

# Oceans Melting Greenland

## AXBT Ocean Water Properties Data

### User's Guide

#### Data Set

OMG Ocean AXBT Level 2 Data

#### Author

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#### Introduction

Global sea level rise will be one of the major environmental challenges of the 21st Century. Oceans Melting Greenland (OMG) will pave the way for improved estimates of sea level rise by addressing the question: To what extent are the oceans melting Greenland's ice from below? Over a five-year campaign, OMG will observe changing water temperatures on the continental shelf surrounding Greenland, and how marine glaciers react to the presence of warm, salty Atlantic Water. The complicated geometry of the sea floor steers currents on the shelf and often determines whether Atlantic Water can reach into the long narrow fjords and interact with the coastal glaciers. Because knowledge of these pathways is a critical component of modeling the interaction between the oceans and ice sheet, OMG will facilitate improved measurements of the shape and depth of the sea floor in key regions as well.

Temperature data was collected using air-deployed sensors called Airborne eXpendable Bathy Thermograph (AXBT) instruments. These expendable instruments are launched from an aircraft, fall under a small parachute and float on the surface after impact. The floating portion then release a probe, which sinks to a depth of up to 1000 meters. The probe is connected to the float by a thin wire which unspools at the probe sinks, measuring temperature and conductivity as a function of time. This information is sent by radio to the aircraft, where it is used to compute temperature as a function of depth.

#### Campaigns

This data set consists of data from a single campaign.

#### 2020

This campaign was conducted by the OMG Science Team aboard the Basler BT-67 aircraft. The data was collected during a survey of Greenland's coastline in August and September 2020 using AXBT instruments.

2021

This campaign was conducted by the OMG Science Team aboard the Basler BT-67 aircraft. The data was collected during a survey of Greenland's coastline in August and September 2021 using AXBT instruments.

## Format

The file names for this data set are of the form

“OMG\_Ocean\_AXBT\_L2\_<time\_coverage\_start>.nc” where <time\_coverage\_start> is formatted as “YYYYMMDDhhmmss”. The data files are in NetCDF format and are compliant with the Climate and Forecast (CF) Metadata Conventions. The data file is formatted as follows:

dimensions:

```
obs = UNLIMITED ; // (X currently)
profile = 1 ;
```

variables:

```
float lat(profile) ;
    lat:_FillValue = -9999.f ;
    lat:long_name = "latitude" ;
    lat:standard_name = "latitude" ;
    lat:units = "degrees_north" ;
    lat:coverage_content_type = "coordinate" ;
    lat:axis = "Y" ;
    lat:valid_max = 90. ;
    lat:valid_min = -90. ;
    lat:comment = "Represents the latitude of the plane position when the probe
was deployed which is an estimate of the actual location where the probe hit the surface of the
water." ;
float lon(profile) ;
    lon:_FillValue = -9999.f ;
    lon:long_name = "longitude" ;
    lon:standard_name = "longitude" ;
    lon:units = "degrees_east" ;
    lon:coverage_content_type = "coordinate" ;
    lon:axis = "X" ;
    lon:valid_max = 180. ;
    lon:valid_min = -180. ;
    lon:comment = "Represents the longitude of the plane position when the probe
was deployed which is an estimate of the actual location where the probe hit the surface of the
water." ;
double time(profile) ;
    time:_FillValue = -9999. ;
    time:long_name = "time" ;
    time:standard_name = "time" ;
```

```

time:units = "seconds since 1970-01-01T00:00:00Z" ;
time:coverage_content_type = "coordinate" ;
time:axis = "T" ;
time:comment = "Represents the time the probe was deployed from the plane."
;

float profile_time(profile, obs) ;
profile_time:_FillValue = -9999.f ;
profile_time:long_name = "time since probe began descent from ocean surface"
;

profile_time:units = "seconds" ;
profile_time:comment = "Represents the time in seconds since the weighted
probe was released from the floating buoy. Depth is calculated from this variable based on a
standard formula." ;
float frequency(profile, obs) ;
frequency:_FillValue = -9999.f ;
frequency:long_name = "frequency" ;
frequency:units = "s-1" ;
frequency:coverage_content_type = "physicalMeasurement" ;
frequency:coordinates = "time lat lon depth" ;
frequency:comment = "This is the frequency of the radio broadcast that is used
to determine the temperature with the following formula: (T = (f - 1440)/36)." ;
float depth(profile, obs) ;
depth:_FillValue = -9999.f ;
depth:long_name = "depth" ;
depth:standard_name = "depth" ;
depth:units = "meters" ;
depth:positive = "down" ;
depth:coverage_content_type = "coordinate" ;
depth:coordinates = "time lat lon" ;
depth:axis = "Z" ;
depth:valid_min = 0. ;
depth:valid_max = 5000. ;
float temperature(profile, obs) ;
temperature:_FillValue = -9999.f ;
temperature:long_name = "sea water temperature" ;
temperature:standard_name = "sea_water_temperature" ;
temperature:units = "degrees_C" ;
temperature:coverage_content_type = "physicalMeasurement" ;
temperature:coordinates = "time lat lon depth" ;
temperature:valid_min = -2.2 ;
temperature:valid_max = 35. ;
float sound_velocity(profile, obs) ;
sound_velocity:_FillValue = -9999.f ;
sound_velocity:long_name = "speed of sound in sea water" ;

```

```
sound_velocity:standard_name = "speed_of_sound_in_sea_water" ;
sound_velocity:units = "m s-1" ;
sound_velocity:coverage_content_type = "physicalMeasurement" ;
sound_velocity:coordinates = "time lat lon depth" ;
sound_velocity:valid_min = 1405. ;
sound_velocity:valid_max = 1560. ;
```

For the profile (profile), the latitude, longitude and time of the measurement are provided. For every observation (obs) associated with the profile, the depth (represented in meters below sea level), temperature and sound velocity are provided. Each data file also includes several global variables to further describe the data contained within the file. The variables that follow the *date\_created* variable below, were extracted directly from the header of the source file and are provided for users who may be familiar with the Export Data File (EBF) generated by the Sippican MK21 device. These variables are as follows (values containing X's represent variables that have product specific values):

```
:title = "OMG Ocean AXBT Level 2 Data" ;
:summary = "This file contains temperature and depth measurements from an
AXBT instrument. In addition, it contains derived sound speed as computed by a Sippican MK21
receiver." ;
:keywords = " Water Depth, Water Temperature" ;
:keywords_vocabulary = "NASA Global Change Master Directory (GCMD) Science
Keywords" ;
:Conventions = "CF-1.6, ACDD-1.3" ;
:id = "OMG_Ocean_AXBT_L2" ;
:uuid = "XXXXXXXX-XXXX-XXXX-XXXX-XXXXXXXXXXXX" ;
:naming_authority = "gov.nasa.jp1" ;
:cdm_data_type = "Station" ;
:history = "Transformed input product XXX_XXXXXXXXXXXXXXX_XXXX_XXX.edf
into NetCDF format." ;
:source = "Temperature data are collected using air-deployed sensors called
Airborne eXpendable Bathy Thermograph (AXBT) instruments purchased from the U.S. Navy." ;
:platform = "<campaign-specific>" ;
2020/2021: "Basler BT-67"
:instrument = "Airborne eXpendable Bathy Thermograph (AXBT)" ;
:processing_level = "L2" ;
:comment = "This data was collected during the XXXX campaign." ;
:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata
Convention" ;
:acknowledgement = "This research was carried out by the Jet Propulsion
Laboratory, managed by the California Institute of Technology under a contract with the
National Aeronautics and Space Administration." ;
:license = "Public Domain" ;
:product_version = "1.0" ;
```

```
:references = "DOI:10.5067/OMGEV-AXBT1" ;
:creator_name = "OMG Science Team" ;
:creator_email = "omg-science@jpl.nasa.gov" ;
:creator_url = "https://dx.doi.org/10.5067/OMGEV-AXBT1" ;
:creator_type = "group" ;
:creator_institution = "NASA Jet Propulsion Laboratory" ;
:institution = "NASA Jet Propulsion Laboratory" ;
:project = "Oceans Melting Greenland (OMG)" ;
:program = "NASA Earth Venture Suborbital-2 (EVS-2)" ;
:contributor_name = "OMG Science Team" ;
:contributor_role = "OMG Science Team performed the survey in the field,
collected the data and performed the initial processing." ;
:publisher_name = "PO.DAAC" ;
:publisher_email = "podaac@podaac.jpl.nasa.gov" ;
:publisher_url = "https://dx.doi.org/10.5067/OMGEV-AXBT1" ;
:publisher_type = "group" ;
:publisher_institution = "NASA Jet Propulsion Laboratory" ;
:geospatial_lat_min = "XX.XXXXX" ;
:geospatial_lat_max = "XX.XXXXX" ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lat_resolution = 1.e-05 ;
:geospatial_lon_min = "XX.XXXXX " ;
:geospatial_lon_max = "XX.XXXXX " ;
:geospatial_lon_units = "degrees_east" ;
:geospatial_lon_resolution = 1.e-05 ;
:geospatial_vertical_min = "X.XXXX" ;
:geospatial_vertical_max = "XXX.XXXX" ;
:geospatial_vertical_resolution = 0.0001 ;
:geospatial_vertical_units = "meters" ;
:geospatial_vertical_positive = "down" ;
:time_coverage_start = "XXXX-XX-XXTXX:XX:XX" ;
:time_coverage_end = "XXXX-XX-XXTXX:XX:XX" ;
:time_coverage_duration = "PT15M" ;
:date_created = "XXXX-XX-XXTXX:XX:XX" ;
:raw_data_filename = "XXXX-XX XXX XXX-XXXXXXXXXXXXXXXXXXXXXXXXX" ;
:probe_type = "AXBT" ;
:drop_number = "XXX" ;
:channel = "XX" ;
:terminal_depth = "XXX m" ;
:depth_equation = ;
:depth_coefficient_1 = "X.X" ;
:depth_coefficient_2 = "X.X" ;
:depth_coefficient_3 = "X.X" ;
:depth_coefficient_4 = "X.X" ;
```

```
:sequence_number = "XXXXX" ;  
:mk21_device = "MK21 Ethernet" ;
```

## Citation

This research was carried out by the Jet Propulsion Laboratory, managed by the California Institute of Technology under a contract with the National Aeronautics and Space Administration. Use of this data should be cited as follows:

OMG Mission. 2020. Temperature and Depth data from the ocean survey. Ver. 1. PO.DAAC, CA, USA. Dataset accessed [YYYY-MM-DD] at <https://dx.doi.org/10.5067/OMGEV-AXBT1>.

## Contact

For questions, please email [podaac@podaac.jpl.nasa.gov](mailto:podaac@podaac.jpl.nasa.gov) or visit the [PO.DAAC forum](#).