

## IQuOD Version 0.1 – 1<sup>st</sup> March 2018

IQuOD ([www.iquod.org](http://www.iquod.org)) is an internationally-coordinated initiative which started to emerge in late 2013 to fulfil the demand for a long-term climate-quality global ocean subsurface database, that can be used with greater confidence for climate change research, by both observational and modelling communities, and for related services of societal benefit.

IQuOD's primary goal is to produce and to freely distribute the most globally complete, consistent and highest quality historical ocean temperature (and other physical tracers) profile database, along with (intelligent) metadata and assigned uncertainties.

IQuOD's goal is being achieved by consolidating relevant expertise and resources into a single best practice community effort. Members work mostly on a volunteer basis and the initiative is supported by the:

- WCRP CLIVAR Global Synthesis and observations Panel (GSOP)  
<http://www.clivar.org/clivar-panels/gsop>
- Scientific Committee on Oceanic Research (SCOR) Working Group 148  
[http://www.scor-int.org/SCOR\\_WGs\\_WG148.htm](http://www.scor-int.org/SCOR_WGs_WG148.htm)
- Intergovernmental Oceanographic Commission of UNESCO/ International Oceanographic Data and Information Exchange (IOC/IODE) IQuOD Steering Group  
[https://www.iode.org/index.php?option=com\\_content&view=article&id=462:iode-steering-group-for-the-iode-iquod-project&catid=10&Itemid=89](https://www.iode.org/index.php?option=com_content&view=article&id=462:iode-steering-group-for-the-iode-iquod-project&catid=10&Itemid=89)
- Global Ocean Data Assimilation Experiment (GODAE) community
- Program for Climate Model Diagnosis and Intercomparison (PCMDI).
- Japanese sponsors

IQuOD database versions will be publically released as coordinated efforts progress. This current preliminary version 0.1 contains two features that are integral to data quality:

- (i) Assigned uncertainties
- (ii) Intelligent metadata

## 1. Uncertainty values

Uncertainty values are a function mainly of instrument type and platform (ship, float, glider, etc.). Careful consideration of manufacturer specifications and oceanographic practices went into setting the uncertainties. In forthcoming IQuOD database versions, uncertainties will also be a function of institute, country, project, and known processing practices. Uncertainty values were assigned to depth, temperature and salinity measurements along profiles, as summarized in Table 1.

Table 1: IQuOD v0.1 uncertainty assignments

Instrument type	Depth/Pressure	Temperature (°C)	Salinity (unitless, PSS 1978)
Bottle/reversing thermometer	5%	0.02	----
CTD (pre-1980)	0.8%	0.01	0.02
CTD calibrated (post-1980)	0.015%	0.002	0.002
CTD animal mounted	----	0.005	----
CTD towed	----	0.01	----
DBT	----	0.05	N/A
Drifting buoy	----	0.01	----
Glider	----	0.002	----
MBT	3%	0.3	N/A
MBT deployed from Soviet Union flagged ships	3%	0.1	N/A
MicroBT	----	0.002	N/A
Moored buoy	N/A	0.3	----
Profiling floats (pre-Argo)	----	0.005	----
Profiling floats (Argo <sup>***</sup> )	2.4 m/dbar	0.002	0.01
STD	----	0.002	----
XBT unknown manufacturer/type	<230 m: 4.6 m >230 m: 2%	0.2	N/A
XBT deployed from submarines or Tsurumi-Seiki Co (TSK) manufacturer	<230 m: 4.6 m >230 m: 2%	0.15	N/A
XBT Sippican manufacturer	<230 m: 4.6 m >230 m: 2%	0.1	N/A
XCTD (pre-1998)	4%	0.06	0.08
XCTD (post-1998)	2%	0.03	0.03
UOR	----	0.01	----

---- Pending assignment

N/A Not applicable

<sup>\*\*\*</sup> 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.

## 2. Intelligent metadata

Metadata are required information that allows for proper correction of known biases (e.g., sensor drifts) in subsurface ocean observations (e.g., Chen et al., 2016). Historically, however, many ocean temperature profiles were included in the global database without metadata. For the dominant instrument type, XBTs, about 50% of their profiles are missing metadata (Abraham et al., 2013), such as manufacturer, probe type and depth equation (to calculate depth from elapsed time). To minimize this problem, IQuOD has developed an “Intelligent Metadata” algorithm to use known information about a probe (deploying country, year, maximum depth) to infer the missing metadata, as detailed in Palmer et al. (2018).

### NOTE

IQuOD quality flagging has not yet been implemented in v0.1. Therefore, for this IQuOD v0.1 quality-control flagging is from the World Ocean Database system or, when available, from the data originators system.

### REFERENCES

Abraham, J. P., et al. (2013), A review of global ocean temperature observations: Implications for ocean heat content estimates and climate change, *Rev. Geophys.*, 51, 450–483, doi:10.1002/rog.20022. OPEN ACCESS: <http://onlinelibrary.wiley.com/doi/10.1002/rog.20022/epdf>

Chen, L., et al. (2016). XBT science – Assessment of instrumental biases and errors. *BAMS*, 923-933. OPEN ACCESS: <https://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-15-00031.1>

Palmer, M., T. Boyer, R. Cowley, S. Kizu, F. Reseghetti, T. Suzuki, and A. Thresher, 2018: An algorithm for classifying unknown expendable bathythermograph (XBT) instruments based on existing meta data. *J. Atmos. Oceanic Technol.* doi:10.1175/JTECH-D-17-0129.1, in press <https://journals.ametsoc.org/doi/abs/10.1175/JTECH-D-17-0129.1>

### FEEDBACK

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