## **International Quality-Controlled Ocean Database**



To maximize the quality, consistency and completeness of the longterm global subsurface ocean temperature database (EOV/ECV). (subsurface profiles | (intelligent) metadata | uncertainty)

To **freely distribute** for use in ocean, climate and Earth system research and services of societal benefit.

#### **One of CLIVAR GSOP's future plans/priorities**



Scientific/Implementation plan: under development. Timeframe: 3-5 years (ultimately dependent on resources/funding)

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## **Expected outcomes (selected)**

- ♦ Free and easy access to the most complete, consistent, high quality, long term subsurface ocean temperature global database (raw profiles and interpolated products), including intelligent metadata and uncertainty.
- Numerous downstream applications of IQuOD products for ocean, climate and Earth system research and high-priority applications/services of societal benefit
  - WMO GCOS Essential Climate and Ocean variables
  - CLIVAR Ocean Climate Indicators
  - CLIVAR Research Foci Initiatives (e.g., CONCEP-HEAT, DCVP)
  - WCRP Grand Challenge on Regional Sea Level Change and Coastal Impacts
- Contribution to IOC IODE & ISCU SCOR objectives Development/implementation of best practices for discovery/management of subsurface ocean observations and metadata, including international standards, QC, open-source software and training/capacity building.

### ♦ Template for future efforts

Historical subsurface salinity observations and other ocean variables (EOVs/ECVs)







Key technical/scientific expertise and infrastructure resources from the international community is being **coordinated into a single best standard practice** 

(currently 17-nation members; mixed expertise/levels of involvement).

Deliverables will be tailored in close collaboration with end-users (e.g., observational, reanalysis/modelling communities and ocean & climate research/services).

**Co-Chairs** Catia Domingues, Matt Palmer (both from CLIVAR GSOP)

### **Steering committee**

Tim Boyer, Rebecca Cowley, Ann Thresher, Simon Good, Susan Wijffels, Gustavo Goni, Janet Sprintall, Alison Macdonald, Toru Suzuki, Steve Diggs, Viktor Gouretski, Charles Sun (including representation from US CLIVAR, CCHDO, Argo, SOT, SOOP, GTSPP, WOD, GODAR, Etc)

Task Team 2 Uncertainty { Formats } (Bec Cowley, John Gould) Task Team 1 GDAC (Tim Boyer)

Task Team 3 Intelligent metadata (Shoichi Kizu, Toru Suzuki)

Task Team 4 **Auto QC** (Mat Palmer Simon Good) Task Team 5 **Duplicates/Expert QC** (Ann Thresher, Ed King)

# Workshop goals

- Update on recent IQuOD activities, particularly SCOR WG 148 and IOC/IODE.
- **Delivery status** of the 1st IQuOD data/flavour version: progress on the development/implementation of intelligent metadata, (random) uncertainty estimates, exact duplicates flagging, platform for Auto QC benchmarking and setting up public delivery.
- Plans towards implementation of further advances for intelligent metadata, uncertainty estimates and duplicates.
- Plans towards benchmarking auto QC procedures using high quality reference datasets.
- Discussion on potential approaches for expert QC & implementation.
- Discussion on potential approaches for implementation of knowledge transfer and capacity building, particularly in developing countries.
- Establishing synergies between IQuOD & XBT science team.
- Reviewing goals and actions for 2017/18 & planning for the <u>5th</u> <u>IQuOD workshop</u>.



# UPDATES

# **Calendar - activities**

2013/06 – 1<sup>st</sup> IQuOD workshop, Hobart, Australia (planning phase)

- 2014/02 IQuOD townhall session at Ocean Sciences Meeting, Honolulu, USA
- 2014/04 IQuOD article at AODN magazine
- 2014/06 2<sup>nd</sup> IQuOD workshop, Washington DC, USA (Auto QC discussion) Parallel Session at GTSPP meeting, Oostend, Belgium Mozilla Science Lab (Simon Good, Bill Mills)
- 2014/07 US CLIVAR summit (Janet Sprintall) PanCLIVAR (Catia Domingues, Matt Palmer)
- 2014/11 CLIVAR GSOP future plans and priorities
- **2015**/03 US CLIVAR follow-up (Janet Sprintall)
- 2015/03 IODE-XXIII recommendation (Toru Suzuki, Charles Sun)
- 2015/04 Endorsement letters data assimilation and clim. model (GODAE, PCMDI)
- 2015/06 Submission SCOR/IAPSO working group proposal IQuOD article submitted to special issue CLIVAR exchanges
- 2015/12 3<sup>rd</sup> IQuOD workshop, Hamburg, Germany (1<sup>st</sup> IODE SG-IQuOD)
- 2016/02 IQuOD session at Ocean Sciences Meeting, New Orleans, USA
- 2016/XX OOPC meeting (Matt Palmer)
- 2016/09 CLIVAR conference (GSOP panel, CONCEPT-HEAT RF, SL, T.Hall Sust. Obs, SSG)
- 2016/10 4<sup>th</sup> IQuOD workshop, Tokyo, Japan (2<sup>nd</sup> IODE SG-IQuOD; 1<sup>st</sup> SCOR WG148)
- 2016/XX Release IQuOD v0.1 (interim product)

# IOC – IODE

### (talk on tuesday by Prof Michida Yutaka)



The programme "International Oceanographic Data and Information Exchange" (IODE) of the "Intergovernmental Oceanographic Commission" (IOC) of UNESCO was established in 1961. Its purpose is to enhance marine research, exploitation and development, by facilitating the exchange of oceanographic data and information

between participating Member States, and by meeting the needs of users for data and information products.

http://iode.org/





# IODE – IQuOD

May, 2015

Annex B to Recommendation IODE-XXIII.3

#### Terms of Reference of the IODE Steering Group for the IODE IQuOD Project

**Objectives** 

The SG-IQuOD shall:

- i. Develop scientific and implementation plans;
- ii. Convene workshops, and advise and review the work of sub-groups;
- iii. Promote collaboration between the related IODE projects: WOD, GODAR, GTSPP and MCDS;
- iv. Provide reports to the IODE Committee.

#### **Membership**

The initial membership of the group will include Ms Rebecca Cowley, Ms Ann Thresher, Ms Susan Wijffels, Ms Catia Domingues; Mr Simon Good, Mr Matt Palmer; Mr Toru Suzuki; Mr Viktor Gouretski; Mr Tim Boyer, Mr Gustavo Goni, Ms Janet Sprintall, Ms Alison Macdonald and Mr Charles Sun.

Details

Created on: Tuesday, 05 May 2015 12:16 Last Updated on: Tuesday, 05 May 2015 12:32



# ICSU – SCOR

The International Council for Science (ICSU) formed the Special Committee on Oceanic Research (SCOR) in 1957 to help address interdisciplinary science questions related to the ocean. SCOR was the first interdisciplinary body formed by ICSU. SCOR's name was later changed to "Scientific Committee on Oceanic Research" to reflect its more permanent status.

SCOR is an international non-governmental non-profit organization. The SCOR Secretariat is hosted at the University of Delaware (USA) and SCOR is incorporated in the State of Maryland as a 501(3)(c) organization.

SCOR activities focus on promoting international cooperation in planning and conducting oceanographic research, and solving methodological and conceptual problems that hinder research. SCOR covers all areas of ocean science and cooperates with other organizations with common interests to conduct many SCOR activities.

SCOR also conducts several different activities to build the capacity for ocean science in developing countries and every SCOR acivity includes members from developing countries.

Scientists from thirty-two nations have formed national SCOR committees as a foundation for international SCOR. Approximately 250 scientists from 38 countries currently participate in SCOR activities.

http://www.scor-int.org/



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# SCOR-IQuOD Working Group 148 Membership

- June 2015 | December 2015 | April 2016 | 3 out 10
- 3-year SCOR-IQuOD WG 148 | 15K/year\* | workshops
- 10 full members\* (balance expertise, gender, country) (1 India, 2 USA, 1 Argentina, 2 Australia, 1 Germany, 1 France, 1 Japan, 1 UK; 5 females)

### 10 associated members

(1 China, 1 Brazil, 1 Australia, 1 Russia, 1 UK, 1 USA, 1 South Africa, 1 Spain, 1 Mexico, 1 Japan; 2 females)



# **SCOR-IQuOD Working Group 148**

Scientific Committee on Oceanic Research 📷 and the second sec About SCOR SCOR Science Capacity Building Administration SCOR Working Group 148 International Quality Controlled Ocean Database: Subsurface temperature profiles (IQuOD) Co-chairs: Catia Domingues (Australia) and Matt Palmer (UK) Other Full Members: TVS Udaya Bhaskar (India), Tim Boyer (USA), Marcela Charo (Argentina), Christine Coatanoan (France), Viktor Gouretski (Germany), Submitting a Proposal Shoichi Kizu (Japan), Alison Macdonald (USA), and Ann (Gronell) Thresher Meeting Planning (Australia) Instructions Associate Members: Lijing Cheng (China-Beijing), Mauro Cirano (Brazil), Rebecca Cowley (Australia), Sergey Gladyshev (Russia), Simon Good (UK), **Travel Instructions** Francis Bringas Gutierrez (USA), Katherine Past Groups Hutchinson (South Africa), Gabriel Jorda (Spain), Sergio Larios (Mexico), and Toru Suzuki (Japan) Follow on Twitter: Terms of Reference @SCOR\_Int 1. To develop, implement and document algorithms for a ssignment of "intelligent" metadata - i.e. an informed guess as to likely values for miss ing information - for temperature profiles where crucial metadata is missing. 2. To evaluate and document the most effective combina tion of automated quality control (AutoQC) procedures for temperature profile observa tions. International collaboration will be required for the design and coordination of benchma rking experiments using high quality reference datasets. 3. To establish and implement a set of optimal automat ed quality control procedures, by reaching international community consensus and usin g the knowledge gained in the benchmarking tests from ToR-2 (above); to produce a nd publish a reference guide for best practices in automated quality control of ocean tem perature profiles; and to develop and freely distribute an open-source quality control so ftware toolkit to promote wide and rapid adoption of best practices by the oceanographic com munity. 4. To examine and document the feasibility of machine learning and other novel computational methods for enhanced quality control, to potentiall y minimize labor costs associated with human expert quality control procedures 5. To develop, implement and document internationally agreed best practice methods for assignment of uncertainty estimates to each tempera ture observation 6. To freely disseminate (interim) versions of the IQu OD global temperature profile database (and added value-products) as it evolves over the n ext 3 years, in user-friendly file formats. 7. To share knowledge and transfer skills in instrumen tation, regional oceanography, quality control procedures and data stewardship with intern ational scientists in both developed and developing nations. Approved: December 2015 Financial Sponsors: SCOR, NSF

http://www.scor-int.org/SCOR\_WGs\_WG148.htm



SCOR-IQuOD Working Group 148 Timeline / Workplan

Year 1:

It will focus on the development and delivery of **'first cut' algorithms for intelligent metadata** and **random error assignments**. Coding up of all partner **AutoQC procedures** in a standard, open-source programming language (python) and include **exact duplicates check**.

Version 1 of the IQuOD database will include intelligent metadata, initial uncertainty estimates and exact duplicates removed.

The first **SCOR WG148 meeting (JAMSTEC, Tokyo, 3-5 October 2016)** will focus on achieving an agreed roadmap to progression of these tasks & delivery of 1<sup>st</sup> IQuOD dataset version (WOD "flavour").



### Year 2:

It will focus on the **benchmarking of the various AutoQC procedures** using a number of high quality regional reference data sets.

Benchmarking analysis will identify the most effective combination of AutoQC checks and the work will be submitted to an open access scientific journal.

The AutoQCed database, in combination with any advances in random error and intelligent metadata assignment, will constitute version 2 of the IQuOD database.

The 2<sup>nd</sup> SCOR WG148 meeting will serve to discuss the outcomes of Year 1, to share the results of the benchmarking tests and to provide an international forum for a consensus on best practices for AutoQC procedures for temperature observations.



### Year 3:

It will focus in the **preparation and submission of scientific papers related to the AutoQC benchmarking exercise**; on the publication of **version 3 of the IQuOD database** with updates and improvements from the previous two years, including related documentation (reference guides and software tools).

We will also be report on the feasibility of using machine learning (or other novel computational) methods for the **expert quality control step**, through publication of a discussion article.

The 3<sup>rd</sup> SCOR WG148 meeting will be organized as a large international workshop for knowledge transfer and capacity building, to encourage rapid and wide adoption of best standards for quality control of historical temperature profile data, inclusion of intelligent metadata and uncertainty. We will also seek additional funding sources to ensure maximum international participation, particularly from developing countries not yet involved in IQuOD.



### **Experts and users from various institutions across 17 nations**





www.iquod.org

# mozilla Science Lab

Join our software collaboration

Visit <u>collaborate.mozillascience.org/projects/autoqc</u> to find out more about our open source software development project with Mozilla Science Lab and to take part.





### **Barrier: missing metadata & original high-resolution profiles**



**Figure 2.** Total number of shallow (dark blue) and deep (deep red) XBT profiles per year and the number of these for which the type is unknown (shallow = light blue; deep = orange).

Abraham et al. (2013)

### Pilot test: expert manual QC reveals warm biases



World Ocean: about 1.5 million BAD temperature profiles