

# International Quality-controlled Ocean Database (IQuOD)

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on behalf of the IQuOD Team

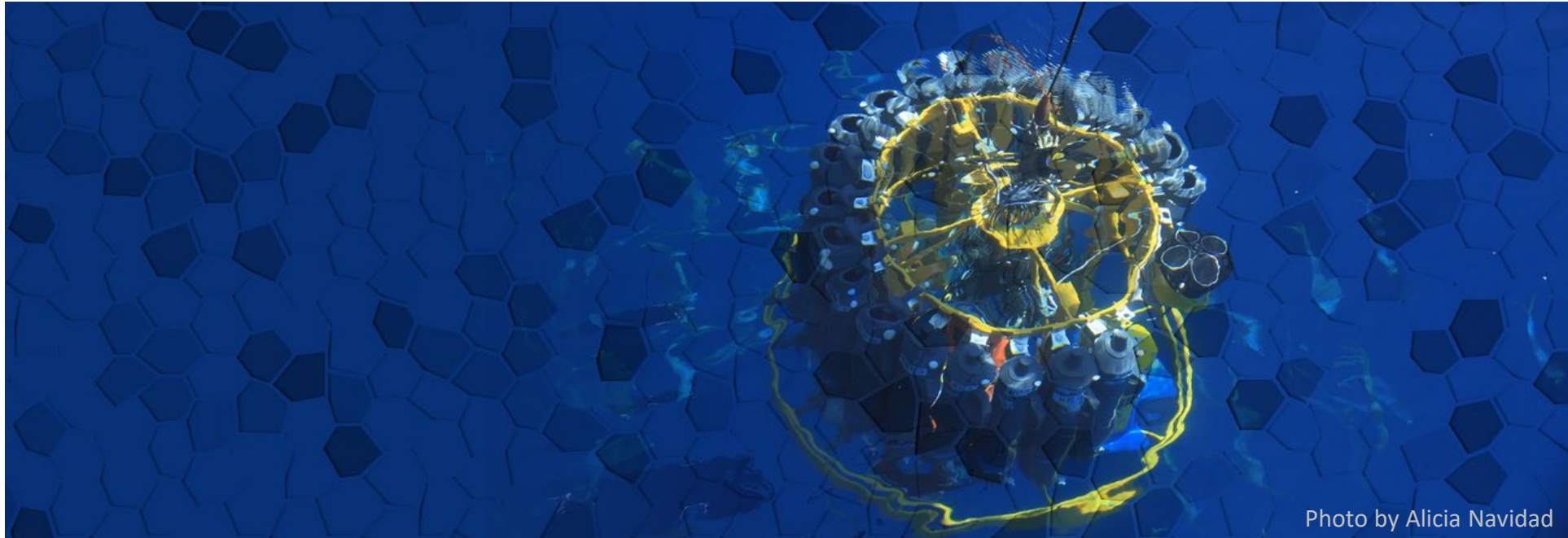


Photo by Alicia Navidad





## IQuOD “Mission Statement”

To **maximize the quality, consistency and completeness** of the long-term global subsurface ocean temperature database

IQuOD includes intelligent metadata for XBTs and has uncertainties assigned to each individual temperature observation. Some uncertainties have been assigned to depth and salinity.

IQuOD will soon include Automated QC flags from the IQuOD community A-QC benchmarking tests. Many duplicates have been identified in the WOD/IQuOD and have been removed.

The power of IQuOD: Ability to pull together the expertise from the international research community (producers/users) and to focus that combined effort into a single “best” dataset.



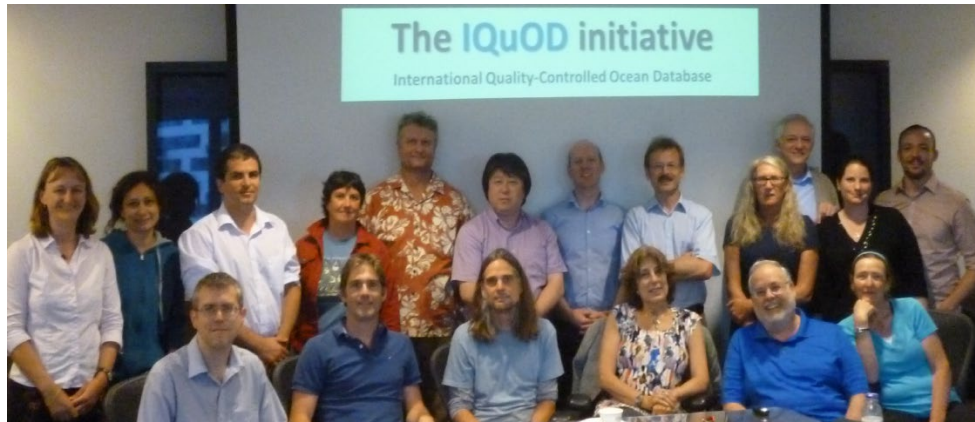
# Happy 10<sup>th</sup> Birthday to IQuOD!

- Inaugural meeting was June 2013 in Hobart, Australia.
- Agreed aim was to work towards: *A high-quality historical subsurface ocean temperature (salinity) global dataset, along with the most complete metadata information and formal error measurements for climate research needs.*





# Five other workshops...



Silver Spring, USA, 2014



Hamburg, Germany, 2014

Tokyo, Japan, USA, 2016

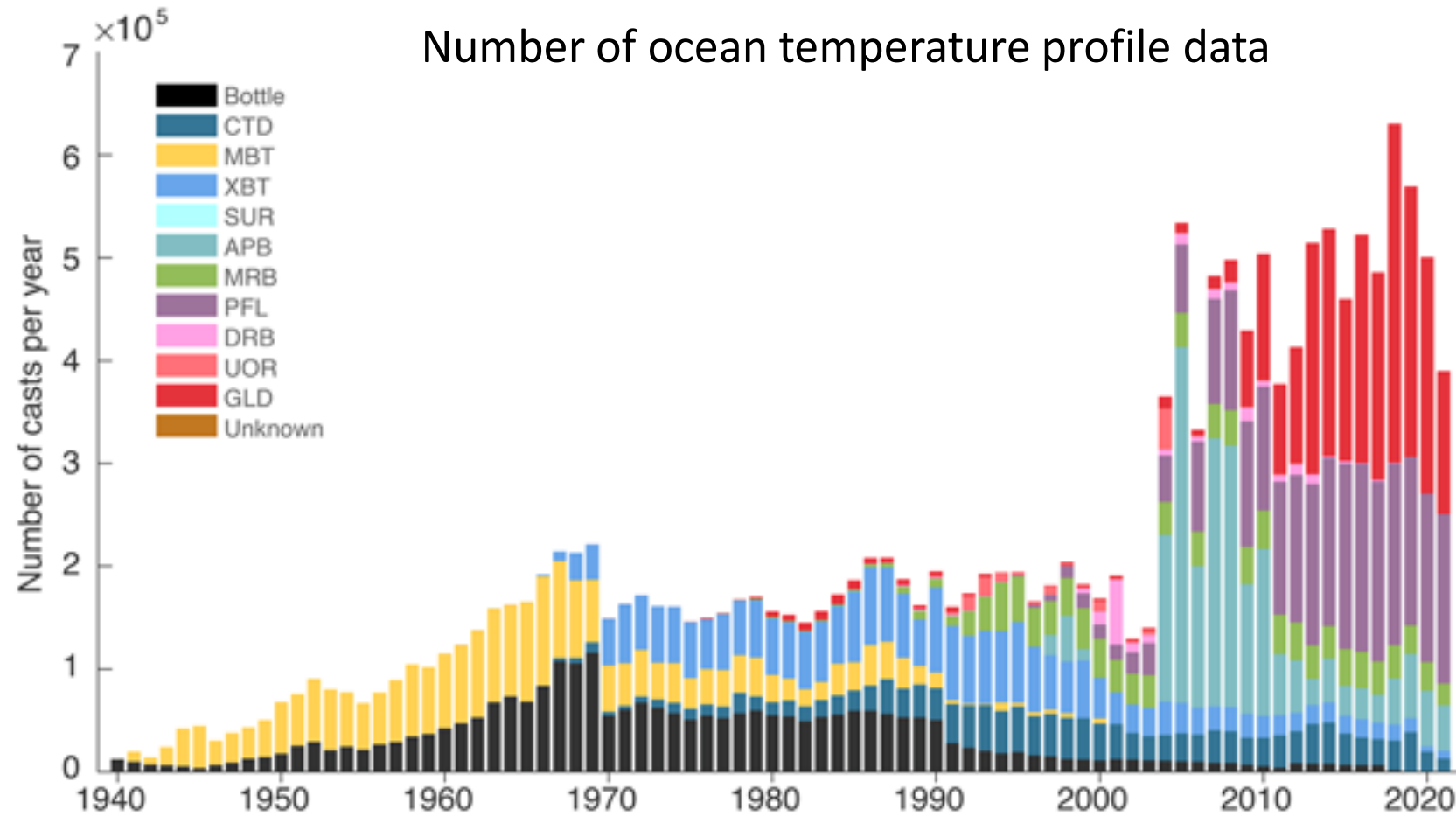


Oostende, Belgium, 2018

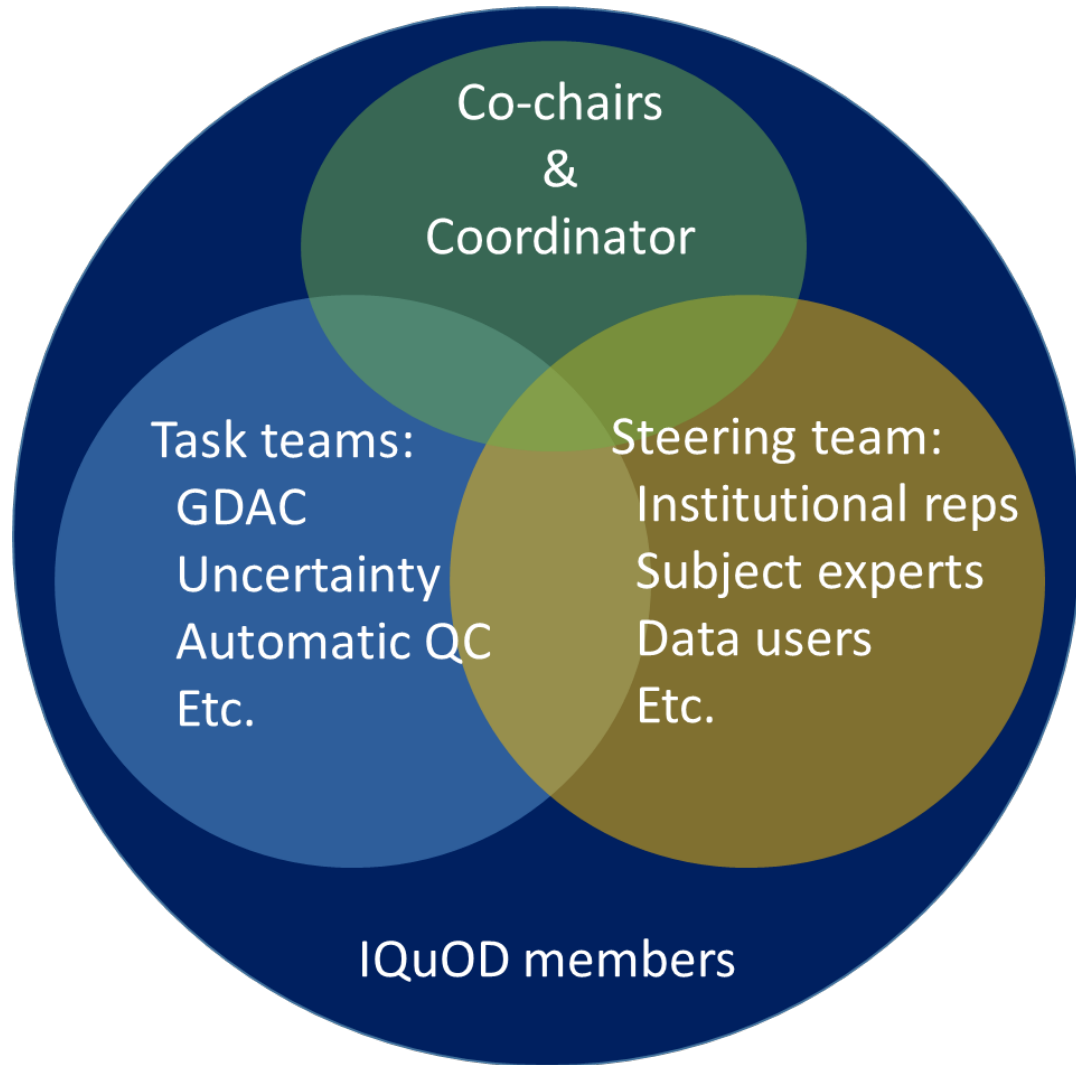


Brest, France, 2019

# Today's big challenge: 'Climate quality' ocean database




# Current IQuOD structure



- Co-chairs since May:
  - Gui Castelao;
  - Lijing Cheng.
- Coordinator:
  - Rebecca Cowley
- **Vote to formalise Gui and Lijing's appointments in July 2023.**

# Achievements of IQuOD

- The community agreed best practice for benchmarking temperature profiles AutoQC
- IQuOD AutoQC flag



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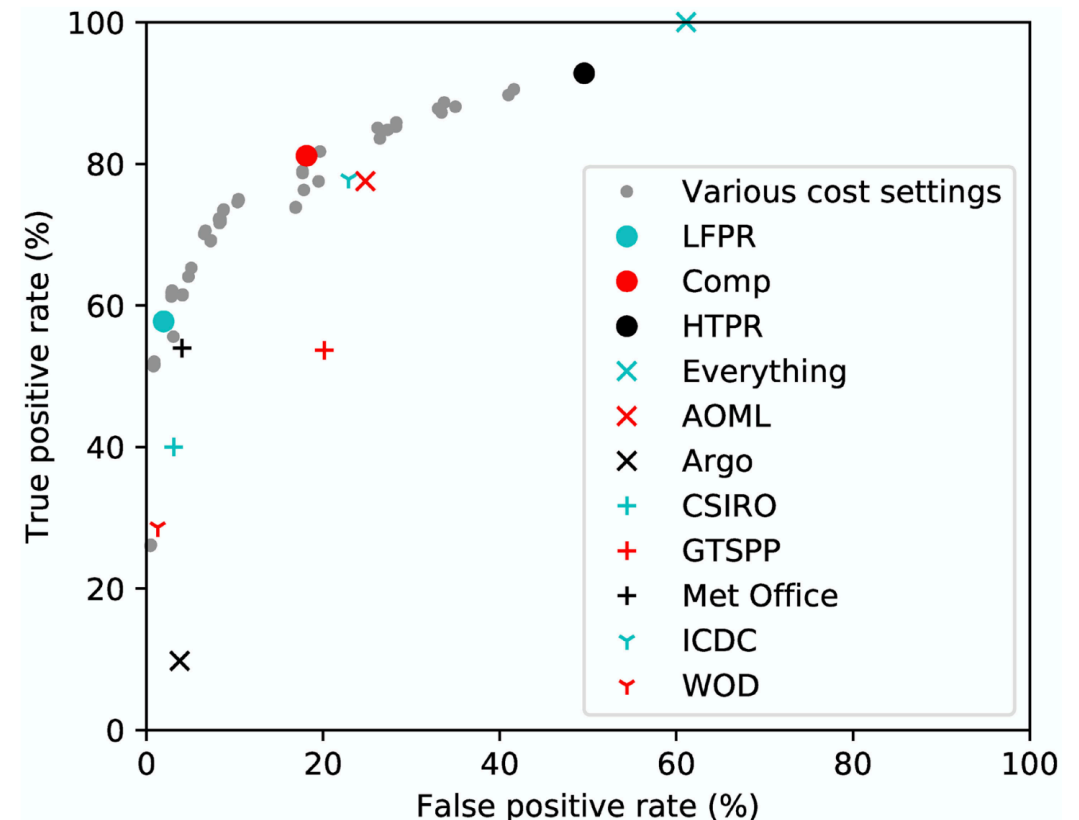
## Benchmarking of automatic quality control checks for ocean temperature profiles and recommendations for optimal sets

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Good et al. 2023

Evaluation of different QC systems





# Achievements of IQuOD

- Assign instrumental uncertainty to each individual temperature measurement
- The provision of a consistent set of observation uncertainties will provide a more complete understanding of historical ocean observations used to examine the changing environment.

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## International Quality-Controlled Ocean Database (IQuOD) v0.1: The Temperature Uncertainty Specification

*Rebecca Cowley<sup>1,2\*</sup>, Rachel E. Killick<sup>3</sup>, Tim Boyer<sup>4</sup>, Viktor Gouretski<sup>5</sup>, Franco Reseghetti<sup>6</sup>, Shoichi Kizu<sup>7</sup>, Matthew D. Palmer<sup>3,8</sup>, Lijing Cheng<sup>5</sup>, Andrea Storto<sup>9</sup>, Marc Le Menn<sup>10</sup>, Simona Simoncelli<sup>11</sup>, Alison M. Macdonald<sup>12</sup> and Catia M. Domingues<sup>13,14</sup>*

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Cowley et al. 2021

TABLE 2 | IQuOD v0.1 uncertainty assignments.

Instrument type	Temperature (°C)	Depth/Pressure
Bottle/Reversing thermometer	0.02	5%
CTD uncalibrated and calibration status unknown	0.01	0.08%
CTD calibrated	0.002	0.015%
CTD animal mounted	0.005	-
CTD towed, UOR	0.01	-
DBT	0.05	-
Profiling Drifting Buoy	0.01	N/A
Glider	0.002	-
MBT	0.3	3%
MBT deployed from Soviet Union flagged ships	0.1	3%
MicroBT	0.002	-
Moored buoy	0.3	-
Profiling floats (pre-Argo)	0.005	-
Profiling floats (Argo***)	0.002	2.4 dbar
STD	0.002	5 m
XBT manufacturers other than Sippican and TSK and unknown manufacturer/type	0.2	≤230 m: 4.6 m; >230 m: 2%
XBT deployed from submarines or Tsurumi-Seiki Co (TSK) manufacturer	0.15	≤230 m: 4.6 m; >230 m: 2%
XBT Sippican manufacturer	0.1	≤230 m: 4.6 m; >230 m: 2%
XCTD (pre-1998)	0.06	4%
XCTD (post-1998)	0.02	2%

\*\*\*Argo profiling float data provides a standard error for each measurement for delayed-mode (quality controlled) cycles. This information was used for the IQuOD uncertainty value when available. The largest standard error for a variable for a cycle was applied to each measurement of that variable in that cycle. -, Pending assignment. N/A, Not applicable.

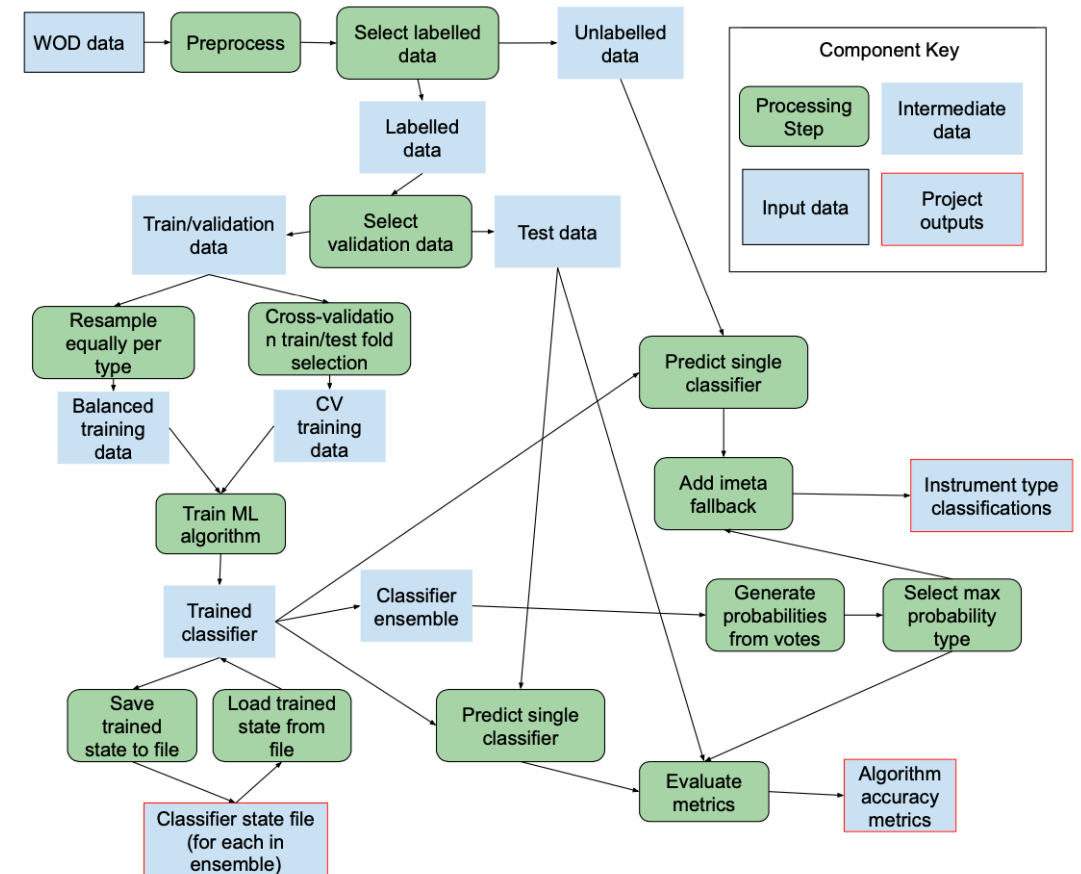
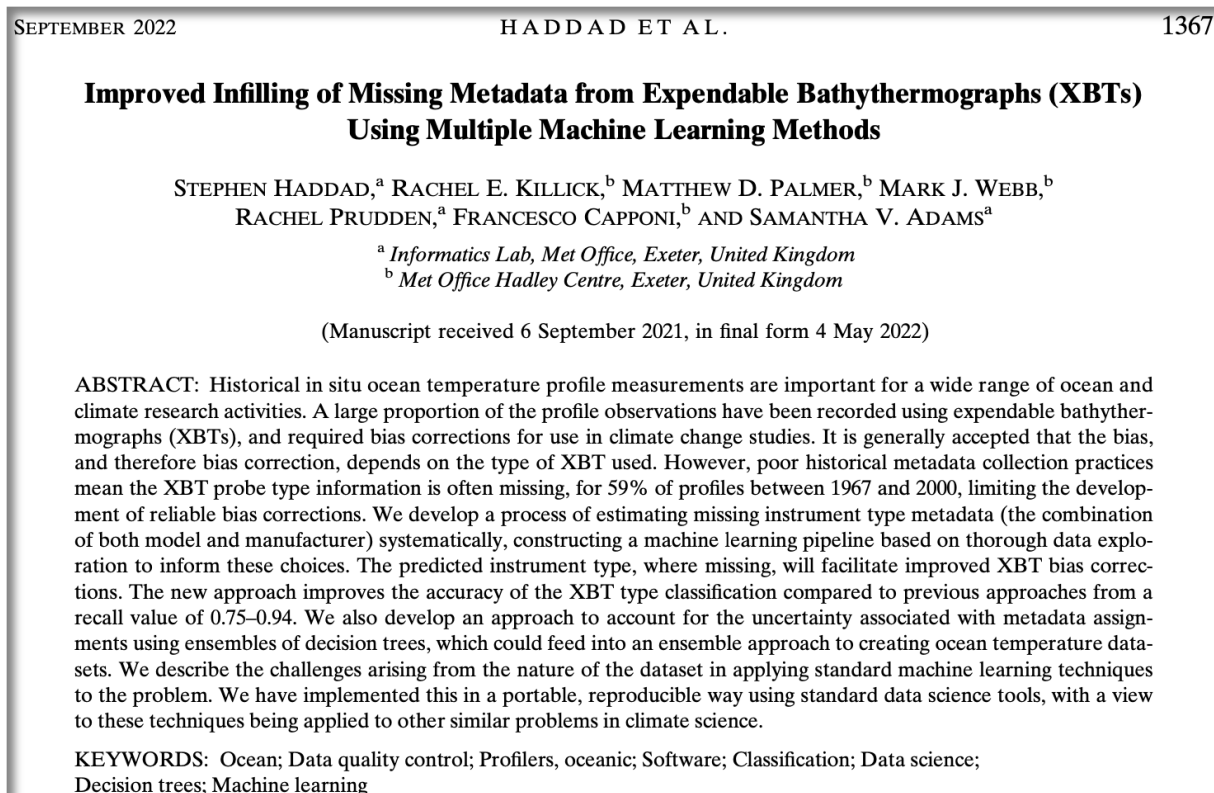
IQuOD  
uncertainty  
assignment



# Achievements of IQuOD

- Assign XBT probe type using a machine learning approach, which is often missing.

Diagram of machine learning pipeline for processing XBT profiles



# Achievements of IQuOD

- IQuOD-v1 online, publicly available through NOAA/NCEI service




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International Quality-controlled Ocean Database (IQuOD) version 0.1 – aggregated and community quality controlled ocean profile data 1772–2018 (NCEI Accession 0170893)



Preview graphic

This dataset includes subsurface ocean profiles of temperature, salinity, oxygen, nutrients, ocean tracers, optics, and biology (chlorophyll, plankton) taken from 1772 to 2018 in the global ocean using bottles, CTD, XBT, MBT, profiling floats, moored buoys, ice drifting buoys, gliders, towed profilers, and instrumented pinnipeds. This dataset was prepared at NCEI in CF compliant netCDF ragged array format under the direction of the International Quality-controlled Ocean Database (IQuOD) project. The IQuOD effort is being organized by the oceanographic community, and includes experts in data quality and management, climate modelers and the broader climate-related community. The primary focus of IQuOD is to produce and freely distribute the

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Dataset Citation

Dataset Identifiers

ISO 19115-2 Metadata

Access Time & Location Documentation Description Credit Keywords Constraints Lineage

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# IQuOD activities in 1-2 years

- ① **Publish a data description/evaluation paper for next release of IQuOD dataset**, there will be a regular update of IQuOD data (every 1-2 years)
- ② **Develop new data processing and data QC techniques**, including bias corrections (MBT, bottle, marine mammal data); Expert-QC; Duplicate check; code optimization, and machine-learning approach application.
- ③ **Improve uncertainty definition/quantification**, including instrumental error and representative error.
- ④ **Increase outreach and international collaboration**, e.g. OTGA.
- ⑤ **Pilot activity for salinity**.
- ⑥ **Reframe IQuOD steering group**.



# Thanks!

IQuOD is an international group bringing together world-wide researchers working to improve ocean temperature and salinity data quality, which could support various applications from synopsis to climate scales.

Website:

[www.iquod.org](http://www.iquod.org)

Bibliography:

[https://scholar.google.com/citations?user=qYD\\_0r8AAAAJ&hl](https://scholar.google.com/citations?user=qYD_0r8AAAAJ&hl)

Also have a publication collection at Ocean Best Practices:

<http://repository.oceanbestpractices.org/handle/11329/1590>

Github:

<https://github.com/IQuOD>

