

## README file for Dataset:

### Hourly Ocean Bottom Pressure at the North Pole from the Arctic Bottom Pressure Recorder Follow-On Version 1.0 (GRACE\_ABPR\_FO\_L2\_V1.0)

#### Summary

This dataset consists of hourly ocean bottom pressure (OBP) and temperature measurements collected at the geographic North Pole from August 2022 to August 2023. The data were obtained using the Arctic Bottom Pressure Recorder – Follow-On (ABPR-FO), a custom-built, deep-sea pressure recorder developed by the Applied Physics Laboratory at the University of Washington (APL/UW). The primary goal of this dataset is to serve as in situ validation for satellite-derived OBP data products from the GRACE-FO (Gravity Recovery and Climate Experiment – Follow-On) mission. The ABPR-FO system uses a Paroscientific Digiquartz Pressure Sensor, Model 410K-LV-319 that measures ocean bottom pressure every 15 minutes and records the data internally. The ABPR-FO system is equipped with an acoustic modem to allow for annual data upload modem sessions, without the need to retrieve the instrument through sea ice. The ABPR-FO software, also developed at the APL/UW, allows for data recovery on the hour, as well as 15, 30 and 45 minutes after the hour. The ABPR-FO is powered by Lithium-ion batteries estimated to last 5 years and is not recoverable. After nearly 2 years of design, fabrication, testing and pressurizing the sensor for over 3 months (to minimize the risk of instrumental drift), the ABPR-FO was deployed in August 2022 at 17:15 UTC at 89° 59' 27.64'' N; 50° 23' 58.26''E on board icebreaker Le Commandant Charcot (LCC). The first year of OBP data were collected in 2023 also on board the icebreaker LCC. In 2024 and 2025, attempts were made to retrieve the second and third years of ABPR-FO data without success. The ABPR-FO is now considered non-functional.

#### Deployment Information

- **Deployment Date:** August 12, 2022 (Ponant Cruise to the North Pole #CC070822)
- **Recovery Attempt:** August 16, 2023 (Cruise #CC110823) – successful recovery of hourly data (this dataset).
- **Subsequent Recovery Attempts:**
  - July 2024 (Ponant Cruise #CC260724) – unsuccessful
  - September 2024 (Ponant Cruise #CC060924) – unsuccessful
  - August 2025 (Cruise #CC060825) – unsuccessful; instrument considered non-functional.
- **Deployment Coordinates:**
  - Latitude: 89° 59' 27.64'' N
  - Longitude: 50° 23' 58.26'' E
  - Depth: ~4200 m (approximate seafloor depth)

## Temporal Coverage

- **Start:** August 14, 2022
- **End:** August 16, 2023
- **Sampling Interval:** Hourly (on-the-hour values)

Note: Internally-recorded data were collected at 15-minute intervals; however, only hourly values were recovered in 2023.

**DOI:** 10.5067/ABPRFO-L2V10

## Data Format

- NetCDF-4 (Network Common Data Form, Version 4).

## Variables and Attributes

Name	Long Name	Unit
time	time	days since 2022-08-14T11:00:00+00:00
obp	ocean bottom pressure	m of water equivalent thickness
temp	ocean bottom temperature	degrees Celsius

**Note:** Ocean bottom pressure is total pressure as measured at the seafloor (atmospheric pressure included). Pressure conversion used is 1 psi to 670 mm of water equivalent thickness.

## Data Processing

- Pressure values were converted from psi to mm of water equivalent thickness using a fixed conversion factor of 1 psi = 670 mm performed by the ABPR-FO data download software (also designed at the APL/UW).
- Only hourly data (on-the-hour) were acoustically recovered.
- No interpolation was applied post-acquisition.
- Only initial values during the descent from the surface to the seafloor were eliminated from the record.
- Raw hourly data in m of water equivalent thickness is provided.

## Limitations and Known Issues

- No data were retrieved for years 2 and 3 (2024–2025). Despite multiple expeditions and upgraded equipment, the ABPR-FO did not respond to any acoustic commands during data recovery attempts in 2024 and 2025 and is now considered non-functional.
- The pressure sensor was pressurized for over 3 months prior to deployment to minimize the risk of instrumental drift. However, it is still possible that the declining linear trend in the raw ABPR-FO ocean bottom pressure record is at least partly due to instrumental drift.

## Citation:

### If you use this dataset, please cite:

Peralta-Ferriz, C., J. Guthrie, and J. H. Morison (2023), Hourly Ocean Bottom Pressure at the North Pole from the Arctic Bottom Pressure Recorder Follow-On Version 1.0. PO.DAAC, CA, USA. Dataset accessed [YYYY-MM-DD] at <https://doi.org/10.5067/ABPRFO-L2V10>

### Journal Reference

A manuscript describing the technical aspects of the ABPR-FO is in progress and will be updated here when published. Meanwhile, we ask users to also cite and refer to the following journal publication that includes details on the earlier versions of the custom, deep-sea ABPRs deployed at the North Pole from 2005 to 2015:

- Peralta-Ferriz, C., J. H. Morison, S. E. Stalin and C. Meinig (2014), Measuring ocean bottom pressure at the North Pole, Marine Technology Society, 48(5), pp. 52-68.

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