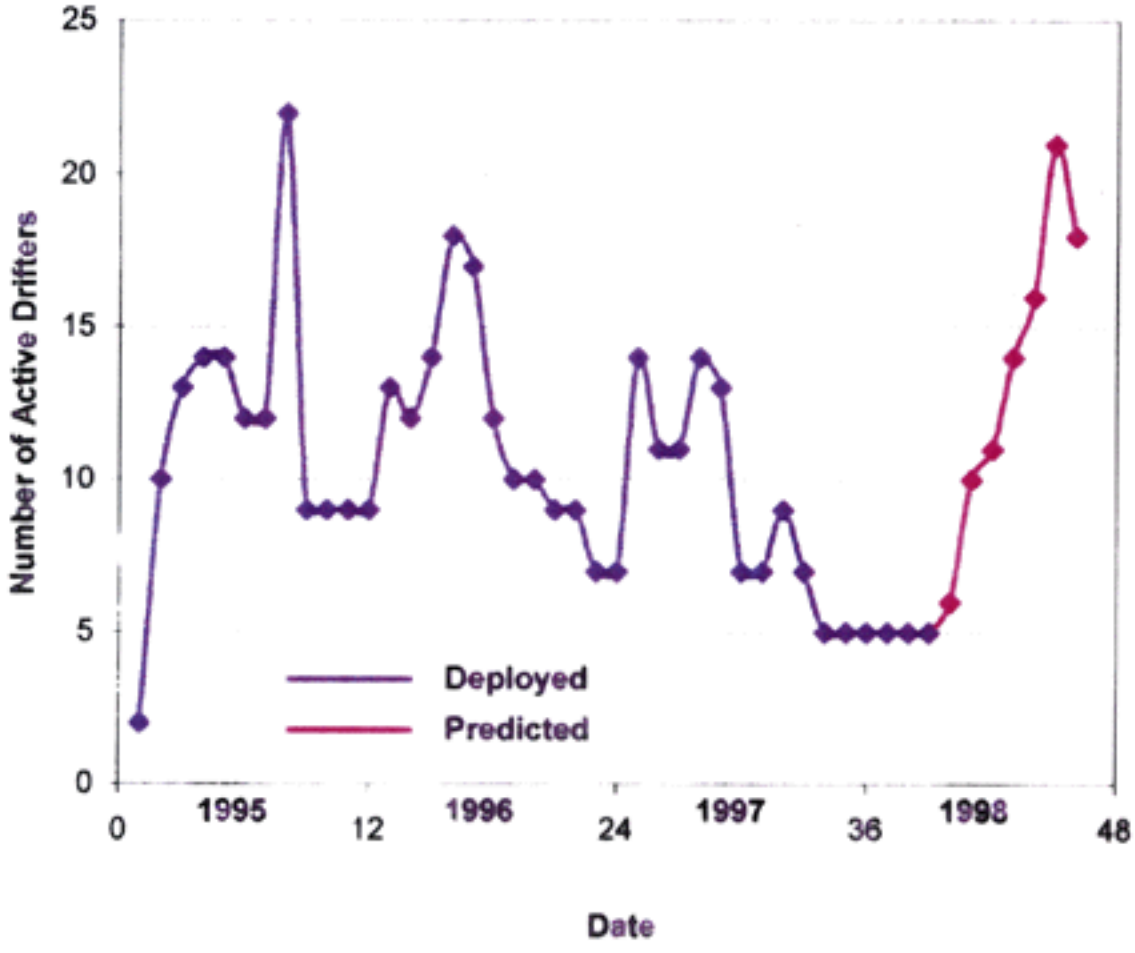


Figure 2. Number of active IPAB drifters per month

International Arctic Buoy Programme (IABP) chairman's and coordinator's report for the 13th session of the Data Buoy Cooperation Panel

La Reunion Island (France), 13 to 17 October 1997

This report highlights activities - and upcoming activities - of the International Arctic Buoy Programme that have occurred since the report filed August 1996 for the 12th session of the Data Buoy Cooperation Panel. The IABP continues to maintain a homepage that provides IABP participant listing, monthly maps of the IABP buoys in place and their status, buoy diagrams, IABP images and plots to browse and borrow, IABP data animations, pointers to ice charts and more - ***http://iabp.apl.washington.edu***

INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP) SEVENTH ANNUAL MEETING AND BUOY DESIGN WORKSHOP, ST PETERSBURG, RUSSIAN FEDERATION, JUNE 1997

Members of the International Arctic Buoy Programme met 2 June for a one day buoy designers workshop and 3-6 June, 1997, in St Petersburg, Russian Federation for the seventh annual business meeting of the program. The meetings were hosted by the Arctic and Antarctic Research Institute.

BUOY DESIGN WORKSHOP HIGHLIGHTS

New model AARI buoy - The Arctic and Antarctic Research Institute (AARI) has developed a buoy for air-deployment. The new model AARI air-deployable Argos-system ice buoy is designed to provide air pressure and air temperature data. The buoy is battery powered to operate for a year. At present, Canada uses CALIB buoys (air pressure only, 1 year life) for air-deployment, while other participants use ICEX buoys (air pressure and air temperature, 3 year life) for air-deployment.

IABP 7 MEETING HIGHLIGHTS

'Drifting' becomes 'data' - In recognition that IABP data sets have grown from beyond only drifting buoys on ice to include fixed buoys on islands and coastal stations, the IABP operating principles were amended to *'data buoys'* in place of *'drifting buoys'*.

Data flow control facilities / tools available on the web - The DBCP is implementing data flow control facilities accessible via the web so that users with no GTS access can check whether their platforms are reporting on GTS. The DBCP is also implementing tools on the web that should be useful for deployment strategies.

GCOS (Global Climate Observing System) - The IABP looks to contact between the coordinator of the IABP and the GOOS (Global Ocean Observing System) Project Office, and the European GOOS Office.

UPCOMING EVENTS

The Arctic Buoy Program: Scientific Achievements from the first 20 years: A mini-conference sponsored by the IABP and the Data Buoy Co-operation Panel will be held 3-4 August 1998, Seattle, Washington.

Operational Sea Ice Charts of the Arctic: A workshop sponsored by the Arctic Climate System Study of the World Climate Research Programme will be held 5-7 August 1998, Seattle, Washington.

See ***http:iabp.apl.washington.edu/*** or ***http:npolar.no:80/acsys*** for details.

COMMITMENT

The IABP is committed to working closely with the Global Groups who are working on the impacts of oceans on climate change to ensure that the Arctic Ocean data is part of the broader global ocean analysis. Atmospheric pressure and 2 meter air temperature remain the principal geophysical variables monitored by IABP buoys. This basic data is made available in real time on the global transmission system. Technology exists for the long term measurement of several additional variables, for example, ice temperature and internal stress. Participants Woods Hole Oceanography Institution, for example, in partnership with the Japan Marine Science and Technology Center has a buoy in place (IOEB Ice-Ocean Environmental Buoy) which provides data both above ice and below ice. Above ice, it provides air temperature, atmospheric pressure and wind speed and direction. Below ice, it has a compliment of oceanographic instruments ranging from sonar to CTD measuring devices. The web site ***http:ioeb.whoi.edu*** outlines the history of the IOEB buoy and the 1996 and 1997 refurbishment of the buoy. Per Figure 1, the IOEB buoy - Argos Ids 10667 and 10668 - resided northwest of Banks Island 21

August 1997. Another set of buoys with oceanographic strings are the Metocean buoys deployed August 1996 by scientists of the Alfred Wegener Institute for Polar and Marine Research. Per Figure 1, these buoys lay on the European site of the pole 21 August 1997.

PARTICPANTS

Twenty-four organizations spanning 10 countries and 1 international organization are participants in the International Arctic Buoy Programme. The participants 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. IABP participants continue to seek partners within their respective countries and internationally who are willing to supply additional buoys or sensors for existing buoys so that the IABP can grow.

CURRENT BUOY ARRAY / DEPLOYMENTS / COOPERATION

Per Figure 1, the buoy array across the Arctic Basin as of 21 August 1997 was comprised of 28 buoys including a total of 6 buoys deployed in 1997 - airdrop of a CALIB buoy by the Canadian Forces May 1997, surface deployment of a U.S. Coastal Climate Zeno buoy by Environment Canada via Twin Otter landing on ice and air deployment of four ICEX-AIR buoys by the U.S. Naval Meteorology and Oceanography Command. The buoys were funded by U.S. National Ice Service and the Japan Marine Science and Technology Center.

MORE (1997) DEPLOYMENTS TO COME

Ongoing Process - Deployments to replenish the buoy array across the Arctic Basin are ongoing. Buoys fail due to battery power coming to an end - buoys are powered to last from a year or so (CALIB air-deployed buoys) to up to 3 years (ICEX air-deployed buoys and the Coastal Climate ZENO surface-deployed buoys), other buoys exit the Arctic Basin for the North Atlantic, and some buoys fall through the ice while others get crushed as ice rafts and ridges. The number of operational buoys is usually at a peak late summer and at a minimum during the spring.

ICEX Buoys to the Laptev - ICEX buoys will be air-deployed on the ice of Laptev Sea late August or September by the Norwegien Air Force.

Buoys to the Beaufort - As part of the SHEBA (Surface Heat Budget of the Arctic Ocean) - ***http://sheba.apl.washington.edu*** - experiment field data gathering stage, several buoys, both sensored and position only buoys, will be deployed September 1997 in the northern Beaufort Sea.

IMPROVEMENTS IN POSITION ACCURACY AND DATA AVAILABILITY

Position accuracy available from Service Argos has improved in the past few years. Since mid June 1994, position accuracy within 100 metres has been available making accurate ice motion calculations possible. In addition, the availability of GPS integrated into Argos transmitters has allowed the very accurate position readings required for studying convergence and divergence within ice fields and the rotation of large floes. Most of the buoys presently in place rely on Service Argos calculated positions for ice motion and the cruder local user terminal calculated positions for real-time meteorological use. Since mid-June 1994, Service Argos has offered 3-satellite service thereby providing an increase of data capacity and the number of daily locations.

RECENT IABP PUBLICATIONS

International Arctic Buoy Program Data Report 1 January 1996 - 31 December 1996; Ignatius G. Rigor and Andreas Heiberg; Applied Physics Laboratory, University of Washington

International Arctic Buoy Program Data Report 1 January 1995 - 31 December 1995; Ignatius G. Rigor and Andreas Heiberg; Applied Physics Laboratory, University of Washington

Monthly Ice Motion and Atmospheric Pressure in the Arctic Basin, 1979 - 1993; Ignatius G. Rigor and Roger L. Colony; Applied Physics Laboratory, University of Washington.

PAPERS MAKING USE OF IABP DATA

Recent and soon to be released papers that make use of IABP buoy data include:

Recent Decrease in Sea Level Pressure in the Central Arctic; John E. Walsh, William L. Chapman, and Timothy L. Shy; American Meteorological Society, Journal of Climate, Vol. 9, February 1996, 480-486.

Sea Ice Production in the Laptev Sea; Rigor, I. and R. Colony; in press: Science of the Total Environment.

Potential Shortcuts for Transport of Contaminants from the Kara Sea; Pfirman, S.L, J.W. Kogeler, and I. Rigor; in press: Science of the Total Environment.

Reconstructing the Origin and Trajectory of Drifting Arctic Sea Ice; Pfirman, S.L., R. Colony, D. Nurnberg, H. Eicken, and I. Rigor; in press: Journal of Geophysical Research.

Properties of the Arctic 2-Meter Air Temperature for 1979; Martin, S. and Munoz, E.; in press: Journal of Climate.

Statistics of Surface Air Temperature Observations in the Arctic Basin; Rigor, I. and E. A. Muroz; in preparation.

Transport of 137 Cs and 239,240 Pu by Ice Rafted Debris in the Arctic Ocean; Landa, E., E. Reimnitz, D. Beals, J. Pochkowski, and I. Rigor; in preparation.

Recent observations of a spring-summer surface warming over the Arctic Ocean; Martin, S., Munoz, E., and R. Drucker; GRL (submitted).

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Modified Method of Objective Analysis of Surface Pressure Field Above the Arctic Ocean (SPFA)

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For the purposes of weather monitoring and forecasting, it is clear that the best buoy deployment plan in the ocean is when the distance between the buoys is less than 300 km. However, for both natural and economic reasons, this seems unrealistic. There are two main problems:

1. Optimization of the buoy deployment.
2. Optimization of a interpolation procedure of meanings T and P between buoys and coastal meteorological stations.

By processing a database of SPFAs collected daily over 25 years (received largely thanks to the International Arctic Buoy Program), it was possible to receive its objective quantitative classification. For each year, season (winter, summer), month and type were received matrixes of average meanings of dispersion and intercorrelations. Using this given probably to offer the optimum plans of buoy deployment for annual, seasonal, monthly and short-term monitoring for sea ice drift, T and P fields.

The existing Method of Objective Analysis (MOA) works well when the distance between buoys and coastal meteorological stations is less than 500 km. However, analysis of buoy deployments over 25 years show that such requirement is not frequently carried out. It is represented expedient to add existing MOA by the block raises accuracy of interpolation for the account of:

1. Not average monthly but typical SPFA.
2. Not average monthly auto-correlation functions but typical correlation matrixes.
3. Restored meanings P on typical synoptical-statistical models taking into account the interrelation between SPF above land and ocean.

The account of the given block at restoration SPFA on February 10 and 24, 1996 has raised accuracy of interpolation above Arctic seas on 15-25%.