IceBridge NSERC L1B Geolocated Meteorologic and Surface Temperature Data, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Shetter, R., E. Buzay, and D. Van Gilst. 2010, updated 2013. IceBridge NSERC L1B Geolocated Meteorologic and Surface Temperature Data, Version 1. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: https://doi.org/10.5067/Y6SQDAAAOEQU. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/IAMET1B

National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

1.1 Format

The data files are ICARTT comma-delimited text files.

1.2 File and Directory Structure

Data files are organized on the following HTTPS site:

https://daacdata.apps.nsidc.org/pub/DATASETS/ICEBRIDGE/IAMET1B_NSERCmetXyMet_v01/

1.3 File Naming Convention

The data files are named according to the following convention and as described in Table 1:

```
IAMET1B_nav_dc8_20121002_R0.ict
```

```
IAMET1B_nav_dc8_YYYYMMDD_r1.ict
```

Table 1. File Naming Convention Description

Variable	Description
IAMET1B	Data set ID
nav	Navigation, aircraft, and facility instrumentation data
dc8	NASA Dryden DC-8 airborne laboratory aircraft
YYYY	Four-digit year of data collection
MM	Two-digit month of data collection
DD	Two-digit day of data collection
r1	Data revision 1
.ict	Indicates ICARRT data file

1.4 Spatial Coverage

Spatial coverage for this data set includes the Greenland and Antarctic areas. In effect, this represents the two coverages noted below.

Arctic / Greenland:
Southernmost Latitude: 60° N
Northernmost Latitude: 90° N
Westernmost Longitude: 180° W
Easternmost Longitude: 180° E

Antarctica:
Southernmost Latitude: 90° S
Northernmost Latitude: 53° S
Westernmost Longitude: 180° W
Easternmost Longitude: 180° E

1.4.1 Spatial Resolution

Spatial resolution varies by instrument parameter and aircraft flight characteristics.

1.4.2 Projection and Grid Description

These data are provided in unprojected geographic coordinates using the WGS84 vertical datum.

1.5 Temporal Coverage

12 October 2009 to 10 November 2012.

1.5.1 Temporal Resolution

IceBridge campaigns are conducted on an annually repeating basis. Arctic and Greenland campaigns are conducted during March, April, and May; Antarctic campaigns are conducted during October and November.

NSERC L1B Geolocated Meteorologic and Surface Temperature data are captured once per second.

1.6 Parameter or Variable

This data set contains meteorological and in-cabin measurements and thermal emission measurements. As the parameters names vary between the campaigns, they're listed in separate tables below. The parameters for the 2009 Antarctica campaign are listed in Table 2 and the parameters for the 2010 Greenland and Antarctica campaigns are listed in Table 3.

Table 2. 2009 Antarctica Campaign Parameter Descriptions

Name	Description	Units
UTC	Universal Time Code	Seconds
LAT	Latitude	Degrees
LON	Longitude	Degrees
GPS_ALT	GPS altitude	Meters
PRESSURE_ALT	Barometric altitude	Feet
GROUND_SPD	Ground speed	Meters per second
TRUE_AIR_SPD	True air speed	Meters per second
IND_AIR_SPD	Indicated air speed	Knots
MACH	Mach speed	Mach
VERT_SPD	Vertical speed	Meters per second
TRUE_HEADING	True heading	Degrees ±180
TRACK_ANGLE	Track angle	Degrees ±180
DRIFT_ANGLE	Drift angle	Degrees ±180
PITCH_ANGLE	Pitch angle	Degrees ±180
ROLL_ANGLE	Roll angle	Degrees ±180
STATIC_AIR_TEMP	Static air temperature	Celsius
DEW_POINT	Dew point	Celsius
TOTAL_AIR_TEMP	Total air temperature	Celsius
IR_SURF_TEMP	Infrared surface temperature	Celsius
SAT_COMPUTED	Static Air Temperature Computed	Celsius
STATIC_PRESSURE	Static pressure	Millibars
CABIN_PRESSURE	Cabin pressure	Millibars
CABIN_ALT	Cabin altitude	Feet
WIND_SPD	Wind speed	Millibars
WIND_DIR	Wind direction	Degrees ±180
MIX_RATIO	Mixing ratio	Grams per kilogram
PART_PRES_H2O	Partial pressure of water vapor relative to water	Millibars
PART_PRES_ICE	Partial pressure of water vapor relative to ice	Millibars
REL_HUM_H2O	Relative humidity relative to water	Percent
REL_HUM_ICE	Relative humidity relative to ice	Percent
SAT_VP_H2O	Saturation vapor pressure relative to water	Millibars
SAT_VP_ICE	Saturation vapor pressure relative to ice	Millibars
SUN_ELEV_EARTH	Solar elevation relative to the ground surface	Degrees
SUN_ELEV_PLANE	Solar elevation relative to the aircraft	Degrees

SUN_AZM_EARTH	Solar azimuth relative to the ground surface	Degrees
SUN_AZM_PLANE	Solar azimuth relative to the aircraft	Degrees
SOLAR_ZEN_ANGLE	Solar zenith angle	Degrees

Table 3. 2010 Greenland and Antarctica Campaign Parameter Descriptions

Name	Description	Units	Notes
UTC	Universal Time Code	s	
Latitude	Latitude	° N	
Longitude	Longitude	° E	
GPS_Altitude	GPS altitude	m	
Pressure_Altitude	Barometric altitude	ft	
Radar_Altitude	Altitude above ground level (AGL)	ft	
Ground_Speed	Ground speed	m/s	
True_Air_Speed	True air speed	m/s	
Indicated_Air_Speed	Indicated air speed	kt	
Mach_Number	Mach speed	Mach	
Vertical_Speed	Vertical speed	m/s	
True_Heading	True heading	Degrees ±180	
Track_Angle	Track angle	Degrees ±180	
Drift_Angle	Drift angle	Degrees ±180	
Pitch_Angle	Pitch angle	Degrees ±180	
Roll_Angle	Roll angle	Degrees ±180	
Static_Air_Temp	Static air temperature	°C	
Dew_Point	Dew/Frost point	°C	
Dew_Point_3-Stage	Dew point	°C	Only in 2010 Antarctica campaign
TAT	Total Air Temperature	°C	Only in 2010 Greenland campaign
TAT_Aircraft	Total air temperature (aircraft)	°C	Only in 2010 Antarctica campaign
TAT_Experimenter	Total air temperature (experimenter)	°C	Only in 2010 Antarctica campaign

IR_Surf_Temp	Infrared surface temperature	°C	
Static_Pressure	Static pressure	mbar	
Cabin_Pressure	Cabin pressure	mbar	
Wind_Speed	Wind speed	m/s	
Wind_Direction	Wind direction	Degrees ±180	
Mix_Ratio	Mixing Ratio	g/kg	Only in 2010 Greenland campaign
Mixing_Ratio	Mixing Ratio	g/kg	Only in 2010 Antarctica campaign
Part_Press_H2O	Partial pressure of water vapor relative to water	mbar	
Part_Press_Ice	Partial pressure of water vapor relative to ice	mbar	
Sat_VP_H2O	Saturated vapor pressure of water relative to water	mbar	Only in 2010 Greenland campaign
H2O_Sat_VP_Water	Saturated vapor pressure of water relative to water	mbar	Only in 2010 Antarctica campaign
Sat_VP_Ice	Saturated vapor pressure of water relative to ice	mbar	Only in 2010 Greenland campaign
H2O_Sat_VP_Ice	Saturated vapor pressure of water relative to ice	mbar	Only in 2010 Antarctica campaign
Sun_Elev_Earth	Solar azimuth relative to the ground surface	Degrees	Only in 2010 Greenland campaign
Sun_Elev_Plane	Solar azimuth relative to the aircraft	Degrees	Only in 2010 Greenland campaign
Aircraft_Sun_Elevation	Solar azimuth relative to the aircraft	Degrees	Only in 2010 Antarctica campaign
Sun_Azimuth_Earth	Solar azimuth relative to the ground surface	Degrees	Only in 2010 Greenland campaign
Sun_Azimuth	Solar azimuth	Degrees	Only in 2010 Antarctica campaign
Sun_Azimuth_Plane	Solar azimuth relative to the aircraft	Degrees	Only in 2010 Greenland campaign

Aircraft_Sun_Azimuth	Solar azimuth relative to the aircraft	Degrees	Only in 2010 Antarctica campaign
Solar_Zenith_Angle	Solar zenith angle	Degrees	
Rel_Humidity_H2O	Relative humidity with respect to water	%	Only in 2010 Antarctica campaign
Rel_Humidity_Ice	Relative humidity with respect to to ice	%	Only in 2010 Antarctica campaign

2 SOFTWARE AND TOOLS

2.1 Software and Tools

NSIDC provides a MATLAB reader that reads NSERC L1B Geolocated Meteorologic and Surface Temperature Data files. The data files also may be opened by any ASCII text reader.

3 DATA ACQUISITION AND PROCESSING

3.1 Data Acquisition Methods

The DC-8 data set is collected from a number of sources. All of the navigation data comes from the Air Data Computer, Flight Management System, and GPS receivers. The parameters from the Air Data Computer and Flight Management System are recorded using dual NASDAT flight recorders via ARINC-429 data bus. The flight recorders are located in the housekeeping rack.

The flight recorders also record the analog voltage output data from the facility instruments located on board, including pressure transducer, hygrometers, and infrared pyrometer. All parameters are recorded at one hertz for the entire duration of the flight.

3.2 Derivation Techniques and Algorithms

Data are taken at one hertz from aircraft instruments and facility instruments onboard. Data are recorded on two redundant NASA Airborne Science Data Acquisition and Transmission (NASDAT) flight recorders. No special techniques or algorithms are used in this data set.

3.2.1 Processing Steps

The following processing steps are performed by the data provider.

1. Obtain flight specific files from flight recorder (NASDAT).
2. Convert to ASCII ICARTT format.

3. Perform quality control on the data set using graphs and curve fitting.
4. Output final quality controlled ICARTT file.

3.2.2 Errors and Limitations

Some data sets have missing data parameters due to either a fault in the system, or data is out of range for respective instruments. Missing parameters are marked with a -99999 label.

3.2.3 Sensor or Instrument Description

Instruments used for the collection of this data include the following:

3.2.3.1 MKS Baratron Type 220D Pressure Transducer (Cabin Pressure)

The MKS Baratron Pressure Transducer is used to measure the pressure within the cabin of the aircraft. Based on a reference pressure which remains constant within the instrument, the exterior pressure can then be measured. The pressure transducer has a resolution of 1 Torr and the accuracy is ± 0.15 percent of Reading ±temperature coefficient. The temperature coefficient is 0.02 percent of Reading / °C.

3.2.3.2 2-Stage Hygrometer Buck Research Instruments Model 1011B (Dew/Frost Point)

The Buck Research Hygrometer system is a chilled-mirror type hygrometer designed for airborne measurements of dew and frost point temperatures. It is capable of measuring dew/frost points between -75°C and +50°C, over a wide range of temperatures, pressures, and airspeeds. The accuracy of this system is ± 0.1°C.

3.2.3.3 3-Stage Hygrometer Model 137 Vigilant by Edgetech (Dew Point)

The Edgetech Model 137 Hygrometer is a rugged, shock mounted instrument used for dew point measurement. This model measures dew point only, including dew points measured below zero degrees Celsius. The dew point is measured using chill mirror technology assuring precision accuracy, repeatability and reliability. The Edgetech hygrometer is able to accurately detect the dew point within the range of -50°C to 90°C with an accuracy of ± 0.2°C and precision of 0.1°C. The sensor is capable of a 65°C depression from an ambient temperature of 25°C.

3.2.3.4 Total Air Temperature Goodrich (Rosemount) model 102

Total air temperature is measured by a Rosemount probe and Goodrich Sensor mounted on the surface of the aircraft. The total air temperature sensor can measure temperature between -70°C

to +70°C with a speed of up to Mach 3 at altitudes between 0 to 100,000 feet. The accuracy of the total air temperature is ± 1.0466 degrees Celsius.

3.2.3.5 Heitronics Infrared Radiation Pyrometer KT-19.85II

The Heitronics Infrared Radiation Pyrometer is a remotely sensed measuring transducer that receives the infrared radiation emitted by the measuring object and transforms it into a standardized output signal. The pyrometer is located on the bottom of the aircraft to measure surface and cloud top temperatures. It has a spectral range of 9.6 to 11.5 µm, a response time of one second, and a temperature range of -100° to +200°C. The accuracy is ± 0.5 percent plus 0.7 percent of the difference between target temperature and housing temperature.

4 REFERENCES AND RELATED PUBLICATIONS

4.1 Related Data Collections

- IceBridge POS/AV L1B Corrected Position and Attitude Data

4.2 Related Websites

- National Suborbital Education & Research Center website
- IceBridge data website at NSIDC
- IceBridge website at NASA
- ICESat/GLAS website at NASA Wallops Flight Facility
- ICESat/GLAS website at NSIDC

5 CONTACTS AND ACKNOWLEDGMENTS

5.1 Contacts

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5.2 Acknowledgments

NASA Airborne Science

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