

ANMN QC Summit meeting

Venue: Freycinet Room, Building 1
CSIRO Marine and Atmospheric Research
Castray Esplanade, Hobart Tasmania

10-12 December 2013

DAY 1 – ADCPs

PRESENTATIONS:

- 1) 0930: Welcome and development of workshops and working groups for QC procedures across the ANMN (*Tim Lynch - 5 mins + 5 mins discussion*)
- 2) 0940: Introduction and Terms of Reference ADCP working group (*Craig Steinberg and Bec Cowley - 5 mins + 5 mins discussion*)
- 3) 0950: **IMOS Toolbox QC overview** (*Guillaume Galibert - 5 mins + 5 mins discussion*)
- 4) 1000: **Case study 1- Deep** (*Bec Cowley - 30 mins + 10 mins discussion*)

1040: MORNING TEA (20 mins)

- 5) 1100: **Case study 2 – Shelf** (*Alessandra Mantovanelli - 30 mins + 10 mins discussion*)
- 6) 1140: **Case study 3 – Coastal / Macro tidal/turbid** (*Craig Steinberg - 5 mins + 5 mins discussion*) (Events of Interest: Internal waves, Significant weather, turbulence)
- 7) 1150: **Uptake – ADCP data and QC: users perspective** (*David Griffin – 20 min*)
- 8) 1210:- **QARTOD response & lessons for IMOS** (*Craig Steinberg and Guillaume Galibert 10mins + 10mins discussion*)

1230: LUNCH (1 hour)

DISCUSSIONS:

- 9) 1330: ADCP workshop - Session 1 (*Craig Steinberg*)
 - The need for an expert working group
 - Where to from here?
 - Toolbox development and priorities
 - Calibration

1515: AFTERNOON TEA (15 minutes)

- 10) 1530: ADCP workshop - Session 2 (*Craig Steinberg - 40 mins*)
 - Real time QC
 - Waves and secondary products
- 11) Sub-facility leaders meeting – (offsite)

Half page summary- IMOS ADCP working group

Term of reference

To develop an integrated and scientifically robust strategy for the calibration, validation and interpretation of ADCP data, as collected by IMOS facilities

Expert Working Group Members

The group is tasked with evaluating and recommending what QC and QA should be applied to the IMOS collected data. Representatives are drawn from regional nodes and sub-facilities however input from experts from industry and manufacturers are welcome. Reports will be to the IMOS science nodes which incorporate the broader science community.

Current nominations from node and ANMN sub-facility leaders are:

	Sub-facility/node	Institution	Location
Rebecca Cowley	ABOS	CSIRO	Hobart
David K Williams / Ale Mantovanelli	QNA	AIMS	Darwin
Sotirios Kioroglou	NSW-IMOS	UNSW	Sydney
Charles James	SAIMOS	SARDI	Adelaide
Ian Darby / Dirk Slawinski	WAIMOS	CSIRO	Perth
Guillaume Galibert	eMII	Utas	Hobart
Shavawn Donoghue	IMOS	Utas	Hobart

If you believe others should be included here then please Craig know c.steinberg@aims.gov.au

Meetings

Quarterly teleconference?

Annual in person, Possibilities:

- ANMN QC meeting Dec 13 2013
- AMOS/AMSA fringe?

Reference Documents:

IMOS toolbox QC procedures

<http://code.google.com/p/imos-toolbox/wiki/QCProcedures>

A store of reference documents is provided at the following ftp area.

ftp://dataupload.emii.org.au/pub/ADCP_QC_Documentation/

Please contact Guillaume.Galibert@utas.edu.au to arrange uploads.

DAY 1 - Alternative session – BGC database training – Huon Room

- 1) 0930: Welcome and development of workshops and working groups for QC procedures across the ANMN (*Tim Lynch*) (5 mins + 5+ mins discussion)

Move rooms to the Huon Room

- 2) 0950: Uploading data to the BGC oracle database - Workshop session 1 – Deep (*Claire Davies and Margaret Miller*)

1030: MORNING TEA (20 mins)

- 3) 1050: Uploading data to the BGC oracle database - Workshop session 2 – Deep (*Claire Davies and Margaret Miller*)

1230: LUNCH (1 hour) – move back to Freycinet Room

ANMN QC Summit meeting

Venue: Freycinet Room, Building 1
CSIRO Marine and Atmospheric Research
Castray Esplanade, Hobart Tasmania

10-12 December 2013

DAY 2 – Satellite Calibration and Validation work and BGC database

- 1) 0930: Bio-Optics working group – Satellite Calibration and validation workshop Session 1
(*Martina Doblin*)

Aim: Improve the ANMN mission for satellite validation and calibration

Sampling design

Sensors locations

- On the mooring
- Geographically

Operational constraints

Scientific rationale for validation of satellite products

Finance – let's write some grants with extensive in-kind

1030: MORNING TEA (20 mins)

- 3) 1050: Bio-Optics working group – Satellite Calibration and validation workshop Session 2
(*Martina Doblin*)

Sampling design BGC

BGC sampling

1230: LUNCH (1 hour)

- 4) 1330: Using and QC for the BGC Oracle database workshop – Session 1 (*Claire Davies and Margaret Miller*)

1510: AFTERNOON TEA

- 5) 1530: Using and QC for the BGC Oracle database workshop – Session 2 (*Claire Davies and Margaret Miller*)

- Half page summary**
- Martina's to come
 - BGC database (Claire Davies)

We will start by running through a schematic of the database and the relationships between trips, samples and metadata.

The BGC database now includes the metadata, zooplankton, phytoplankton, carbon, salinity, nutrients, TSS and pigments data from the NRS sampling. The flow cytology data has recently become available and we are in the process of including this. The CTD data is not yet included in the BGC database. This data will first be QC'd by the IMOS toolbox. Once this has been done the data can be uploaded into the BGC database as a netcdf file from the data portal.

Each analyst will be trained to upload all of the data they are likely to process into the database. Each analyst will also be able to query / download their data at any point and so won't need to keep manually updating individual spreadsheets. BGC data will automatically be exported to eMII on a daily basis.

We will run through the list of QC checks in the database. We will describe the features and what they are designed to do. Some checks prevent certain data being entered, some may only provide a warning that a limit has been exceeded. We will be asking for feedback on the QC checks included and suggestions for additional checks.

We will ask for input on some of the QC checks, i.e. acceptable values for regional ranges. Some of the data uploaded does not have a QC flag so we will be explaining the IMOS QC flag system and working with the appropriate analysts to assign flags to all data.

ANMN QC Summit meeting

Venue: Freycinet Room, Building 1
CSIRO Marine and Atmospheric Research
Castray Esplanade, Hobart Tasmania

10-12 December 2013

DAY 3 – Profiling CTD and Matlab toolbox

- 1) 0930: Profiling CTD workshop (*Val Latham, Rob Kay and Cristian MunozMas - 45mins*)
- 2) 1015: ANFOG CTD and Oxygen data improvements (*Claire Gourcuff - 15 mins*)

1030: MORNING TEA (20 mins)

- 3) 1050: Matlab toolbox update and workshop (*Guillaume Galibert – 50 mins*)
- 4) 1140: Matlab toolbox discussion – priorities for development (*Guillaume Galibert and Craig Steinberg – 50 mins*)

1230: LUNCH (1 hour)

- 5) 1330: Comparing two semi-autonomous QC systems (Matlab toolbox and Fuzzy logic) to an expert oceanographer (Morello et al submitted) – (*Tim Lynch – 20 mins*)
- 6) 1350: Experiment with graded flags, and creation of burst-averaged WQM data products the burst-averaged WQM product (*Monique Breslin and Marty Hidas - 50mins*)
- 7) 1440: a) "Measurement uncertainties" -- i.e. estimating "error bars" for each measured value
b) "WQM pathological time-stamping" -- some WQM files have timestamps jumping back & forth over a large range, well outside the duration of the deployment.
(*Monique Breslin and Marty Hidas - 50mins*)

1530: AFTERNOON TEA (20 mins)

- 8) 1550: Future development of QC procedures and close – (*Tim Lynch*)

- Half page summary**
- Val's to come
 - Cristian – IMOS Profiling CTD Data

**IMOS Profiling CTD Data:
Implementation of an Automated Post-Processing Method**
Cristian Munoz Mas¹, Greg Coleman¹, Craig R. Steinberg¹, Felicity McAllister¹, Paul Rigby¹, John Luetchford¹, Chris Bartlett¹, Juergen Zier¹ and Mederic Mainson¹

¹ Australian Institute of Marine Science, Townsville, AUSTRALIA.

email: c.munozmas@aims.gov.au

Keywords: CTD post-processing, Quality Control, standardized automated process, IMOS toolbox.

Profiling CTD data generated within a number of IMOS facilities and the broader observing community. The data are used primarily to ascertain the vertical water column structure and help validate the data provided from instruments moored for long intervals. There is a need to standardize the profiling CTD post-processing method in order to allow multiple users from different institutions to process these data in an automated way and to help minimise errors and to save operator time.

This presentation describes a wrapping script that implements processing standards described by Ingleton et al. (2012). This utilises the batch processing capability provided by the Sea-Bird Electronics routines.

The CTD profile post-processing method can be considered to be applying some QC though it also alters the data through processes such as alignment and binning. The toolbox QC could then apply a subset of the Morello et al (2011) QC however those routines were primarily designed to apply to moored time series data. The two data types need to be distinguished and treated separately by the toolbox. The toolbox also performs the documenting of metadata and reformatting to netCDF and file naming to IMOS standards.

Items for discussion include:

- Whether or not the Sea-Bird procedure be incorporated into the toolbox or not.
- The need to archive and make available the raw (hex,xml) files, (cnv,xml) (as sampled and binned) files, netCDF level FV00 data (as un-binned?) netCDF and a new FV01 netCDF incorporating the Morello QC.
- netCDF documenting of pre-processing steps undertaken via the toolbox.

References

Ingleton, T. et al., (201) NRS-BGC ANMN Standardised Profiling CTD Data Post-Processing Procedures v.1.5, IMOS , March 2012.

Morello, E. B.; Lynch, T.P.; Slawinski, D.; Howell, B.; Hughes, D.; Timms, G.P., "Quantitative Quality Control (QC) procedures for the Australian National reference stations: Sensor data," *OCEANS 2011* , vol., no., pp.1,7, 19-22 Sept. 2011

Matlab toolbox

* New supported instruments :

- SBE56.
- SBE16plus.
- RBR TDR/TWR 2050.
- WETLabs ECO triplet.
- Sensus Ultra.
- Nortek Aquadopp Velocity ADCP.
- Star ODDI Starmon mini.
- Nortek AWAC ADCP wave data.
- RDI Workhorse ADCP wave data.

* Major bug fixes for output data :

- Nortek ADCP bins vertical positions corrected.
- ADCP data is now properly referenced either to magnetic North or true North.
- ADCP measured parameters are now better described.

* QC :

- Improved version of imosImpossibleDepthQC procedure.

* New features :

- Able to read and output CTD profile data.
- Plot any variable recorded on more than 2 instruments on a mooring for all of them during the deployment time period.
- QC procedures and their parameters, plus statistics on QC results are detailed graphically.
- x86_64 architecture is supported for Windows and Linux in addition to the already existing x86 support for Windows.
- UCanAccess opensource JDBC driver provided.
- Gibbs-SeaWater toolbox (TEOS-10) replaces the CSIRO SeaWater library (EOS-80).
- Magnetic declination can be computed with Geomag v1.7 and then applied when relevant.
- Data is output in NetCDF4 with compression enabled and relevant data type (double, single precision, bytes...).
- Parameters definitions and units can be displayed as a tooltip.

Comparing two semi-autonomous QC systems (Matlab toolbox and Fuzzy logic) to an expert oceanographer (Morello et al submitted)

The National Reference Station (NRS) network, part of Australia's Integrated Marine Observing System (IMOS), is designed to provide baseline multi-decadal time series that are required to understand how large-scale, long-term change and variability in the global ocean are affecting Australia's coastal ocean ecosystems. High temporal resolution observations of oceanographic variables are taken continuously across the network's 9 moored stations using a Water Quality Monitor (WQM) multi-sensor which comprises a conductivity temperature and depth sampler, oxygen sensor and a combined fluorometer and turbidity sensor. Data collected at the stations are made freely available to the scientific community and the general public and thus need to be assessed to ensure their consistency and fitness-for-use prior to release. Here, we describe a series of Quality Control (QC) guidelines that have been developed and implemented as a standardised software suite to provide QC flags for these data. In addition to our flag system of QC we also describe an experimental 'fuzzy logic' approach to assessing data. This approach extends the qualitative pass/fail approach of the QC flags to a quantitative system that provides estimates of uncertainty around each data point. Using a sub-set of preliminary temperature observations from the NRS network we ran both our semi-automated flag and fuzzy logic QC methods across the data and also had an expert oceanographer (KRR), who is highly experienced with the study sites,

undertake an independent manual quality control assessment. We then compared results across these three methods. The qualitative flag and fuzzy logic QC assessments were shown to be highly correlated and capable of flagging samples that were clearly erroneous. In general, however, the quality assessments of the two QC schemes did not accurately match those of the oceanographer, with the semi-automated QC schemes far more conservative in flagging samples as 'bad'. This may be a result of the high degree of independence of the semi-automated systems that can't take into account broader temporal and/or spatial contexts compared to an experienced oceanographer. This result exposes us to the quandary of Big Data, as due to the large amount of data now being generated; expert QC also imposes large costs. The conservative nature of the semi-automated systems does, however, provide a solution for QC with a known risk. Our software systems should thus be seen as robust low-pass filters of the data with subsequent expert review of data flagged as 'bad' to be recommended.