

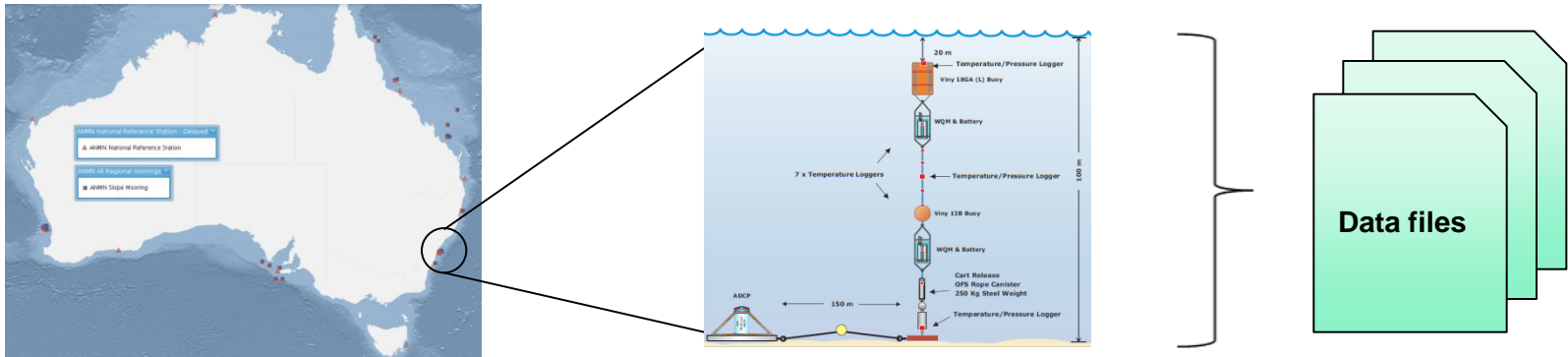


ANMN IMOS-Toolbox Workshop

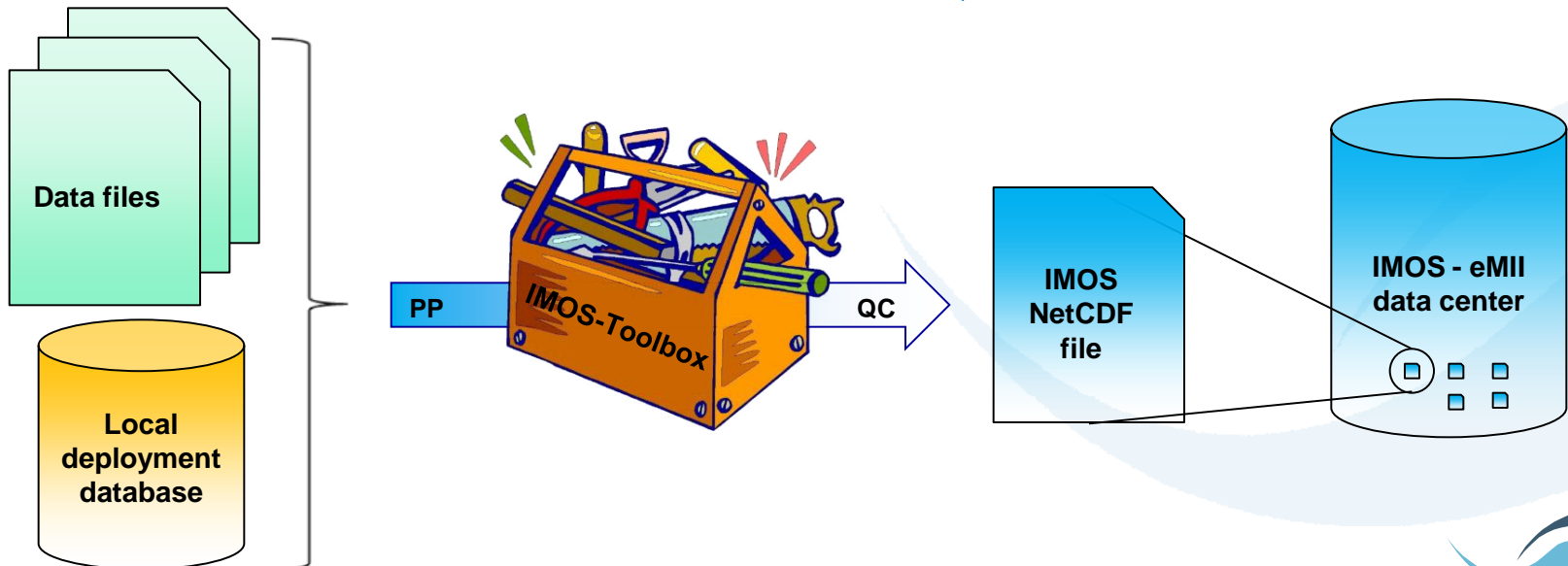
IMOS-Toolbox Workshop

- Introduction
- What happened since the last QC summit?
- Automated QC procedures & CTD casts ?
- IMOS toolbox live demo

Context



Convert data files from ANMN sensors to
IMOS NetCDF QC'd files



Update since last QC summit Aug. 2012

- Toolbox versions 2.2 and 2.3b.
- CTD timeseries QC working group.
- November 2013 : Morello et al. “Quality Control (QC) procedures for Australia's National Reference Station's Sensor Data - comparing semi-autonomous systems to an expert oceanographer” submitted to Methods in Oceanography.

New since toolbox v2.1b - General

- “Profile” mode for SBE19 and RBR XR CTDs
- Operating Systems specific standalones :
 - Windows 32-bit
 - Windows 64-bit
 - Linux 64-bit
- UCanAccess JDBC included to query MS-Access DDB
- Gibbs-SeaWater toolbox (TEOS-10)

New since toolbox v2.1b - Parsers

- New supported instruments :

- Nortek Aquadop current metre
- WETLabs ECO Triplet
- SBE56 and SBE16plus
- RBR TDR/TWR 2050
- SENSUS Ultra
- Starmon Mini Star ODDI

- ADCP wave data :

- Nortek AWAK
- RDI Workhorse

- Important ADCP fixes :

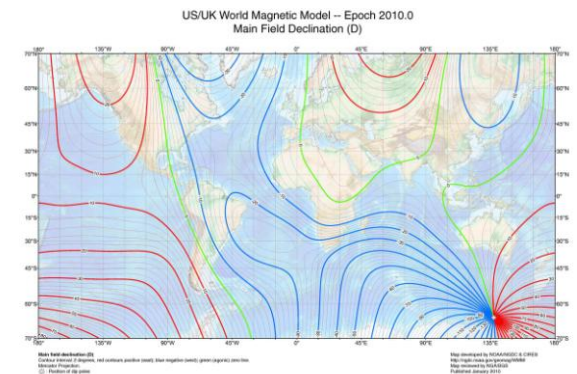
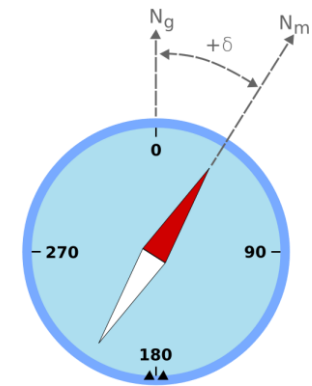
- Nortek bins vertical positions corrected
- Data is referring to magnetic or True North
- ADCP parameters definitions

New since toolbox v2.1b - Pre-processing

- `timeOffsetPP` supported in profile mode

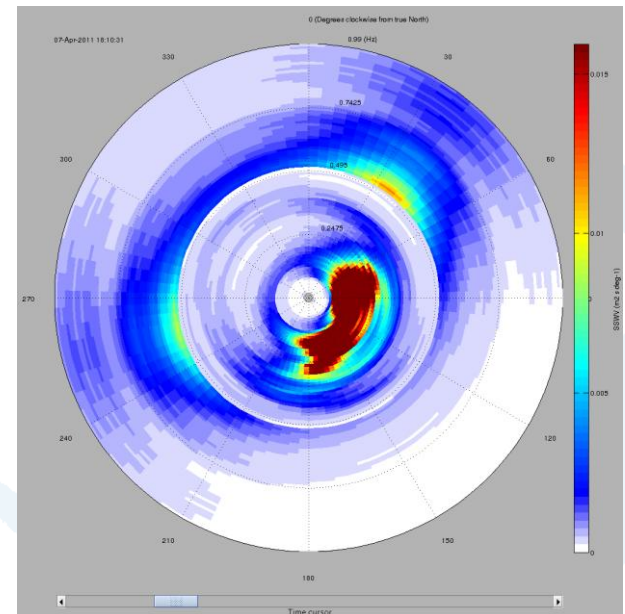
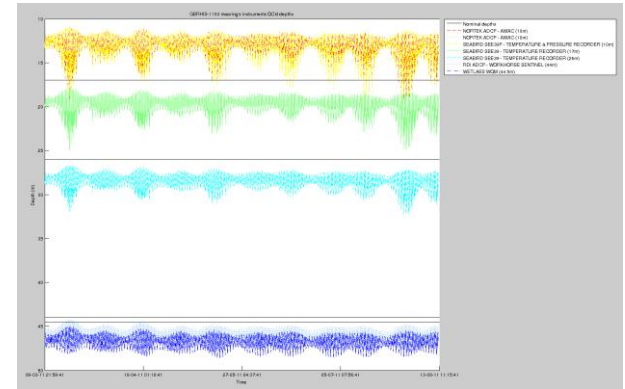
- `magneticDeclinationPP` :

- Computes relevant magnetic declination
 - X = mooring actual longitude
 - Y = mooring actual latitude
 - Z = instrument nominal depth
 - T = start date + (end date – start date)/2
- Software = Geomag v7.0
- Model = IGRF11



New since toolbox v2.1b - Display

- GUI is fully resizable
- New tooltip for parameters definitions and units
- New menu
 - Link to IMOS Toolbox's Wiki
 - Plot any common parameter from deployment
- New polar type plot to display wave spectrum data



New since toolbox v2.1b – Quality Control

- First Official IMOS set of automated QC procedures for CTD timeseries
- QC procedures run in sequence and flags updated when greater
- Global attribute `quality_control_log` :
 - QC procedure performed
 - Settings
 - Flag results
- “QC stats” table displays QC settings and results
- `imosTeledyneSetQC` updated (Symonds 2006) thanks to R. Cowley
- `imosImpossibleDepthQC` re-written

From toolbox v2.1b to 2.3b – NetCDF

- Variables/dimensions are now output according to their data type (default is float in v2.2)

→ Up to 50% decrease in size

- NetCDF 4 files with compression level 1 enabled in v2.3b

→ Up to another 70% decrease in size

- FV00 files don't have any ancillary QC variables in v2.3b

Toolbox	Deployment	Size in Mb	Reduction in %
2.1b	5139-Heron_South	559	
2.2	5139-Heron_South	326	42
2.3b	5139-Heron_South	126	78

IMOS Toolbox Automated QC procedures

- First Official IMOS set of automated QC procedures for CTD timeseries
- QC working group identified for ADCP current data
- QC for CTD profiles?

CTD profiles QC procedures?

ANMN Standardised Profiling CTD Data Post-Processing Procedures v. 1.5 (T. Ingleton, B. Morris – March 2012) :

“The Matlab TOOLBOX is to be used to QAQC the data files. Its function is to read in the processed SEABIRD data file and then automatically flag data points relative to “regional climate” filters developed for each station (currently being developed for each node – see Morello et al, 2011).”

“Currently, none of the Pre-Run Profiling CTD Check data (see **Pre-Run Check and Field Sampling CTD Procedural Guide v. 1.1, 9 November 2011**) are applied, however, it is envisaged that this QAQC information may be able to be incorporated and applied in future Toolbox versions.”

CTD profiles QC procedures?

QC procedure	Variables flagged (* can be extended by user)	Paramet erized	Pass flag	Fail flag
Impossible date	TIME	Yes	Good	Bad potentially correctable
Impossible location	LATITUDE, LONGITUDE	Yes, and per site	Good	Bad potentially correctable
In/out water	All	No	Non QC'd	Bad
Global range	TEMP, PSAL, PRES/DEPTH, DO, CHL-A *	Yes	Good	Bad
Regional range	TEMP, PSAL, DO *	Yes, and per site	Good	Bad
Spike	TEMP, PSAL, PRES/DEPTH, DO, CHL-A *	Yes	Good	Bad potentially correctable
Climatology test ?	TEMP, PSAL, DO *	Yes	Good	Bad potentially correctable

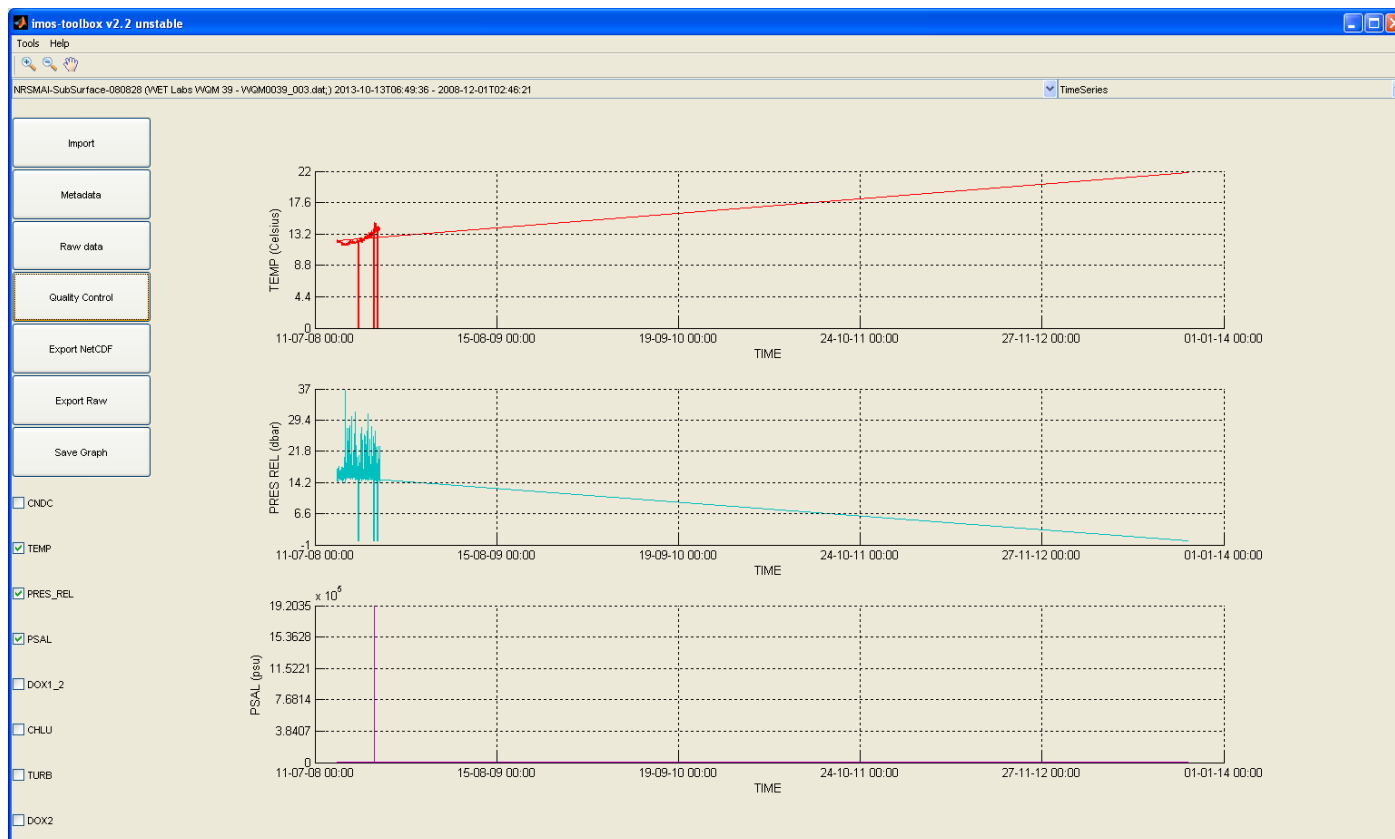
Impossible date test

The recorded time in a file takes place after a minimum valid date and after a maximum valid date. TIME is flagged, not the PARAMETERS. Default values are :

01 Jan. 2007 <= TIME <= today

PASS : GOOD

FAIL : PROBABLY BAD



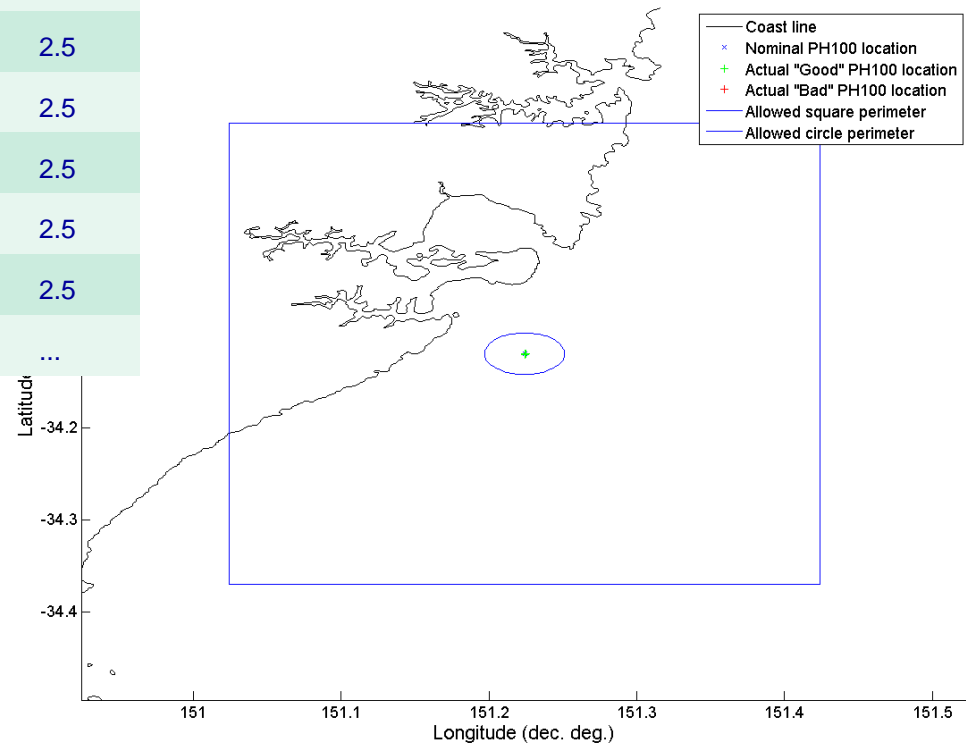
Impossible Location test

Actual position of a mooring is in a box or circle centred on the site nominal location :

Site	Nominal longitude	Nominal latitude	Box +/- in Longitude	Box +/- in Latitude	Circle radius (km)
NRSMAI	148.2333	-42.59667	0.2	0.25	2.5
NRSNSI	153.58	-27.389	0.2	0.25	2.5
NRSKAI	136.4473	-35.83217	0.2	0.25	2.5
NRSESP	121.85	-33.93333	0.2	0.25	2.5
NRSROT	115.4167	-32	0.2	0.25	2.5
NRSNIN	113.947	-21.86652	0.2	0.25	2.5
NRSDAR	130.7681	-12.4	0.2	0.25	2.5
NRSYON	147.6184	-19.30847	0.2	0.25	2.5
NRSPHB	151.25	-34.08333	0.2	0.25	2.5
...

PASS : GOOD

FAIL : PROBABLY BAD



In / out water test

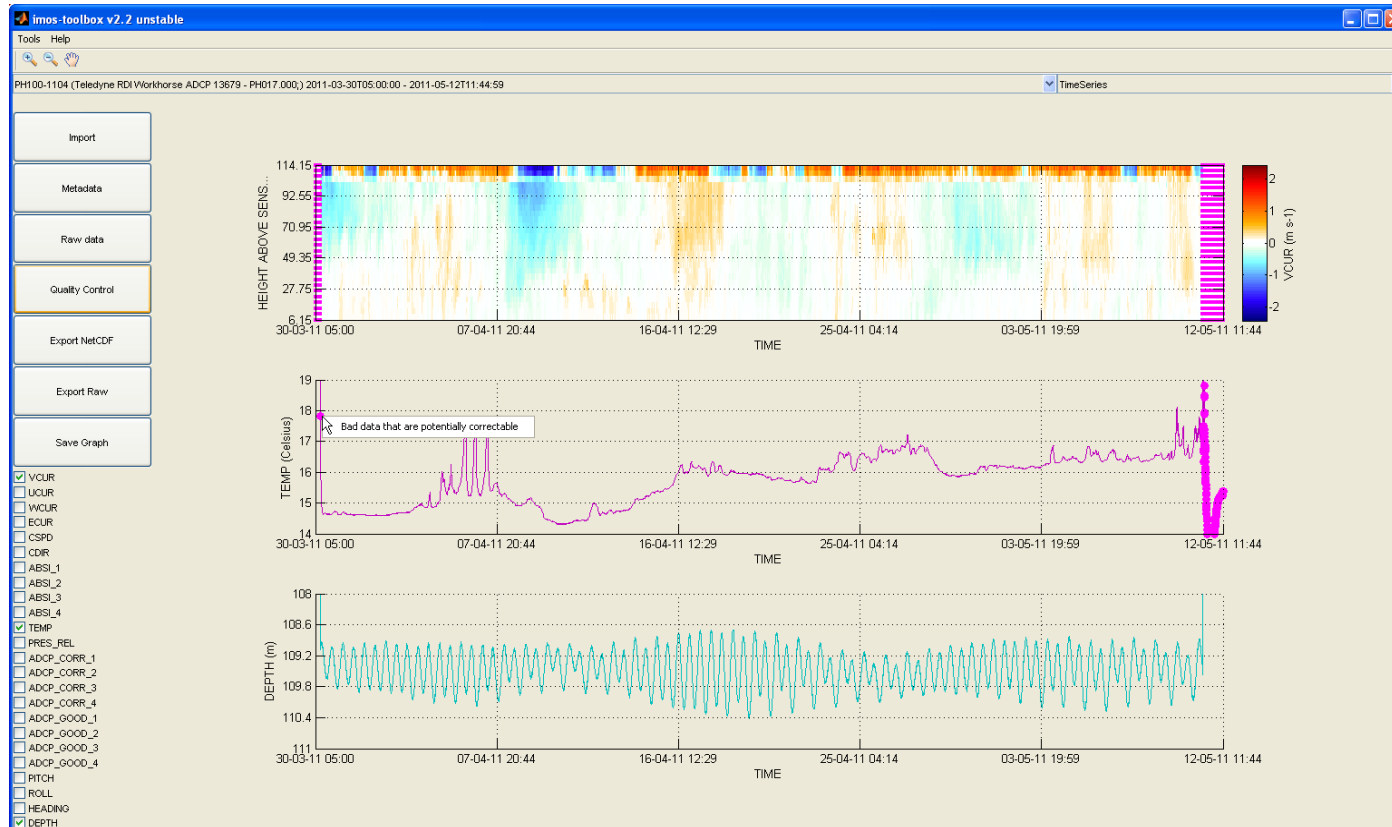
Anything outside a specified time period fails the test.

PASS : non QC'd

FAIL : **BAD**

In / out water date & time are taken from the ddb by order of preference :

1. Time first / last in position
2. Time first wet / back on deck
3. Time switched on / off



Global range test

Each listed parameter has its values compared to global upper and lower valid values :

PASS : GOOD

FAIL : BAD

IMOS parameter	CF title	Unit	Valid min	Valid max	Source
TEMP	Sea water temperature	Celsius	-2.5	40	ARGO Quality control manual v2.7 (Jan. 2012)
PSAL	Sea water salinity	PSU	2.0	41	ARGO Quality control manual v2.7 (Jan. 2012)
PRES	Sea water pressure	dbar	5	12 010	ARGO Quality control manual v2.7 (Jan. 2012)
PRES_REL	Sea water relative pressure	dbar	-5	12 000	ARGO Quality control manual v2.7 (Jan. 2012)
DEPTH	Depth	m	-5	12 000	ARGO Quality control manual v2.7 (Jan. 2012)
DOX1	Mole concentration of dissolved molecular oxygen in sea water	umol/l	0	900 000	MyOcean - Real Time Quality Control of biogeochemical measurements v1.0 (Jan. 2011)
DOX2	Moles of oxygen per unit mass in sea water	umol/kg	0	880 000	MyOcean - Real Time Quality Control of biogeochemical measurements v1.0 (Jan. 2011)
CPHL, CHLU, CHLF	Mass concentration of chlorophyll in sea water	mg/m3	0	100	MyOcean - Real Time Quality Control of biogeochemical measurements v1.0 (Jan. 2011)
...

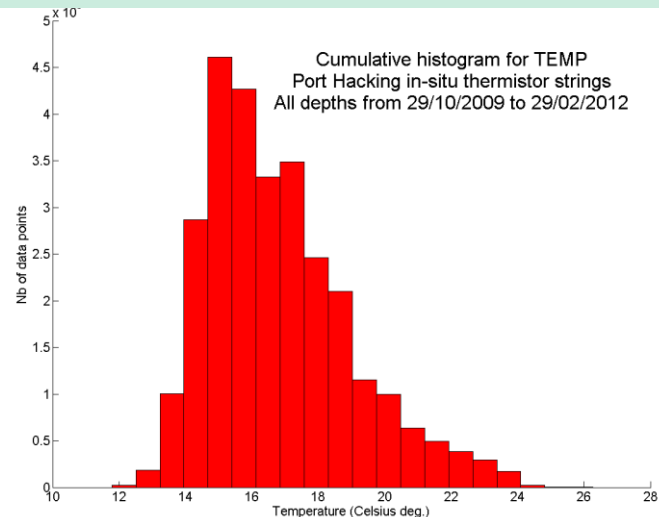
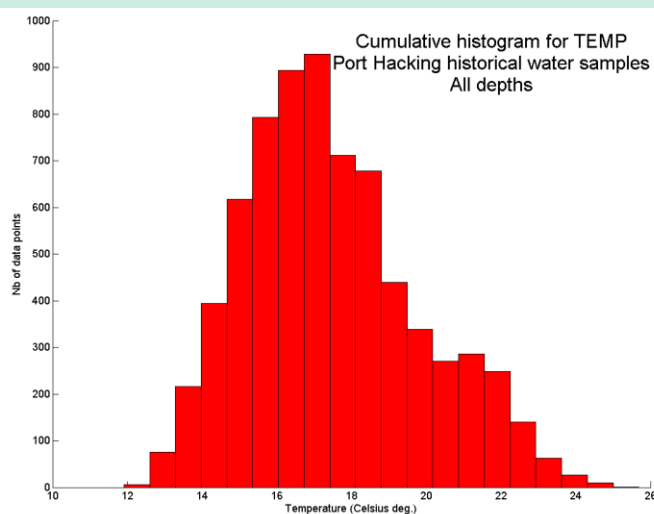
Regional range test

Each listed Site and parameter has its values compared to regional upper and lower valid values :

PASS : GOOD

FAIL : BAD

Site	IMOS parameter	CF title	Unit	Valid min	Valid max	Source
NRSPHB	TEMP	Sea water temperature	Celsius	10	28	Port Hacking historical water samples.
NRSPHB	PSAL	Sea water salinity	PSU	31	37	Port Hacking historical water samples.
NRSPHB	DOX2	Moles of oxygen per unit mass in sea water	umol/kg	50	400	Port Hacking historical water samples.
NRSMIA	TEMP	Sea water temperature	Celsius	8	21	Maria Island historical water samples.
NRSMIA	PSAL	Sea water salinity	PSU	33	37	Maria Island historical water samples.
NRSMIA	DOX2	Moles of oxygen per unit mass in sea water	umol/kg	100	400	Maria Island historical water samples.
...



Spike test

Each listed parameter has its own threshold value to be used in the ARGO spike test :

$$|V_n - (V_{n+1} + V_{n-1})/2| - |(V_{n+1} - V_{n-1})/2| \leq \text{threshold}$$

PASS : GOOD

FAIL : PROBABLY BAD

IMOS parameter	CF title	Unit	Thresh old	Source
TEMP	Sea water temperature	Celsius	6	ARGO Quality control manual v2.7 (Jan. 2012)
PSAL	Sea water salinity	PSU	0.9	ARGO Quality control manual v2.7 (Jan. 2012)
PRES, PRES_REL, DEPTH	Sea water pressure, Sea water relative pressure, Depth	dbar, m	3	
DOX1, DOX2	Mole concentration of dissolved molecular oxygen in sea water, Moles of oxygen per unit mass in sea water	umol/l, umol/kg	PABIM	MyOcean - Real Time Quality Control of biogeochemical measurements v1.0 (Jan. 2011)
CPHL, CHLU, CHLF	Mass concentration of chlorophyll in sea water	mg/m3	PABIM	MyOcean - Real Time Quality Control of biogeochemical measurements v1.0 (Jan. 2011)
...	

PABIM white book v1.3 (Feb. 2010) threshold :

$$|\text{median}(V_{n-2}, V_{n-1}, V_n, V_{n+1}, V_{n+2})| + |\text{stDev}(V_{n-2}, V_{n-1}, V_n, V_{n+1}, V_{n+2})|$$

Toolbox future

- Use → feedback → improve the existing IMOS set of QC procedures
- ADCP current timeseries QC working group
- CTD profile QC working group?
- QARTOD is about to release a NRT-QC manual for T and S :
 - 2013 IODE flag scale
 - Threshold test → 3 levels of flags
 - Conductivity is QC'd
 - Cross validation tests

Toolbox live demo

- Visiting the toolbox Wiki page
- Running the toolbox interactively
 - Timeseries mode
 - Profile mode
- Inspecting the output NetCDF files
- Running the toolbox in batch mode

Thank you

