

[DAMOCLES2008_paws_buoy.pdf](#)

DAMOCLES 2008-2011 - Hamburg Arctic Ocean Buoy Drift Experiment: meteorological measurements of 9 autonomous drifting ice buoys

Summary

This dataset contains data collected by 9 drifting autonomous ice buoys (Metocean PAWS) in the 'Hamburg Arctic Buoy Drift Experiment DAMOCLES 2008-2009' (shortened DAMOCLES2008). Seven buoys were deployed in the Canadian sector of the Arctic Ocean in late April 2008. Two more buoys were deployed in the Beaufort Sea and in the Laptev Sea in September and October 2008. The platforms report position, atmospheric pressure, temperature and humidity, wind speed and ice temperature at 3-hourly time steps. The last two buoys additionally report wind direction.

Citation

Brümmer, B., G. Müller, M. Haller, A. Kriegsmann, M. Offermann, C. Wetzel (2011): DAMOCLES 2008-2011 - Hamburg Arctic Ocean Buoy Drift Experiment: meteorological measurements of 9 autonomous drifting ice buoys. World Data Center for Climate. DOI:10.1594/WDCC/UNI_HH_MI_DAMOCLES2008

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1. Data Set Overview

This data set comprises one datafile including data of 9 buoys. Parameters are time, position, sea level pressure, air temperature, sea ice temperature, relative humidity and wind. Wind direction is hardly usable as heading information is only available from two of the buoys and the local magnetic declination is unknown. Included are text (csv) and NetCDF versions of the data.

Data Set Identification

DAMOCLES2008_paws_buoy

Objective/ Purpose

The field experiment DAMOCLES 2008 (Hamburg Arctic Ocean Buoy Drift Experiment DAMOCLES 2008-2009) consisted of the deployment and tracking of 9 drifting autonomous buoys in the Arctic Ocean. Seven buoys were deployed in the Canadian sector of the Arctic Ocean in late April 2008. Two more buoys were deployed in the Beaufort Sea and in the Laptev Sea in September and October 2008.

Tracking the position of individual buoys yields the motion field of sea ice in the area covered by the buoys. From the measurement of sea level pressure the pressure field can be calculated. Thus the relationship between geostrophic wind forcing and ice drift can be analyzed. This investigation is supported by measurement of wind speed (and direction). The dataset is suited for comparison with numerical models (operational, reanalysis or case studies) and validation of satellite and model derived ice motion.

Summary of Parameters

Latitude
Longitude
Sea level pressure
Air Temperature
Sea Ice Temperature
Relative Humidity
Wind speed
Wind direction (is of limited use as the platform heading is only known for two of the buoys and the local magnetic declination had to be known)

Values are reported at 3-hourly timesteps.

Related Datasets

FRAMZY2009_calib_buoy
one buoy (329410) of DAMOCLES2008 operated in the same area at the same time as the FRAMZY 2009 buoys
DAMOCLES2007_calib_buoy
FRAMZY2008_calib_buoy

2. Investigator(s)

Investigator(s) Name and Title

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3. Project

Framework, Project, Campaign

DAMOCLES2008 is a contribution to European integrated project DAMOCLES (Developing Arctic Modeling and Observing Capabilities for Long-term Environmental Studies) which is funded by the European Union. DAMOCLES is a contribution to IPY 2007-2008 (International Polar Year).

Participating Institutions and Companies

Meteorological Institute, University of Hamburg, Germany

Acknowledgement

4. Data Description

Parameter or Variable

This table lists the parameters included in the data files. Standard name is given if an adequate CF-standard name exists. The last two rows indicate that time is represented in the text and NetCDF files in different ways.

Name	Standard Name	Description	csv	nc
Time	time	Date and time	x	
Time	time	Date and time in seconds since 2008-01-01		x
Time String		Time string in human readable format		x
JHOUR		Julian hour since start of the current year, starts at zero at beginning of each year	x	x
Pressure (BP)	air_pressure_at_sea_level		x	x
Pressure tendency (BPT)		Difference between current and last pressure reading	x	x
Ice Temperature (SST)	sea_ice_temperature	Metoccean calls it Sea Surface Temperature SST by mistake	x	x
Air Temperature (AT)	air_temperature		x	x
Relative Humidity (RH)	relative_humidity		x	x

Scalar Wind Speed (SWS)	wind_speed	Difference to WS is unclear	x	x
Vector Wind Speed (WS)		Difference to SWS is unclear	x	x
Wind Direction (UVWD)		Unit vector wind direction. Difference to WD is unclear	x	x
Wind Direction (WD)	wind_from_direction	Difference to UVWD is unclear	x	x
Heading (HDG)	platform_orientation	only for buoys 329380 and 329410	x	x
Pitch (PITCH)	platform_pitch_angle	only for buoys 329380 and 329410	x	x
Roll (ROLL)	platform_roll_angle	only for buoys 329380 and 329410	x	x
Latitude (LAT)	latitude		x	x
Longitude (LON)	longitude		x	x
Battery Voltage (VBAT)			x	x
SBD On Time (SBDTIME)		total time the Iridium modem was on for the last transmission	x	x
GPSFIXJHOUR (GPSFIXJHOUR)		Jhour of last succesful GPS fix	x	x
Time to first fix (TTFF)			x	x
Report Body		Complete data message as hexadezimal string. 52 with and 44 characters without hdg, pitch and roll	x	x

Parameter description and range

Name, standard name, and unit are shown in the table above. Detailed description of sensor characteristics, accuracy, and precision are given in [Section 5 'Data Acquisition and Processing'](#). The data file contains additional diagnostical parameters like battery voltage. Details are given below and in the 'Assembly and deployment manual' ([Section 8 'References and Related Publications'](#)).

Spatial Characteristics

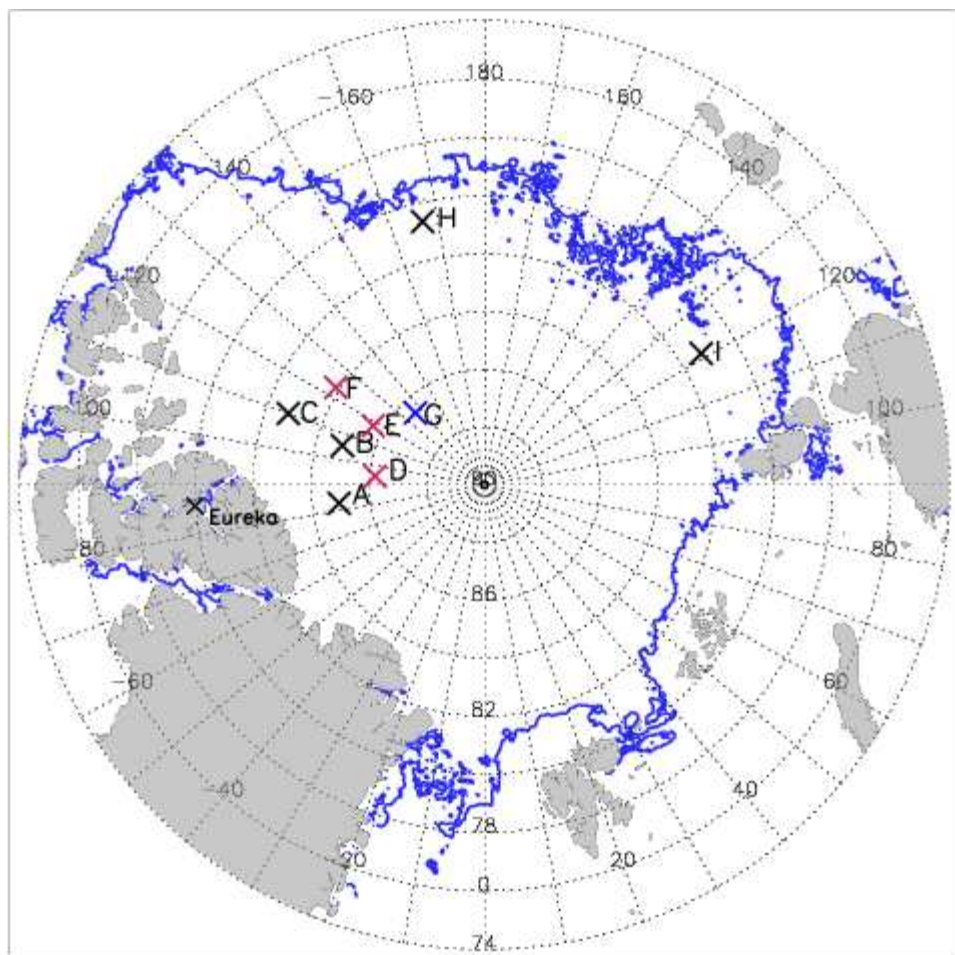
Seven buoys were deployed in the western sector of Arctic Ocean in spring. Two more buoys were deployed by RV Polarstern in the East Siberian Sea and in the Laptev Sea in autumn.

Spatial Coverage

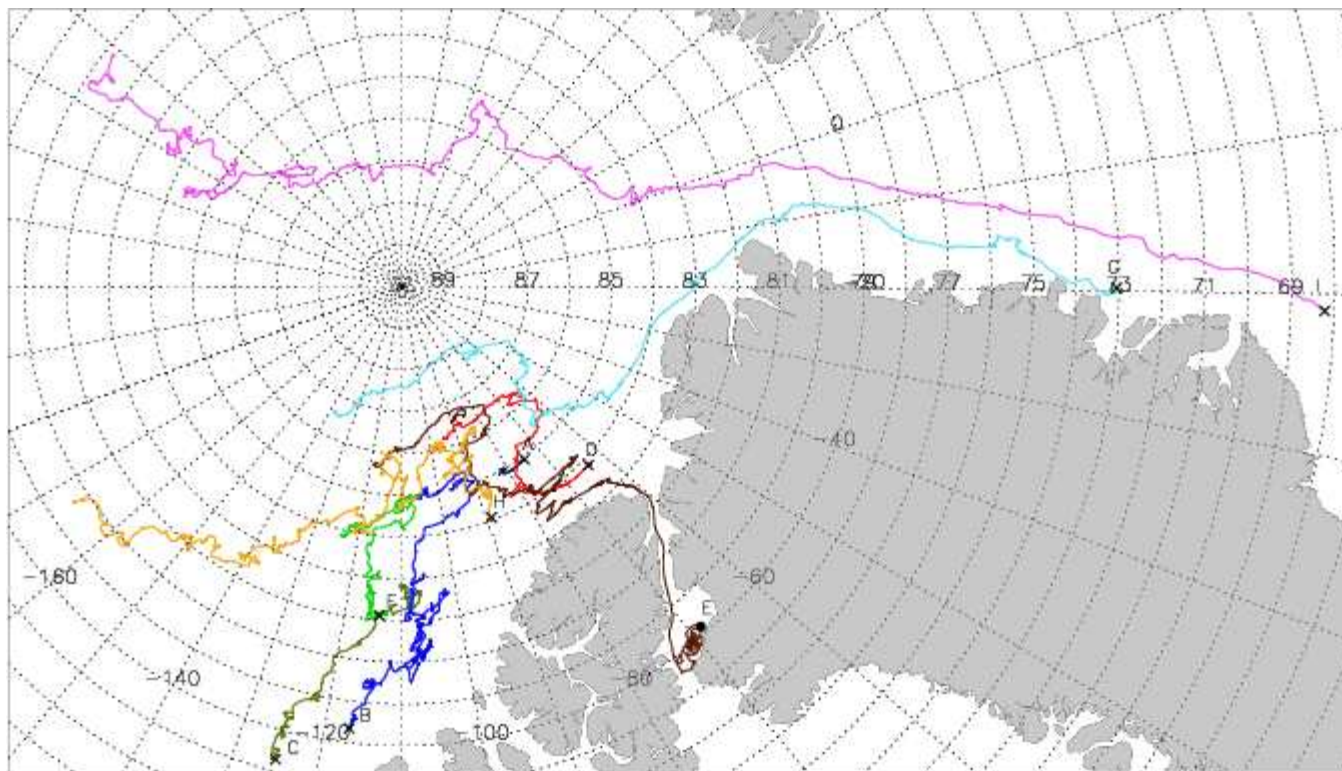
Minimum Longitude: -166 E
Maximum Longitude: 121 E
Minimum Latitude: 80.5 N
Maximum Latitude: 86.5 N

These values only apply to start positions.

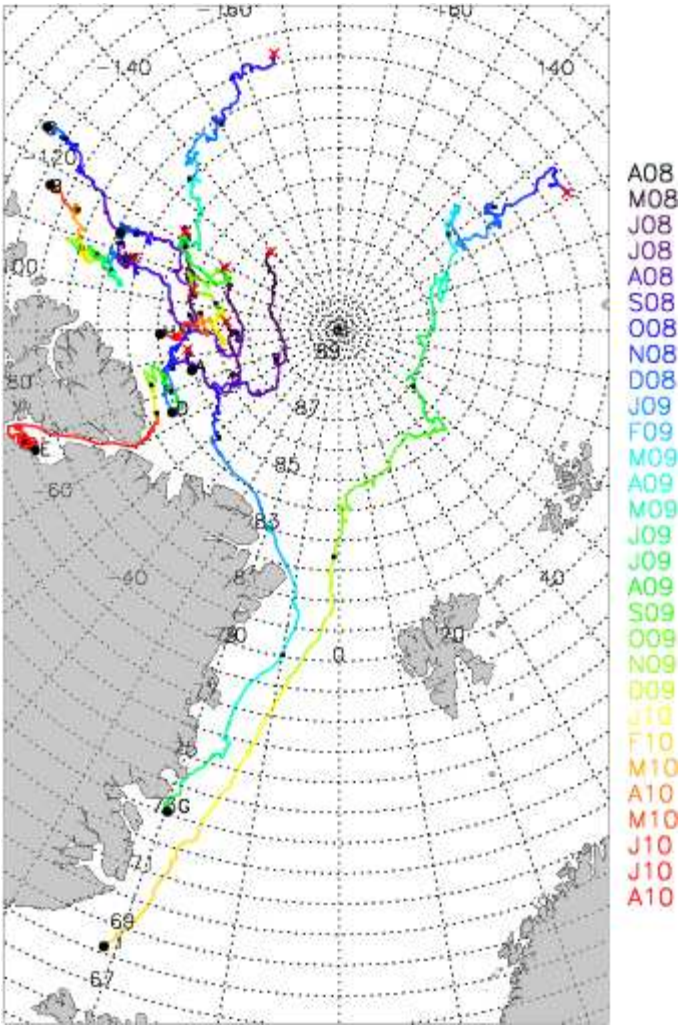
Spatial Coverage Maps



Deployment positions of 9 buoys. Buoys H (7) and I (8) were deployed in autumn of 2008.



Drift trajectories of buoys; individual buoys are coded by color.

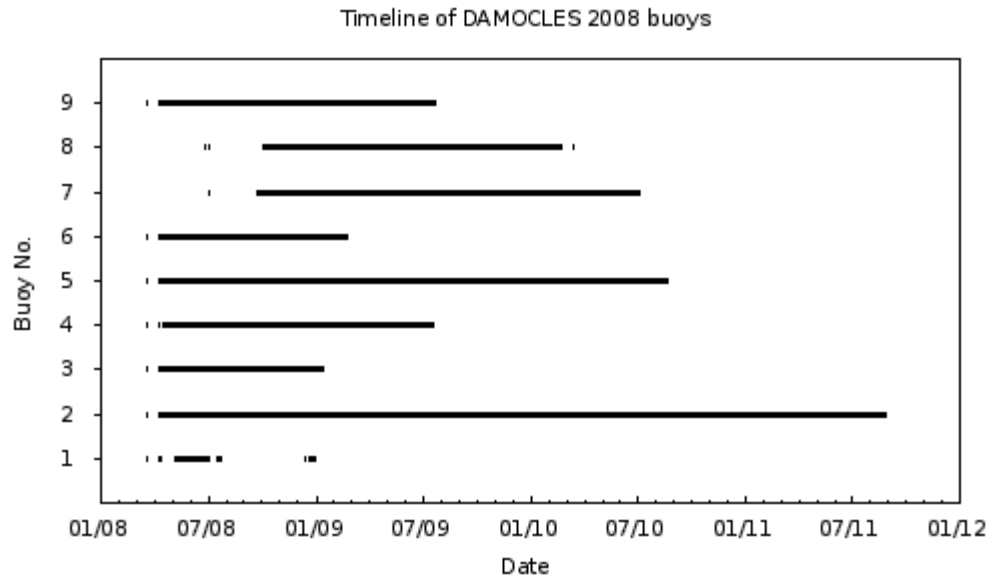


Drift trajectories of buoys, drift distances in one month are marked by colours.

Temporal Characteristics

Temporal Coverage

The data set covers a period from 12 April 2008 which is the date of installation of the first buoy to August 2011. Data coverage has interruptions and varies between buoys.



Temporal Resolution

Values are reportes on 3-hourly timesteps. See [Section 6 'Data Acquisition'](#) for details on sampling and averaging.

Buoy list

No.		Code	Start	Stop
1	A	325420	2008-04-13	2008-12-30
2	B	326420	2008-04-13	2011-08-29
3	C	321420	2008-04-13	2009-01-13
4	D	321430	2008-04-14	2009-07-20
5	E	141100	2008-04-13	2010-08-20
6	F	146100	2008-04-12	2009-02-21
7	H	329380	2008-09-21	2010-07-03
8	I	329410	2008-10-03	2010-03-16
9	G	338180	2008-04-12	2009-07-23

Projection

Positions are given in geographic Lat/Lon coordinates.

Grid Description

Measured values are given along a trajectory.

5. Data Acquisition and Processing

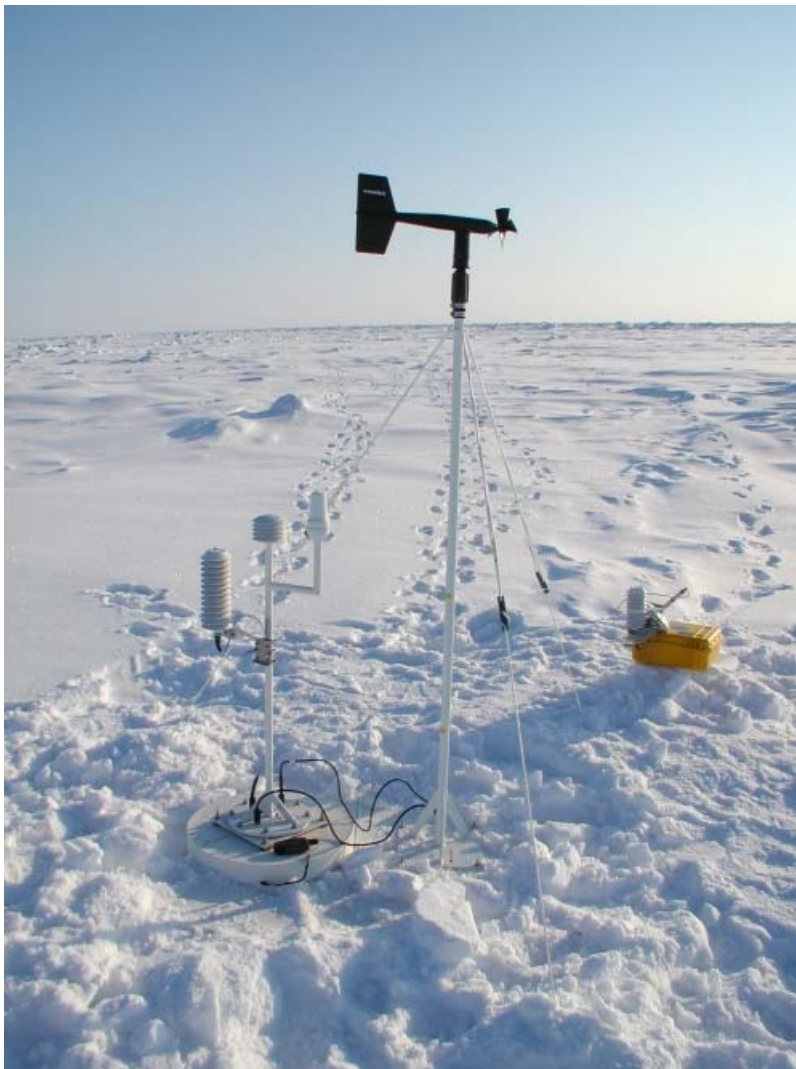
Theory of Measurement

The buoy consists of a surface unit which is deployed in a hole drilled into the ice. It accomodates the electronics, batteries and the ice temperature sensor, which is placed 40 cm below the surface. Mounted on the surface unit is a mast which holds the sheltered air temperature and humidity sensor, the GPS and the Iridium antennas. At a second mast the wind sensor and a compass are mounted at a height of about 2 m. Position is determined by Global Positioning System (GPS). Data are submitted in 3-hourly intervalls via Iridium satellite link. Details about the buoy can be obtained from MetOcean: www.metocean.com

Sensor/ Instrument Description

The deployed buoys are of type PAWS (Polar Area Weather Station) manufactured by MetOcean, Canada.

- Air Temperature: ISY Model 44032 Encased Thermistor
- Sea Ice Temperature: ISY Model 44032 Encased Thermistor
- Pressure: Vaisala PTB-110 Pressure Sensor
- Relative Humidity: HMP45D
- Wind: RM Young anemometer (#05103AP-10) and PNI TCM2 compass
- Position: GPS Jupiter 21



PAWS buoy after deployment. On the left are shielded sensors for temperature and humidity and the antenna for GPS and IRIDIUM. On the right is the pole with wind sensors.

Procedure

Buoys were installed with aid of a Twin-Otter airplane by a technician. The installation procedure is described in the 'PAWS Assembly and deployment manual'. Basis of this operation was the drifting polar schooner Tara.

Measurements are performed every three hours. After system activation and self-calibration each sensor is sampled 20 times. The sampling procedure takes no more than 90 seconds. Therefore all measurements represent point measurements without averaging in time.

GPS position is acquired every three hours as far as a position fix is successful. If a position fix was not possible the last known position is transmitted (see JHOUR and GPSFIXJHOUR).

The PAWS manual states that wind direction (wd) and unit vector wind direction (uvw) are computed by the system. The geomagnetic heading is known to the system but is included in the data record only for two of the buoys.

Sources of Error (Acquisition)

Air temperature and humidity sensors are affected by standard error sources like e.g. radiation. Additionally the arctic conditions can cause problems like icing and snow cover.

The pressure sensor might be affected by ice or snow overing the air intake.

The ice temperature is measured in a depth of 40 cm below the surface. The sensor is placed inside the buoy hull which might not always be in direct contact to the ice. It is possible, that there is air, snow or melt water between the hull and the ice.

The wind sensor is highly error-prone. Wind direction is unreliable under calm conditions as the wind vane might not line up with the wind direction. Under conditions with high turbulence the short measurement intervall might only represent a snapshot and not the overall conditions. A serious problem in the Arctic is icing of the propeller and/or wind vane or even the destruction of parts of the sensor.

Data Handling

Final raw data is provided by ARGOS on CD. During the field phase, near-realtime data was obtained online.

Quality Checks and Data Processing

The internal processing is described in the 'PAWS Assembly and Deployment Manual'. A secondary processing did not take place.

Sources of Error (Processing)

The conversion of text files (csv) to NetCDF has been checked thoroughly, but errors can not be excluded.

6. Data Quality, Errors, Usage Guidance

Assumptions and Data Uncertainty

As stated above, 3 hourly values represent point measurement in time and space. Therefore the data may be of limited representativeness.

Data Quality Assessment and Validation

In general, the data is in good agreement to model output and other observation. The behaviour of the buoys and sensors does not differ from earlier field experiments with comparable platforms.

Error Sources

See above.

Usage Guidance

It should be pointed out again, that the wind data is highly questionable and must be used with caution.

6. Data Access and Tools

File and Directory Structure

This dataset contains data in two formats. First is a comma separated textfile, originating from Metocean. Second is a NetCDF file containing exactly the same data, except for some data line duplicates. Each file represents data of one single buoy. The text files are different for buoys with or without report of heading, pitch and roll. The text files representing buoys 7 and 8 contain three additional columns for heading, pitch and roll and the report body has 52 instead of 44 characters. The decomposition of the report body string is described in the 'PAWS Assembly and Deployment Manual'. It also explains the precision and bounds of the transmitted values.

Missing values are not flagged in the raw data but zeros appear. It is not in all cases transparent if the sensor reading is zero or the value is missing.

File format

The CERA-DB holds one tar-archive file containing single NetCDF- and CSV-files for each buoy.

Sample Data Record (CSV)

First two lines of the file 'IRIDIUM_300034012141100_1280841147112.csv'. The first line names the parameters and is not repeated.

```
Date (GMT),Date (EDT),JHOUR,BP,BPT,SST,AT,RH,SWS,WS,UVWD,WD,LAT,LON,VBAT,SBDTIME,GPSFIXJHOUR,TFFF,Report Body
2010-08-03 12:07:01,2010-08-03 08:07:01 EDT,5148,1003,-0.9,0.6,1.9,94,3.75,3.75,112.64,112.64,78.8715,-
71.40618,13.9,75,5148,36,5070bf4f697a6bbcc0f0f5050e506bf49a51aa6541c090,
```

First two lines of the file 'IRIDIUM_300034012329380_1280842432037.csv'. The first line names the parameters and is not repeated. Note the additional parameters, heading, pitch and roll and the longer report body string.

```
Date (GMT),Date (EDT),JHOUR,BP,BPT,SST,AT,RH,SWS,WS,UVWD,WD,HDG,PITCH,ROLL,LAT,LON,VBAT,SBDTIME,GPSFIXJHOUR,TTFF,Report Body
```

Sample Data Record (NetCDF)

The subsequent section shows the definition section of the datafile 'DAMOCLES2008_paws_buoy_141100.nc' in CDL notation (CDL: network Common data form Description Language).

```

netcdf DAMOCLES2008_paws_buoy_141100 {
dimensions:
    timestr len = 20 ;
    reportsTr len = 44 ;
    time = 6876 ;
variables:
    int buoy_nr ;
        buoy_nr:units = "1" ;
        buoy_nr:long_name = "buoy_number" ;
    int buoy_id ;
        buoy_id:units = "1" ;
        buoy_id:long_name = "buoy_id" ;
    int time(time) ;
        time:units = "seconds since 2008-01-01 00:00:00" ;
        time:standard_name = "time" ;
        time:long_name = "time of measurement" ;
        time:axis = "T" ;
        time:calendar = "standard" ;
    char timestring(time, timestr len) ;
        timestring:units = "1" ;
        timestring:long_name = "time of measurement" ;
    float jhour(time) ;
        jhour:units = "hour" ;
        jhour:long_name = "julian hours since start of current year" ;
        jhour:coordinates = "time" ;
    float bp_pressure(time) ;
        bp_pressure:units = "hPa" ;
        bp_pressure:standard_name = "air pressure at sea level" ;
        bp_pressure:long_name = "sea level pressure" ;
        bp_pressure:coordinates = "time" ;
    float bpt_pressure tendency(time) ;
        bpt_pressure tendency:units = "hPa" ;
        bpt_pressure tendency:long_name = "sea level pressure difference to last measurement" ;
        bpt_pressure tendency:coordinates = "time" ;
    float sst_icetemperature(time) ;
        sst_icetemperature:units = "celsius" ;
        sst_icetemperature:standard_name = "sea ice temperature" ;
        sst_icetemperature:long_name = "sea ice temperature 40cm below surface" ;
        sst_icetemperature:coordinates = "time" ;
    float at_airtemperature(time) ;
        at_airtemperature:units = "celsius" ;
        at_airtemperature:standard_name = "air temperature" ;
        at_airtemperature:long_name = "air temperature" ;
        at_airtemperature:coordinates = "time" ;
    float rh_relativehumidity(time) ;
        rh_relativehumidity:units = "1" ;
        rh_relativehumidity:standard_name = "relative humidity" ;
        rh_relativehumidity:long_name = "relative humidity" ;
        rh_relativehumidity:coordinates = "time" ;
    float sws_windspeed(time) ;
        sws_windspeed:units = "m s-1" ;
        sws_windspeed:standard_name = "wind speed" ;
        sws_windspeed:long_name = "scalar wind speed" ;
        sws_windspeed:coordinates = "time" ;
    float ws_windspeed(time) ;
        ws_windspeed:units = "m s-1" ;
        ws_windspeed:long_name = "vector wind speed" ;
        ws_windspeed:coordinates = "time" ;
    float uvwd_winddirection(time) ;
        uvwd_winddirection:units = "degree" ;
        uvwd_winddirection:long_name = "unit vector wind direction" ;
        uvwd_winddirection:coordinates = "time" ;
    float wd_winddirection(time) ;
        wd_winddirection:units = "degree" ;
        wd_winddirection:standard_name = "wind from direction" ;
        wd_winddirection:long_name = "wind direction" ;
        wd_winddirection:coordinates = "time" ;
    float hdg_heading(time) ;
        hdg_heading:units = "degree" ;
        hdg_heading:standard_name = "platform orientation" ;
        hdg_heading:long_name = "heading" ;
        hdg_heading:FillValue = -999.999f ;
        hdg_heading:coordinates = "time" ;
    float pitch_pitch(time) ;
        pitch_pitch:units = "degree" ;
        pitch_pitch:standard_name = "platform pitch angle" ;
        pitch_pitch:long_name = "pitch" ;
        pitch_pitch:FillValue = -999.999f ;
        pitch_pitch:coordinates = "time" ;
    float roll_roll(time) ;
        roll_roll:units = "degree" ;
        roll_roll:standard_name = "platform roll angle" ;
        roll_roll:long_name = "roll" ;
        roll_roll:FillValue = -999.999f ;
        roll_roll:coordinates = "time" ;
    float lon_longitude(time) ;
        lon_longitude:units = "degree east" ;
        lon_longitude:standard_name = "longitude" ;
        lon_longitude:long_name = "longitude" ;
    float lat_latitude(time) ;
        lat_latitude:units = "degree north" ;
        lat_latitude:standard_name = "latitude" ;
        lat_latitude:long_name = "latitude" ;
    float vbat_batteryvoltage(time) ;
        vbat_batteryvoltage:units = "volt" ;
        vbat_batteryvoltage:long_name = "battery voltage" ;
        vbat_batteryvoltage:coordinates = "time" ;
    float sbdtime_sbdtime(time) ;
        sbdtime_sbdtime:units = "seconds" ;
        sbdtime_sbdtime:long_name = "SBD On Time" ;
        sbdtime_sbdtime:coordinates = "time" ;
    float gpsfixjhour_gpsfixjhour(time) ;
        gpsfixjhour_gpsfixjhour:units = "hour" ;
        gpsfixjhour_gpsfixjhour:long_name = "Julian hour of last successful GPS fix" ;
        gpsfixjhour_gpsfixjhour:coordinates = "time" ;
    float ttff_ttff(time) ;
        ttff_ttff:units = "seconds" ;

```

```

        ttff_ttff:long_name = "Time to first fix" ;
        ttff_ttff:coordinates = "time" ;
char reportbody(time, reportstr_len) ;
    reportbody:units = "1" ;
    reportbody:long_name = "Reportbody hexadecimal raw data string" ;
    reportbody:coordinates = "time" ;

// global attributes:
    :Conventions = "CF-1.4" ;
    :CF:featureType = "trajectory" ;
...

```

File naming convention

Example: 'DAMOCLES2008_paws_buoy_141100_raw.nc'

File names are composed of experiment acronym (DAMOCLES2008), platform name (paws), platform type (buoy), buoy identifier (141100) and file extension (.nc).

Example: 'IRIDIUM_300034012141100_1280841147112.csv'

The buoy id is part of the filename.

File list

```

DAMOCLES2008_paws_buoy_141100_raw.nc
DAMOCLES2008_paws_buoy_146100_raw.nc
DAMOCLES2008_paws_buoy_321420_raw.nc
DAMOCLES2008_paws_buoy_321430_raw.nc
DAMOCLES2008_paws_buoy_325420_raw.nc
DAMOCLES2008_paws_buoy_326420_raw.nc
DAMOCLES2008_paws_buoy_329380_raw.nc
DAMOCLES2008_paws_buoy_329410_raw.nc
DAMOCLES2008_paws_buoy_338180_raw.nc

IRIDIUM_300034012141100_1298455603380.csv
IRIDIUM_300034012146100_1280842040777.csv
IRIDIUM_300034012321420_1280842103782.csv
IRIDIUM_300034012321430_1280842155057.csv
IRIDIUM_300034012325420_1280842198513.csv
IRIDIUM_300034012326420_1298383282067.csv
IRIDIUM_300034012329380_1280842432037.csv
IRIDIUM_300034012329410_1280842489488.csv
IRIDIUM_300034012338180_1280842538335.csv

```

File size

13MB (DAMOCLES2008_paws_buoy.tar)

Fixity information

MD5 sum:

ab440cec7605f01e3314bebea4383308 (DAMOCLES2008_paws_buoy.tar)

Access

The dataset is available from CERA-DB at WDC-Climate: <http://cera-www.dkrz.de/WDCC/ui/Index.jsp>

You have to apply for an account in order to access the data. Details are given on the website.

Access and Usage Restrictions

CERA-DB requires a registration with confirmation by the data provider.

Volume

13MB

Software and Tools

Extracting the tar-archive is platform dependent. On Linux/Unix use 'tar' on command line, on Windows proprietary software (e.g. 7-ZIP, Winzip, etc) is needed.

Interfaces to the NetCDF format are available for a variety of programming languages (C, Fortran, Java, Perl, Python, R) and for environments like Matlab or IDL. See the NetCDF website for details: <http://www.unidata.ucar.edu/software/netcdf/>

7. References and Related Publications

Related Data Collections

The Meteorological Institute University Hamburg has operated several experiments utilising buoys of the same type in the

Arctic. Data is published on CERA-DB under the same project name (UNI_HH_MI_fielddata).

List of buoy datasets in the project UNI_HH_MI_fielddata:

FRAMZY2009_calib_buoy: position, temperature and pressure data of 6 autonomous drifting ice buoys
DAMOCLES2008_paws_buoy: position, temperature, pressure and wind data of 9 autonomous drifting ice buoys
FRAMZY2008_calib_buoy: position, temperature and pressure data of 6 autonomous drifting ice buoys
DAMOCLES2007_calib_buoy: position, temperature and pressure data of 16 autonomous drifting ice buoys
FRAMZY2007_calib_buoy: position, temperature and pressure data of 16 autonomous drifting ice buoys
FRAMZY2007_xan_buoy: position, air temperature, water temperature and pressure data of 13 autonomous drifting water buoys
LOFZY2005_xan_buoy: position, temperature and pressure data of 23 autonomous drifting water buoys
ACSYS2003_calib_buoy: position, temperature and pressure data of 10 autonomous drifting ice buoys
ACSYS2003_ibeacon_buoy: position, temperature and pressure data of one autonomous drifting ice buoy
FRAMZY2002_calib_buoy: position, temperature and pressure data of 14 autonomous drifting ice buoys
FRAMZY2002_ibeacon_buoy: position, temperature and pressure data of one autonomous drifting ice buoy
BASIS2001_ibeacon_buoy: position, temperature, pressure and wind data of 2 autonomous buoys
FRAMZY1999_calib_buoy: position, temperature and pressure data of 15 autonomous drifting ice buoys

International Arctic Buoy Programme (IABP) <http://iabp.apl.washington.edu/>

Numerous field experiments are carried out making use of autonomous drifting platform and manually operated platforms like drifting stations and ships. Check databases and repositories (e.g. [GCMD](#), [IPYDIS](#)) for suitable datasets.

Related Publications

Brümmer, B. (Ed.), **2000**: Field experiment FRAMZY 1999: Cyclones over the Fram Strait and their impact on sea ice – Field report with examples of measurements. Ber. a.d. ZMK, Reihe A, Meteorologie, 33, 176 pp.

Brümmer, B., G. Müller, B. Affeld, R. Gerdes, M. Karcher, and F. Kauker, **2001**: Cyclones over Fram Strait: impact on sea ice and variability. Polar Research 20 (2), 147-152.

Brümmer, B., G. Müller and H. Hoeber, **2003**: A Fram Strait cyclone: properties and impact on ice drift as measured by aircraft and buoys. J. Geophys. Res. 108, 4217, doi: 10.1029/2002JD002638.

Brümmer, B.; Müller, G.; Schröder, D.; Kirchgäßner, A.; Launiainen, J. and Vihma, T., **2003**: The eight BALTIMOS Field Experiments 1998 - 2001 over the Baltic Sea International BALTEX Secretariat, 24, 141pp

Brümmer, B., G. Müller and D. Schröder, **2005**: In situ observations in cyclones over Fram Strait. Meteorol. Zeitschrift, Vol. 14, No. 5, 721-734.

Brümmer, B., J. Launiainen, G. Müller and D. Schröder, **2005**: FRAMZY 2002: Second field experiment on Fram Strait cyclones and their impact on sea ice. Ber. a.d. ZMK, Reihe A, Meteorologie, 37, 154 pp.

Brümmer, B., Müller, G., Lammert-Stockschläder, A., Jahnke-Bornemann, A. **2009**: The drift buoys experiment: FRAMZY 2008 - Ice drift in Fram Strait and relation to atmospheric forcing, Berichte aus dem Zentrum für Meeres- und Klimaforschung, Universität Hamburg, Reihe A, 2009, 40, 49pp

Lammert, A., B. Brümmer, I. Ebbers, and G. Müller, **2008**: Validation of ECMWF and DWD Model Analyses with Buoy Measurements over the Norwegian Sea. Meteorology and Applied Physics 102, 87-96

Lammert, A., B. Brümmer, and L. Kaleschke, **2009**: Observation of cyclone-induced inertial seaice oscillation in Fram Strait. Geophys. Res. Let. 36, 10

Lammert, A., B. Brümmer, M. Haller, G. Müller, and H. Schyberg, **2010**: Comparison of three weather prediction models with buoy and aircraft measurements under cyclone conditions in Fram Strait. Tellus A, DOI: 10.1111/j.1600-0870.2010.00460.x

Launiainen, J. and Brümmer, B. **2003**: ACSYS-ABSIS 2003 RV Aranda Cruise Report

Cited References

Leonard, J. 2008; PAWS Assembly and Deployment Manual, Document No. TD-07-003, Version 2.0, MetOcean Data Systems

8. Citation

When using or mentioning the dataset, it should be referenced as formal citation. If applicable the following proposal should be used:

Brümmer, B., G. Müller, M. Haller, A. Kriegsmann, M. Offermann, C. Wetzel (2011): DAMOCLES 2008-2011 - Hamburg Arctic Ocean Buoy Drift Experiment: meteorological measurements of 9 autonomous drifting ice buoys. World Data Center

for Climate. DOI:10.1594/WDCC/UNI_HH_MI_DAMOCLES2008

If this proposal is not suitable, please try to follow the IPYDIS recommendations for citing data sets under <http://ipydis.org/data/citations.html>.

Use the data in the table below, entries in italics should be filled as necessary.

Author or investigator	Burghard Brümmer, Gerd Müller, Michael Haller, Arne Kriegsmann, Michael Offermann, Christian Wetzel
Publication date	2011
Title	DAMOCLES 2008-2011 - Hamburg Arctic Ocean Buoy Drift Experiment: meteorological measurements of 9 autonomous drifting ice buoys
Dates used	<i>denominate the utilised data subset, topical and/or temporal and/or regional</i>
Editor or compiler	<i>same as Author</i>
Publication place	Hamburg, Germany
Publisher	Meteorological Intitute University Hamburg
Distributor or associate publisher	World Data Center for Climate
Distribution medium or location	CERA-DB "UNI_HH_MI_DAMOCLES2008" http://cera-www.dkrz.de/WDCC/ui/Compact.jsp?acronym=UNI_HH_MI_DAMOCLES2008 DOI:10.1594/WDCC/UNI_HH_MI_DAMOCLES2008
Access date	<i>date of download</i>
Data within a larger work	<i>not applicable</i>

9. Document Information

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