



# IABP Drifting Buoy Pressure, Temperature, Position, and Interpolated Ice Velocity, Version 1

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## USER GUIDE

### **How to Cite These Data**

Please contact the data provider for the correct Data Citation for this data set.

FOR QUESTIONS ABOUT THESE DATA, CONTACT [NSIDC@NSIDC.ORG](mailto:NSIDC@NSIDC.ORG)

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/G00791>



National Snow and Ice Data Center

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# 1 DATA DESCRIPTION

The International Arctic Buoy Programme (IABP) maintains a network of drifting buoys 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. An average of 25 buoys are in service at any time. The IABP drifting buoy data products described here are 12-hour interpolated pressure, temperature, position, and ice velocity grids available by year from 1979 through the present.

These data are permanently archived with the [NSF Arctic Data Center](#) and are also available through the [IABP website](#). NOAA@NSIDC maintains these pages in cooperation with IABP in order to promote the use of these data and provide descriptive information that may be difficult to find elsewhere.

**NSIDC does not archive these data.**

## 1.1 Summary

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A network of automatic data buoys for monitoring synoptic-scale fields of pressure, temperature, and ice motion throughout the Arctic Basin was recommended by the U.S. National Academy of Sciences in 1974. Based on the Academy's recommendation, the Arctic Ocean Buoy Programme was established by the Polar Science Center, University of Washington, in 1978 to support the Global Weather Experiment. Operations began in early 1979 and the program continued through 1990 with funding from various agencies. In 1991, the Arctic Ocean Buoy Programme was superseded by the International Arctic Buoy Programme (IABP), although the basic objective remains the same: to establish and maintain a network of drifting buoys in the Arctic Ocean to collect data needed for real-time operations and meteorological and oceanographic research.

Drifting buoys measure atmospheric pressure, air temperature, and other geophysical quantities. These data are processed at the University of Washington's Polar Science Center, and are interpolated to produce gridded fields. Data are usually updated by May of each year. NSIDC does not archive these data; they are available online from the Polar Science Center. NSIDC catalogs the data set and provides this documentation with links to the [Polar Science Center's IABP site](#) in order to publicize and facilitate access to the data.

Several related data sets are available from the Polar Science Center's IABP site, including a CD-ROM containing IABP data and derived products from 1979 through 1999, an ocean buoy data set with temperature and salinity from drifting buoys from 1985 through 1994, GIF files graphically depicting gridded products, and a surface air temperature (SAT) data set (the IABP/POLES SAT

data set) that combines data from buoys, manned drifting stations, and meteorological land stations.

## 1.2 Parameters

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The data record begins in 1979 and is ongoing. The processed data sets consist of atmospheric pressure, temperature, position, and ice velocity interpolated to a fixed grid of points in space and at 12-hour intervals (0000 UTM and 1200 UTM) daily. Data set AB contains pressure and temperature fields, data set C contains buoy positions, and data set D contains interpolated ice velocity fields computed from the buoy positions. The number of buoys deployed and the area they cover varies from year to year.

Data are interpolated to both a 2° longitude by 10° latitude grid, where latitude is 70°N to 90°N and longitude is 0° to 360°, and a rectangular EASE-Grid with 100 km resolution.

The format of the ASCII data files is described in annual data reports from 1980 to 2003 from the [IABP Data Reports](#) web site. Included are also the data from each year complete with column headers and specified units.

## 1.3 File Information

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### 1.3.1 Format

Data are in space delimited ASCII text format and are available on a 2° x 10° grid and in [EASE-Grid format](#). Data are downloadable in gunzip, ".gz", format.

Data file sizes range from 45 KB to 3.4 MB compressed.

**WARNING:** The AB data sets are 20 MB - 30 MB when uncompressed. Compressed, they are only about 4 MB, but if these data sets are retrieved through mosaic rather than through ftp, the user must make sure that there is enough disk space free in temporary and home directories. This will prevent a system crash from lack of available disk space.

### 1.3.2 Sample Data Record

The following sample data record is from the "84" data file found in the AB directory, which contains twelve-hourly pressure and temperature fields. These data are from 1984 and the columns correspond to the following:

1. year
2. month; 1 for January, 2 for February, etc.
3. day
4. hour in GMT (0 or 12)
5. latitude in degrees north
6. longitude in degrees east
7. interpolated pressure in millibars
8. interpolated temperature in degrees Celsius squared
9. interpolation error variance in millibars squared
10. interpolation error variance in degrees Celsius squared
11. pressure derivative multiplied by  $10^3$  in the x direction in units of millibars per kilometer
12. pressure derivative multiplied by  $10^3$  in the y direction in units of millibars per kilometer
13. interpolated second derivatives (xx) of pressure multiplied by  $10^6$  in units of millibars per kilometer
14. interpolated second derivatives (yy) of pressure multiplied by  $10^6$  in units of millibars per kilometer
15. interpolated second derivatives (xy) of pressure multiplied by  $10^6$  in units of millibars per kilometer

Table 1. Sample Data 1

84	1	1	0	70	0	956.5	-999.9	2.1	-9.9	-11	-15	52	4	38
84	1	1	0	70	10	954.9	-999.9	2.1	-9.9	-10	3	43	2	61
84	1	1	0	70	20	962.8	-999.9	2.1	-9.9	-9	27	37	6	41
84	1	1	0	70	30	975.5	-999.9	2.1	-9.9	-9	31	31	5	13
84	1	1	0	70	40	986.5	-999.9	2.1	-9.9	-10	20	20	-2	6
84	1	1	0	70	50	993.7	-999.9	2.1	-9.9	-6	11	15	5	5
84	1	1	0	70	60	998.2	-999.9	2.1	-9.9	-7	4	11	4	6
84	1	1	0	70	70	1002.6	-999.9	2.1	-9.9	-11	0	16	-1	4
84	1	1	0	70	80	1009.8	-999.9	2.1	-9.9	-20	4	5	-2	2
84	1	1	0	70	90	1018	-999.9	2.1	-9.9	-18	5	-9	-1	-2

The following sample data record is from the "C2003" data file found in the C directory, which contains buoy positions data. These data are from 2003 and the columns correspond to the following:

1. year
2. month; 1 for January, 2 for February, etc.
3. day
4. hour in GMT (0 or 12)
5. buoy identification number
6. latitude in degrees north
7. longitude in degrees east

Table 2. Sample Data 2

2003	1	1	0	1222	80.561	-136.472
2003	1	1	0	1907	76.644	170.393
2003	1	1	0	1908	74.4	-155.248
2003	1	1	0	5311	83.974	-118.374
2003	1	1	0	9120	84.012	26.058
2003	1	1	0	9834	79.918	177.131
2003	1	1	0	15524	72.943	-175.386
2003	1	1	0	19577	82.861	-162.599
2003	1	1	0	19578	80.304	-156.248
2003	1	1	0	20726	84.011	26.044

The following sample data record below is from the "D79" data file found in the D directory, which contains ice velocity estimates at a fixed grid of points. These data are from 1979 and the columns correspond to the following:

1. year
2. month; 1 for January, 2 for February, etc.
3. day
4. hour in GMT (0 or 12)
5. latitude in degrees north
6. longitude in degrees east
7. interpolated ice velocity in the x direction in cm/s
8. interpolated ice velocity in the y direction in cm/s
9. variance of the interpolation error in velocity in dimensionless units
10. interpolated velocity derivatives expressed in Cartesian coordinates (After multiplication by  $10^{-7}$ , the reported values have units of  $s^{-1}$ .)
11. interpolated velocity derivatives expressed in Cartesian coordinates (After multiplication by  $10^{-7}$ , the reported values have units of  $s^{-1}$ .)
12. interpolated velocity derivatives expressed in Cartesian coordinates (After multiplication by  $10^{-7}$ , the reported values have units of  $s^{-1}$ .)
13. interpolated velocity derivatives expressed in Cartesian coordinates (After multiplication by  $10^{-7}$ , the reported values have units of  $s^{-1}$ .)

Table 3. Sample Data 3

79	2	19	12	74	160	-1.1	-0.1	0.9	-0.1	0.31	-0.02	-0.02
79	2	19	12	74	180	-0.4	0.9	0.2	-0.42	-0.67	0.04	-0.29
79	2	19	12	74	200	2.3	3	0.1	-0.26	0.16	0.06	-0.23
79	2	19	12	74	220	0.7	2.1	0.1	0.07	0.11	-0.4	0.21
79	2	19	12	78	120	1.1	0	1	0.21	-0.44	0	0
79	2	19	12	78	140	1.1	0	1	0.32	-0.39	-0.01	-0.01
79	2	19	12	78	160	-0.1	0	0.8	0.88	0.02	0.03	-0.04
79	2	19	12	78	180	-0.6	0.8	0.2	0.7	-0.25	-0.03	-0.25
79	2	19	12	78	200	1.2	1.6	0.3	0.1	-0.18	-0.36	-0.14
79	2	19	12	78	220	1.3	0.6	0	-0.2	0.04	-0.38	0.04

Please refer to the [International Arctic Buoy Programme and Arctic Buoy Data](#) Web site for more information on the fields in each data record.

### 1.3.3 Directory Structure

Links to the data directories on the IABP web server are the following:

- [AB](#): Pressure and temperature fields as described in the buoy reports.
- [C](#): Buoy positions as described in the buoy reports.
- [D](#): Ice velocity fields as described in the buoy reports.

### 1.3.4 Naming Convention

File names include the directory that they are grouped under, AB, C, or D, and the year the data were recorded.

## 2 DATA ACQUISITION AND PROCESSING

### 2.1 Data Access

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Data are available from the International [Arctic Buoy Program](#) at the Polar Science Center, Applied Physics Laboratory, at the University of Washington and the [NSF Arctic Data Center](#). Raw data (data received from buoys prior to processing) through 2004 are archived at NSIDC and are available by special arrangement with the University of Washington Polar Science Center and NSIDC.

### 2.2 Acquisition

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Please refer to the documentation provided by the Polar Science Center, Applied Physics Laboratory, at the University of Washington. Specific information on data acquisition and processing can be found in the documentation on the [International Arctic Buoy Programme and Arctic Buoy Data](#) Web site. In brief, buoy data are relayed via NOAA polar orbiting satellites to Service Argos in Toulouse, France and Largo, Maryland. These "raw" data are collected by the Polar Science Center, where they are quality controlled and interpolated to equal space and time intervals using objective analysis procedures (Rigor et al. 2000, Thorndike, 1986, Thorndike and Colony, 1982, and Thorndike and Colony, 1979). The data are also posted on the Global Telecommunications System.

### 2.3 Quality, Errors, and Limitations

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Atmospheric pressure is typically measured using barometers with errors of < 1 mb.



Air temperature is measured using a variety of instruments. The thermistors typically have measurement errors of  $< 0.1^{\circ}\text{C}$ , but where these instruments are installed on the buoys necessitates some care in interpreting the data. Prior to 1991, most measurements were taken from thermistors placed inside the hull of air dropped buoys, and were used primarily to calibrate the barometers. These buoys were sometimes covered with snow during winter, and were often warmed from insulation during summer. In 1992, the IABP began deploying buoys which measured true air temperatures from shielded thermistors at 2 meters height. For a detailed discussion of the temperature measurements from buoys, see Rigor et al. 2000.

Most buoys are positioned by the Argos systems on NOAA polar orbiting satellites. The Argos system results in positions with a measurement error of  $< 300$  m. Global Position Systems have been installed on many of the newer buoys, and can be positioned with errors of  $< 100$  m.

### 3 SOFTWARE AND TOOLS

Data can be read with FORTRAN statements provided by the Polar Science Center, Applied Physics Laboratory, at the University of Washington. Visit the [International Arctic Buoy Programme and Arctic Buoy Data](#) web site.

### 4 VERSION HISTORY

Table 4. Version History Summary

Version	Release Date	Description of Changes
1.0	2002	Initial release
	March 2020	A. Windnagel updated the information on data access and storage upon learning that the NSF Arctic Data Center is permanently archiving these data. January 2006: L. Husted edited and reformatted this document.
	November 2020	Converted to PDF

#### 4.1 Contacts and Acknowledgments

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The International Arctic Buoy Programme is partially funded through the U.S. Interagency Arctic Buoy Programme (USIABP). Refer to the [International Arctic Buoy Programme \(IABP\)](#) Web site for more information on program sponsorship.

## 5 REFERENCES

For a complete list of references and related publications using IABP data, please visit the [International Arctic Buoy Programme \(IABP\)](#) Web site.

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## 6 DOCUMENT INFORMATION

### 6.1 Author

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### 6.2 Publication Date

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2002

### 6.3 Revision History

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