**IQuOD Version 0.1 – 16 March 2018**

IQuOD (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 freely distribute the most globally complete, consistent and highest quality historical ocean temperature (and other physical tracers) profile database, along with 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
- ScientificCommittee on Oceanic Research (SCOR) Working Group 148 http://www.scor-int.org/SCOR_WGs_WG148.htm , funded by national SCOR committees and a grant to SCOR from the U.S. National Science Foundation (Grant OCE-1546580)
- 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
- Global Ocean Data Assimilation Experiment (GODAE) community
- Program for Climate Model Diagnosis and Intercomparison (PCMDI).
- Australian Government's National Environmental Science Program through the Earth Systems and Climate Change Hub
- Ministry of Environment of Japan, and Environmental Restoration and Conservation Agency of Japan (The Environment Research and Technology Development Fund [2-1506]

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) Intelligent metadata

(ii) Assigned uncertainties

## 1. Uncertainty values

Measurement uncertainty is a function mainly of instrument and platform types (ship, float, glider, etc.). Under IQuOD, careful consideration of manufacturer specifications and oceanographic practices went into setting the uncertainties. In future 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 (Conductivity, Temperature, Depth) | 0.08% | 0.01 | 0.02 |
| CTD post-1980 calibrated | 0.015% | 0.002 | 0.002 |
| CTD animal mounted | - - - - | 0.005 | - - - - |
| CTD towed, UOR (Undulating Oceanographic Recorder) | - - - - | 0.01 | - - - - |
| DBT (Digital Bathythermograph) | - - - - | 0.05 | N/A |
| Drifting buoy | N/A | 0.01 | - - - - |
| Glider | - - - - | 0.002 | - - - - |
| MBT (Mechanical Bathythermograph) | 3% | 0.3 | N/A |
| MBT deployed from Soviet Union flagged ships | 3% | 0.1 | N/A |
| MicroBT (Micro Bathythermograph) | - - - - | 0.002 | N/A |
| Moored buoy | - - - - | 0.3 | - - - - |
| Profiling floats (pre-Argo) | - - - - | 0.005 | - - - - |
| Profiling floats (Argo***) | 2.4 m/dbar | 0.002 | 0.01 |
| STD (Salinity, Temperature, Depth) | 5 m | 0.002 | - - - - |
| XBT (Expendable Bathythermograph) manufacturers other than Sippican and TSK and unknown manufacturer/type | ≤230 m: 4.6 m<br>>230 m: 2% | 0.2 | N/A |
| XBT deployed from submarines or Tsurumi-Seiki Co (TSK) manufacturer | ≤230 m: 4.6 m<br>>230 m: 2% | 0.15 | N/A |
| XBT Sippican manufacturer | ≤230 m: 4.6 m<br>>230 m: 2% | 0.1 | N/A |
| XCTD pre-1998 (Expendable Conductivity, Temperature, Depth) | 4% | 0.06 | 0.08 |
| XCTD post-1998 | 2% | 0.02 | 0.03 |

- - - - Pending assignment

N/A Not applicable

*** 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, such as the instrument or recording system type, are required for proper error labelling and the correction of known biases (e.g., sensor drifts) in subsurface ocean observations (e.g., Cheng et al., 2016). Historically, however, many ocean temperature profiles were included in the global database without complete 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).

## NOTES – v0.1

- 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 and, when available, from the data originators system.
- Cheng et al's. (2014) XBT bias correction was applied to the static, archived version of IQuOD v0.1. Through WODselect, a user can apply any of the XBT bias correction choices (Cheng et al., 2016). No MBT bias correction was applied to the static version of IQuOD v0.1.

## REFERENCES


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## FEEDBACK

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