DOXY meeting 20/11/20

Virginie Racapé vracape@ifremer.fr
Raphaelle Sauzède raphaelle.sauzede@imev-mer.fr
Catherine Schmechtig schmechtig@obs-vlfr.fr
Virginie Thierry vthierry@ifremer.fr

RT Adjustment (20 minutes) Virginie R's presentation

1. Method used (https://doi.org/10.13155/76709)
   Statement (WOA monthly, ADJUSTED_ERROR)
   When do we choose not to apply

2. How many floats have been adjusted in RT ?

3. Alerts (drift, elapsed time since the deployment, checking with reference database)

DM steps and tools (1h30)

1. Visual control to remove outliers

    - Suggested tools SCOOP (Java)) Catherine's presentation https://doi.org/10.17882/48531

2. Estimation of DM adjustment

    - SAGE O2 (Matlab) Raphaelle's presentation https://github.com/SOCCOM-BGCArgo
    - Chris Gordon's SAGE O2 adaptation (Python) https://github.com/ArgoCanada/bgcArgo
    - LOCODOX (Matlab) Virginie T's presentation https://github.com/euroargodev/LOCODOX

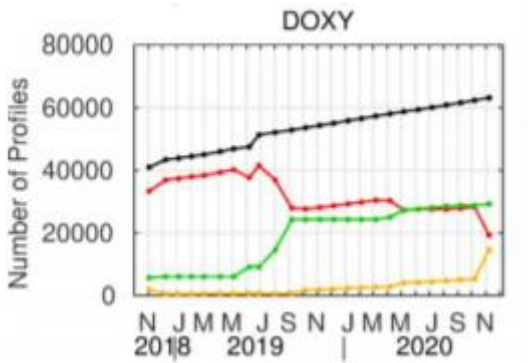
3. Filling your DM Files

    - DM Filler (R) Catherine's presentation (any type of adjustment) https://github.com/catsch/DM_FILLER

4. Check the files (ftp://usgodae.org/pub/outgoing/argo/etc/FileChecker/)

5. Towards a uniform DM DOXY equation

Strategy and discussion (40minutes)



Coriolis DOXY status (PARAMETER_DATA_MODE RED: R, YELLOW: A, GREEN: D)

Points to address

- Josh's plant audits on DOXY status (ftp://ftp.mbari.org/pub/BGC_argo_audits/DOXY/ and try to get rid of the backlog
- Further control (DM mode)
- Building the reference database

DOXY meeting 20/11/20

(*operational*)

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EA-RISE WP4: Extension to biogeochemical parameters

Task 4.2: Data qualification and management

Subtask 4.2.1: Testing QC data qualification methods (RT & DM)

Subtask 4.2.2: Develop and propose a EU organization for the BGC data

D4.2 Recommendations for **Chla QC** Methods	(**SU**, PML)
D4.3 Recommendations for **suspended particles** QC Methods	(**PM**L, SU)
D4.4 Recommendations for **Irradiance** QC Methods	(**SU**, PML)
D4.5 Recommendations for **NO3** QC Methods	(**SU**)
D4.6 Recommendations for **O2** QC Methods	(**GEOMAR,** BODC)
D4.7 Recommendations for **pH** QC Methods	(**GEOMAR,** BODC)
D4.10 Report on use of **remote sensing** to improve DM QC	(**ACRI-ST**)

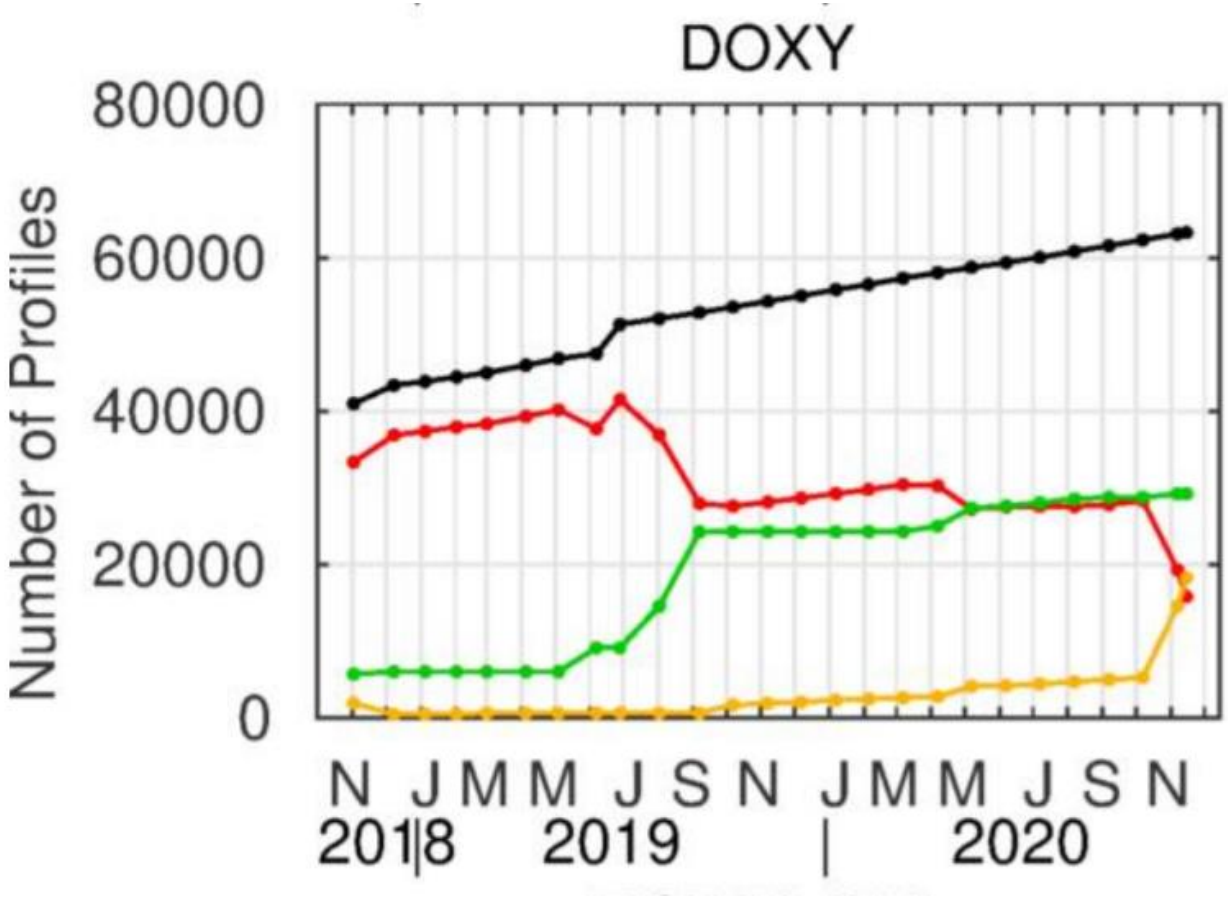
D4.11 Recommendations for the data management and structure for BGC extension within the Argo system at EU level (including recommendations of task 4.2.1)

(**SU**, IFREMER, BODC, BSH)

D4.13 Test processor to implement QC real time and delayed methods in the data system (including advancements from task 4.2.1)

(**IFREMER,** BODC)

DOXY Status at the coriolis DAC



H. Bittig

https://biogeochemical-argo.org/cloud/document/implementation-status/BGC_summary_coriolis.pdf

Meeting Objectives

1. To present advancement in RT adjustment

2. To present tools and different ways of working together (or getting people involved) to improve the DOXY status

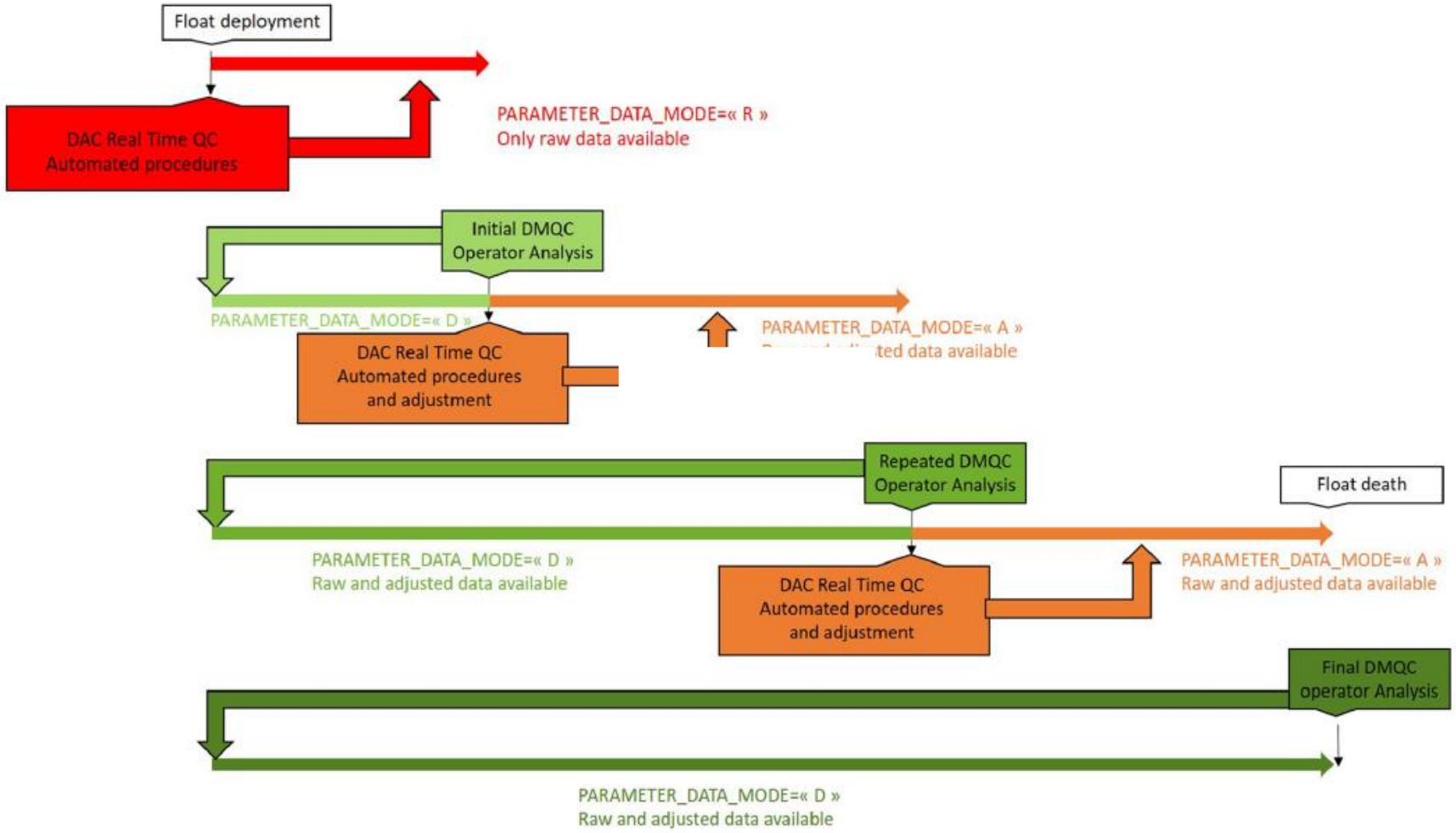
3. To present strategy to move forward

DOXY meeting : RT adjustment 20/11/20

- Virginie Racapé vracape@ifremer.fr
- Catherine Schmechtig schmechtig@obs-vlfr.fr
- Vincent Bernard vincent.bernard@ifremer.fr

Real time adjustment procedure set up by DAC Coriolis

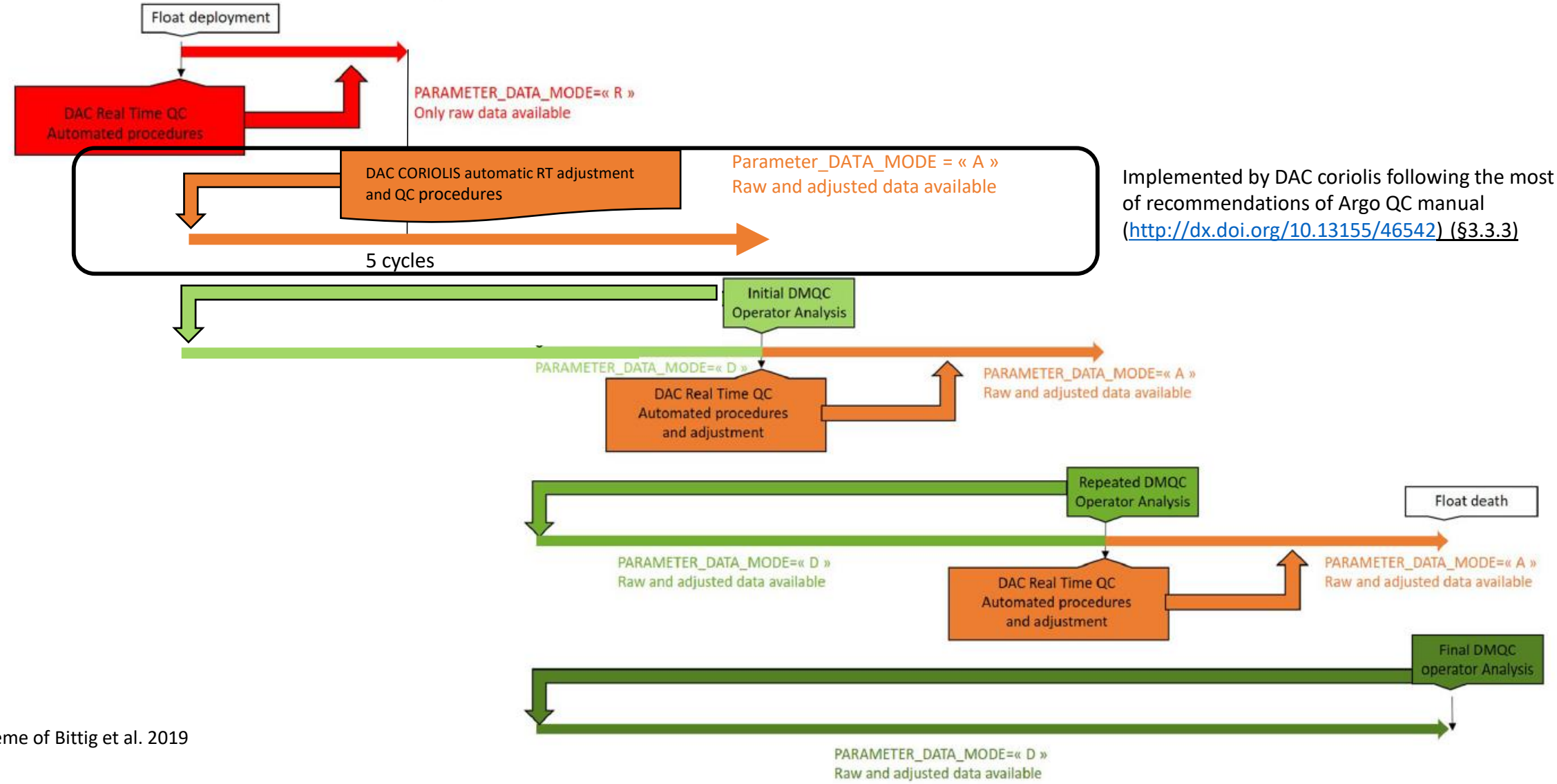
To improve DOXY quality in real time



Bittig et al. 2019

Real time adjustment procedure set up by DAC Coriolis

To improve DOXY quality in real time



Implemented by DAC coriolis following the most of recommendations of Argo QC manual (http://dx.doi.org/10.13155/46542) (§3.3.3)

Modified scheme of Bittig et al. 2019

Real time adjustment procedure set up by DAC Coriolis

Method if no previous delayed-mode adjustment is available

(https://doi.org/10.13155/76709)

- **Method # 1**: Adjustment by comparison of in water float data to WOA based on PSAT or PPOX

- **Description** : Gain estimated from the comparison between in water PSAT or PPOX from float and PSAT or PPOX from WOA climatology at most in the upper 20 dbar of the water column. WOA PPOX is computed from WOA PSAT and from TEMP and PSAL float data at the atmospheric pressure of 1 atm.

DOXY_ADJUSTED = DOXY .* G

G (gain factor) = median(gi)

gi = (PPOX_woa/PPOX_DOXY_float)cycle i

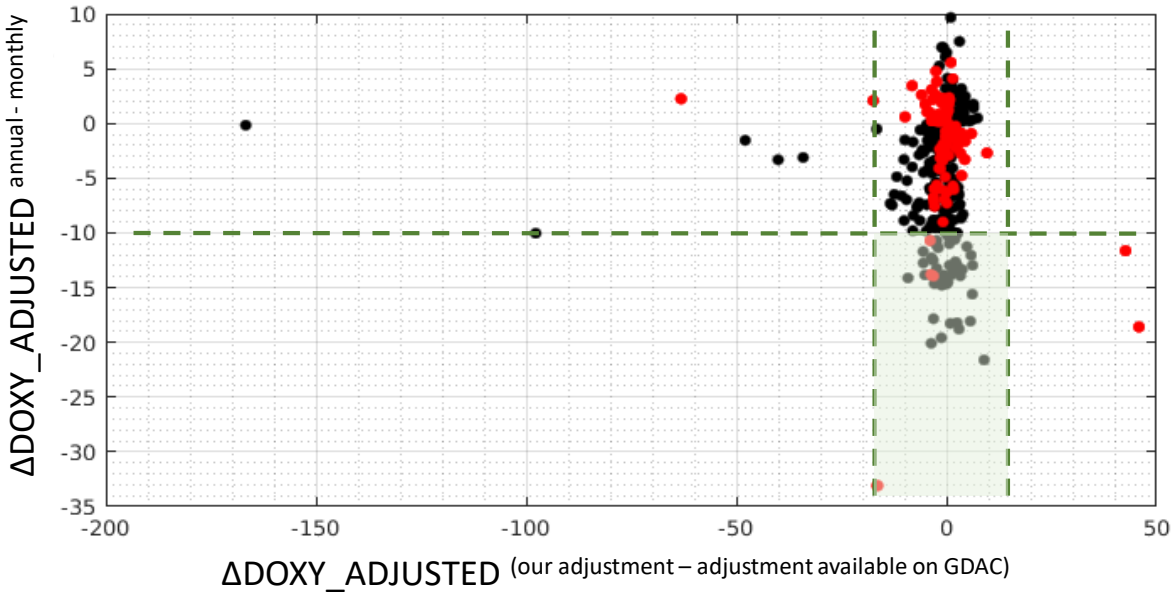
With PPOX_woa{PSAT_woa,TEMP_float,PSAL_float,Patm = 1atm}
PPOX_float{MOLAR_DOXY_float,TEMP_float,PSAL_float,Patm = 1atm}

Real time adjustment procedure set up by DAC Coriolis

Method if no previous delayed-mode adjustment is available (https://doi.org/10.13155/76709)

- **Parametrization**

Climatology	WOA18 PSAT objectively analyzed mean
Climatology resolution	monthly



- From annual WOA
- From monthly WOA

Added values for the correction with monthly climatology

Real time adjustment procedure set up by DAC Coriolis

Method if no previous delayed-mode adjustment is available

(https://doi.org/10.13155/76709)

- **Parametrization**

Climatology	WOA18 PSAT objectively analyzed mean
Climatology resolution	monthly
Climatology level	1 (depth = 0 m)
Profiles for G estimation	5st ascending profiles from cycle 2(and before cycle 20) with valid data (DOXY_QC & PSAL_QC~4, TEMP_QC and PRES_QC ~3 & 4) measured in the 10 first dbar (or 20 dbar) without profiles in greylist /under ice/ badly porsitioned

- **O_2 quantity conversion**

  SCOR WG 142 recommendations (#RD5)

Real time adjustment procedure set up by DAC Coriolis

When do we choose not to apply? Which criteria used to apply

- **Go / No Go threshold is equal to PPOX_ADJUSTED_ERROR fixed at 10 mbar by default for RT adjustment**

1. Which climatology used ?
2. At what depth?

➔ Float data set = All Argo-O_2 floats in delayed mode from the dac coriolis

➔ Climatology : 2 mapped data products

a) clim1 = the mapped O_2 product GlodapV2.2016b
(to be totally independent from the gain estimation)

b) clim2 = the annual mapped O_2 product WOA18

➔ Level tested

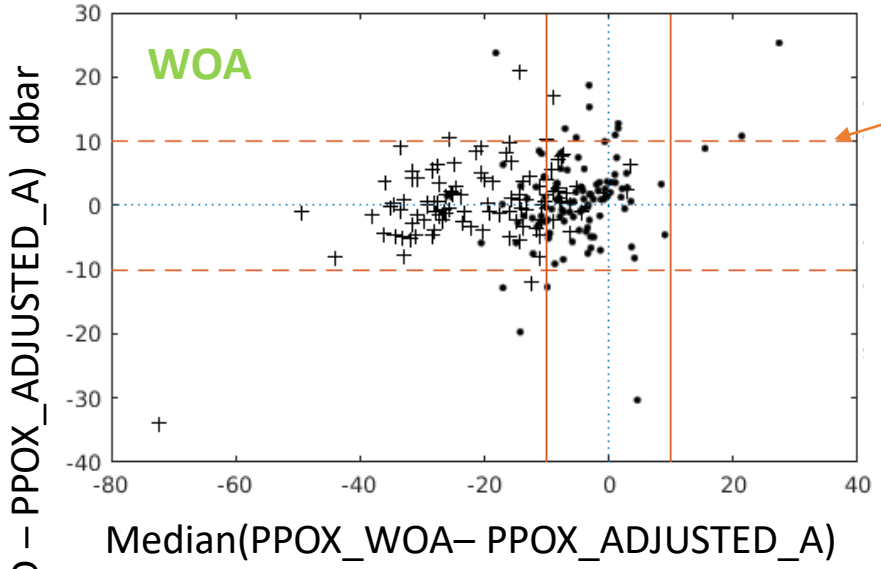
a) surface (10 dbar)

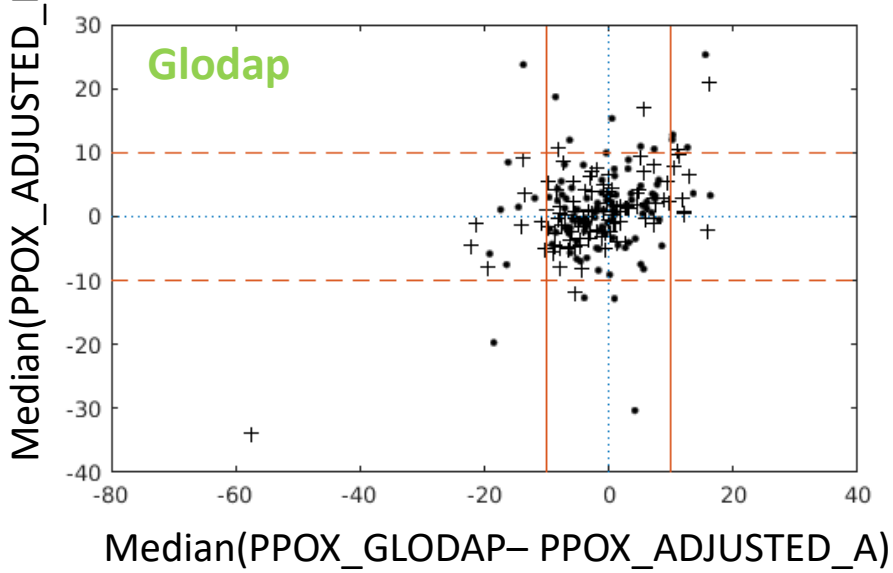
b) 900 dbar

➔ Criteria tested <u>on the 5 profiles used for gain estimation</u> and using ppox_adjusted

Real time adjustment procedure set up by DAC Coriolis

When do we choose not to apply? Which criteria used to apply



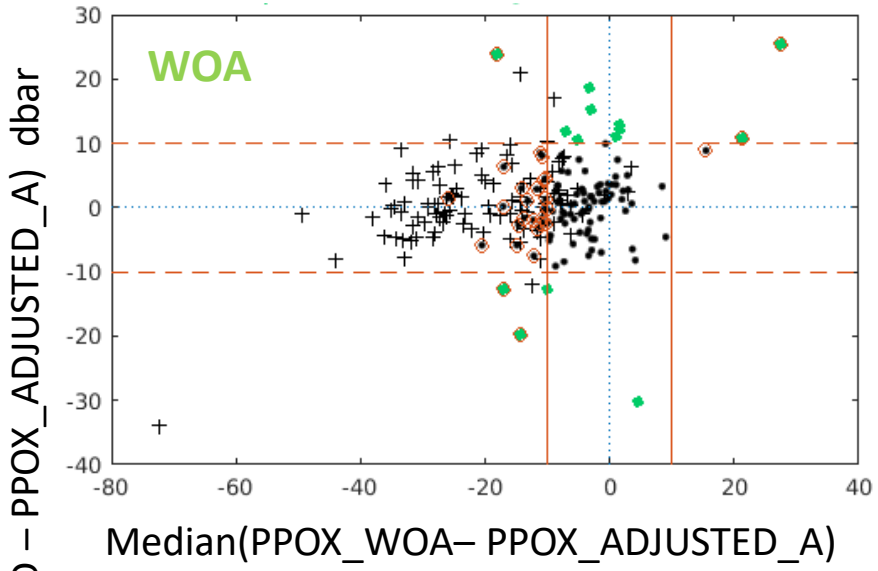


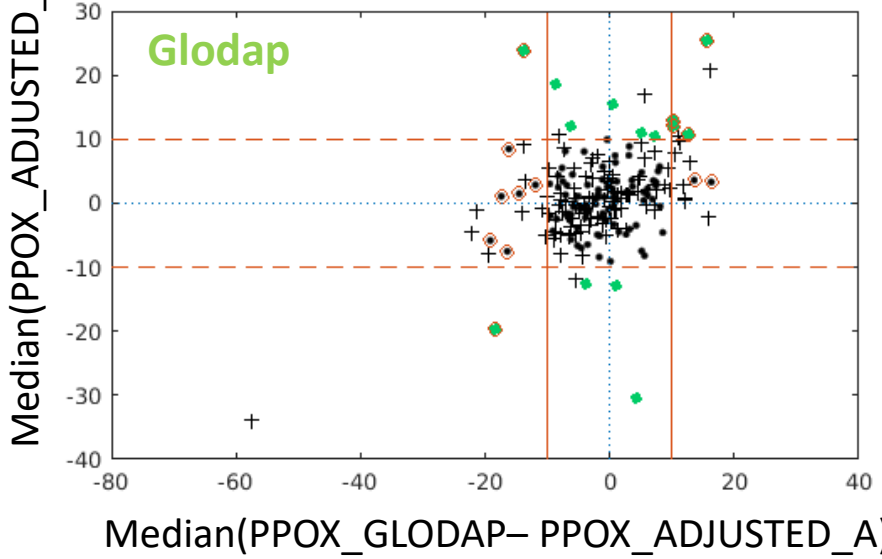
Thresholds of 10 dbar

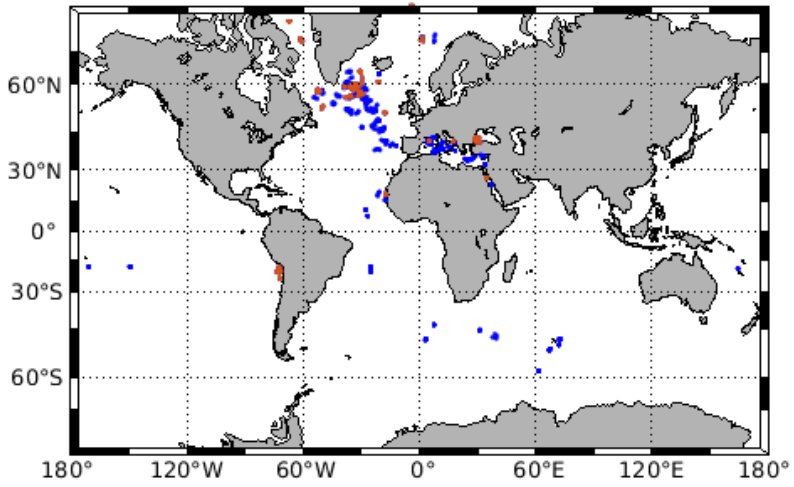
+ Surface
• 900 dbar

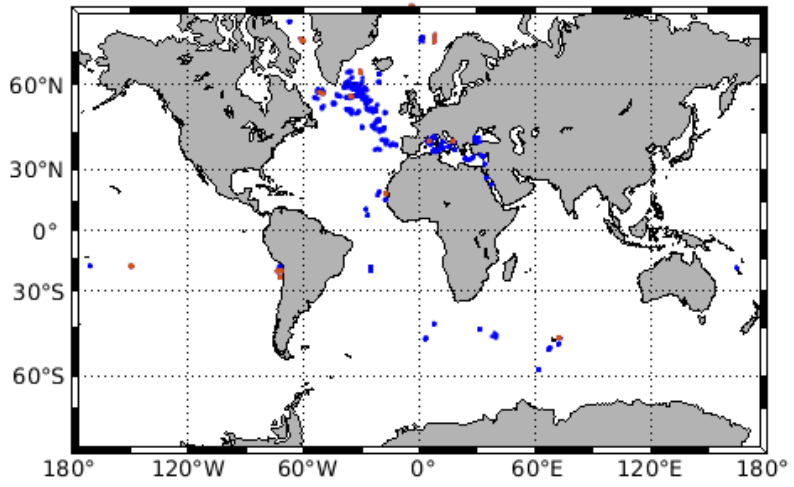
Real time adjustment procedure set up by DAC Coriolis

When do we choose not to apply? Which criteria used to apply









+ Surface
● 900 dbar

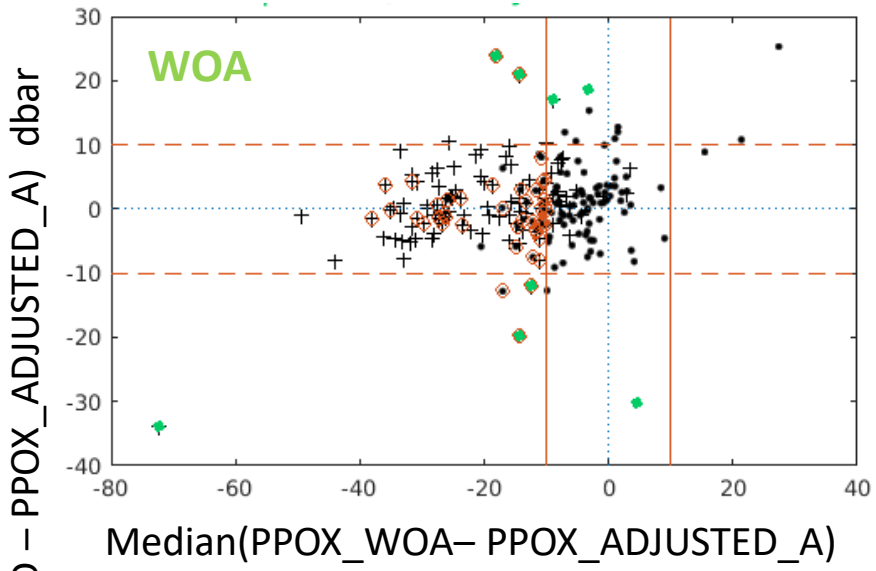
● position of floats tested
● No Go

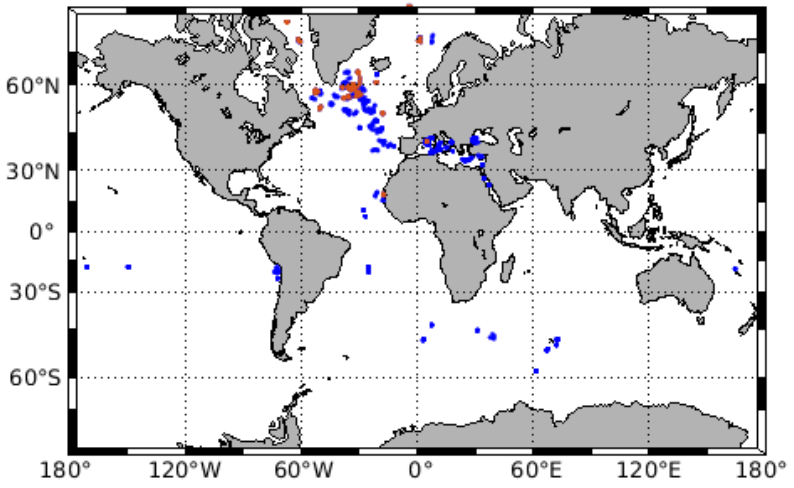
In Surface
○ No Go
Median(PPOX_GLODAP – PPOX_ADJUSTED_A) > 10

● Confirmed by results on gdac
Median(PPOX_ADJUSTED_D – PPOX_ADJUSTED_A) > 10

Real time adjustment procedure set up by DAC Coriolis

When do we choose not to apply? Which criteria used to apply

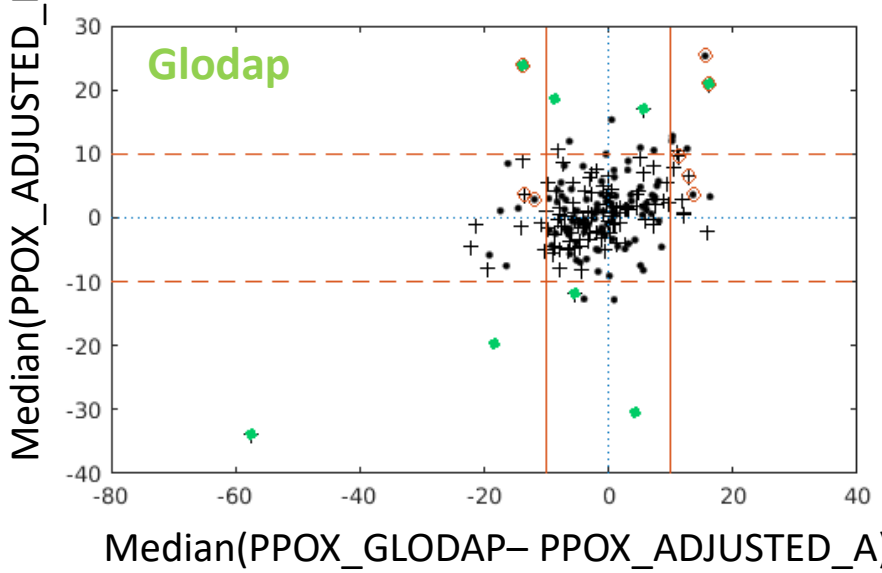


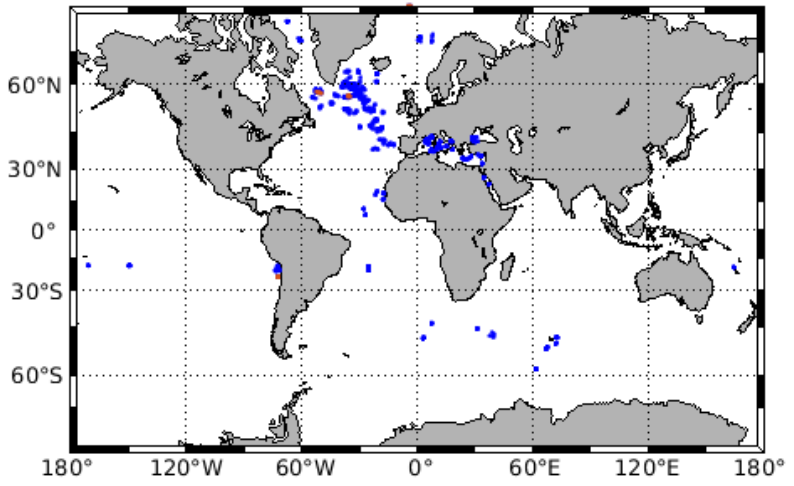


+ Surface
● 900 dbar

● position of floats tested
● No Go

At 900 dbar
○ No Go
Median(PPOX_GLODAP – PPOX_ADJUSTED_A) > 10





● Confirmed by results on gdac
Median(PPOX_ADJUSTED_D – PPOX_ADJUSTED_A) > 10

Real time adjustment procedure set up by DAC Coriolis

Method if no previous delayed-mode adjustment is available

(https://doi.org/10.13155/76709)

- **GO / No GO**

  Based on this study, we have devided to visualize all cycles for which :

  (1) Median Absolute Deviation > $MAD_{threshold}$(=10 /ppox_woa_monthly)
  (2) |median($PPOX\_clim_1$–PPOX_adjusted)| > 10 in surface
  (3) |median($PPOX\_clim_2$–PPOX_adjusted)| > 10 in surface (if no data from $clim_1$)
  (4) no data from $clim_1$ or $clim_2$ are available for comparison

Where $clim_1$= the mapped O_2 product GlodapV2.2016b
$clim_2$= the annual mapped O_2 product WOA18

- **To validate No Go**

Coriolis is going to build a 'in house' reference data base including GLODAPv2.2020 (adjusted data product), CARIMED (for the Mediterranean sea) for the moment. This data base should be completed with "trusted" adjusted profiles (we should also define some criteria to decide how we select good floats and good profiles), and other regional data set of reference.

➔ further information/discussion during the third part of the meeting

Real time adjustment procedure set up by DAC Coriolis

Method if no previous delayed-mode adjustment is available (https://doi.org/10.13155/76709)

- **How we fill SCIENTIFIC_CALIB_COMMENT and DOXY_ADJUSTED_ERROR**

Case 1_1: Adjustment by comparison of in water float data to WOA based on PSAT or PPOX, error in PPOX

SCIENTIFIC_CALIB_COMMENT = "DOXY_ADJUSTED is estimated from an adjustment of in water PSAT or PPOX float data at surface by comparison to WOA PSAT climatology or WOA PPOX in using $PSAT_{WOA}$ and TEMP and $PSAL_{float}$ at 1 atm, DOXY_ADJUSTED_ERROR is estimated from a PPOX_ERROR of [xx] mbar"

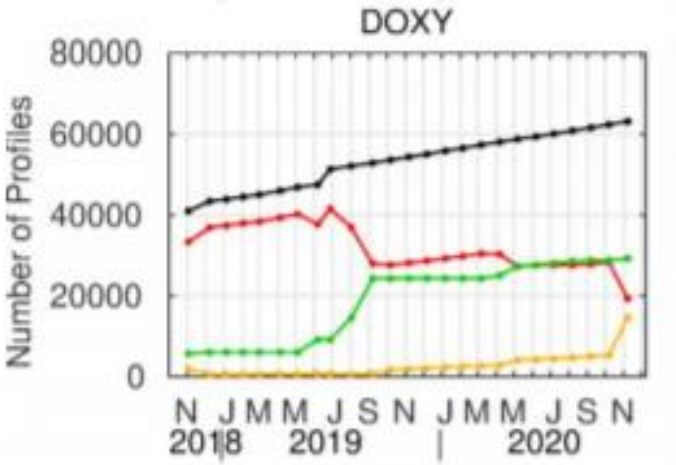
Propagation ERROR Method # = 1

propagation error of 10mbar by default or provided by PI in mbar

DOXY_ADJUSTED_ERROR = [X] µmol/kg is recomputed from CALIB_RT_ADJUSTED_ERROR

Real time adjustment procedure set up by DAC Coriolis

How many floats have been adjusted in RT



- 119 floats has been adjusted last week
  - many problems resolved now
  - a e-mail to inform PI must be sent very soon

Dear Birgit,
the float 6900666 (equipped with Optode S/N 4212) was deployed last month
We used the method : https://doi.org/10.13155/76709 to adjust the Doxy profiles, the DOXY_ADJUSTED profiles are available on the GDAC

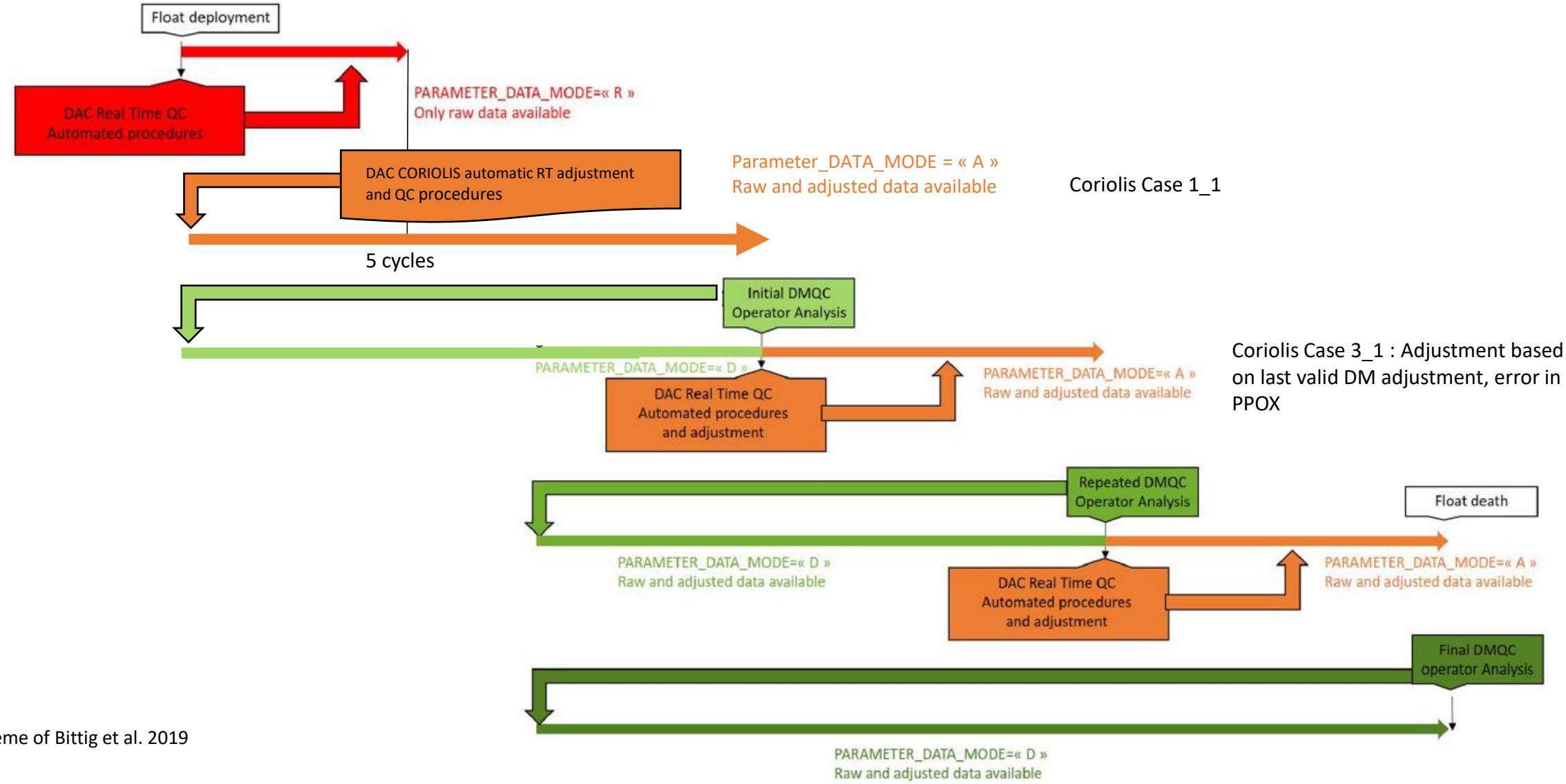
Please let me know if you disagree with this adjustment and I will re-process the float
Regards,
Vincent

- 63 floats with No Go
  - need to build 'in house' reference database to validate or not

- Automatic implementation asap for new float

Real time adjustment procedure set up by DAC Coriolis

To improve DOXY quality in real time



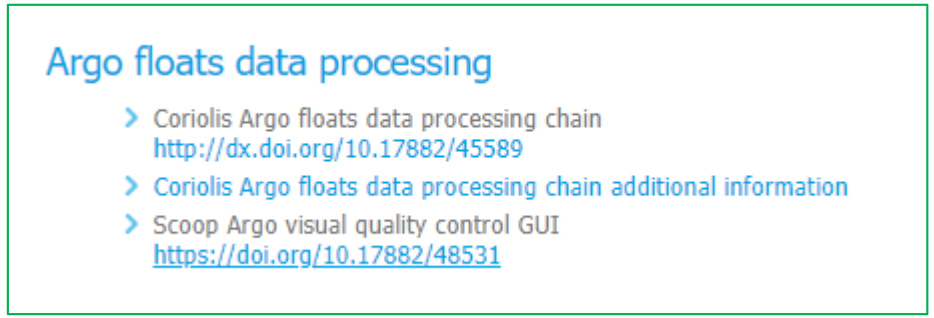
Modified scheme of Bittig et al. 2019

Scoop Visual QC

The visual QC is the first step that allows to remove outlier and clean your dataset prior to any DM adjustment

Getting SCOOP

http://www.argodatamgt.org/Documentation/Tools



Java code working on linux, windows, IOS

=> New release v1.4 soon available

Example of text file sent by Siv Lauvset

```
FLOAT_NAME      6903551
CYCLE_NUMBER    "2-107"
DOXY_ADJUSTED_ERROR     equivalent to 19.2 mbar
DOXY_ADJUSTED_QC        1
SCIENTIFIC_CALIB_EQUATION       "DOXY_ADJUSTED=A*DOXY+B; "
SCIENTIFIC_CALIB_COEFFICIENT    "A=1.064; B=0 "
SCIENTIFIC_CALIB_COMMENT        "Partial pressure corrected as a linear function of PPOX using continuous in-air
measurements as in Johnson et al (2015); PPOX converted from DOXY and DOXY_ADJUSTED converted from
PPOX_ADJUSTED; ERROR calculated as 2std(A) x 205mbar + 2mbar "
NOTES   "Missing Float profile(s) for station(s): 1 108. Software: SAGE-O2 (https://github.com/SOCCOM-
BGCArgo/ARGO_PROCESSING). On cycle 31 there is bad PSAL data between 854-1202 dbar. The DOXY data in this range
is therefore given a flag 4 "

CYCLE_NUMBER    2-5
PRES>1940
DOXY_ADJUSTED   FillValue
DOXY_ADJUSTED_ERROR     FillValue
DOXY_ADJUSTED_QC        4

CYCLE_NUMBER    31
PRES>854
PRES<1202
DOXY_ADJUSTED   FillValue
DOXY_ADJUSTED_ERROR     FillValue
DOXY_ADJUSTED_QC        4
```

```
FLOAT_NAME      6903551
CYCLE_NUMBER    "2-107"
DOXY_ADJUSTED_ERROR     equivalent to 19.2 mbar
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CYCLE_NUMBER    2-5
PRES>1940
DOXY_ADJUSTED   FillValue
DOXY_ADJUSTED_ERROR     FillValue
DOXY_ADJUSTED_QC        4

CYCLE_NUMBER    31
PRES>854
PRES<1202
DOXY_ADJUSTED   FillValue
DOXY_ADJUSTED_ERROR     FillValue
DOXY_ADJUSTED_QC        4
```

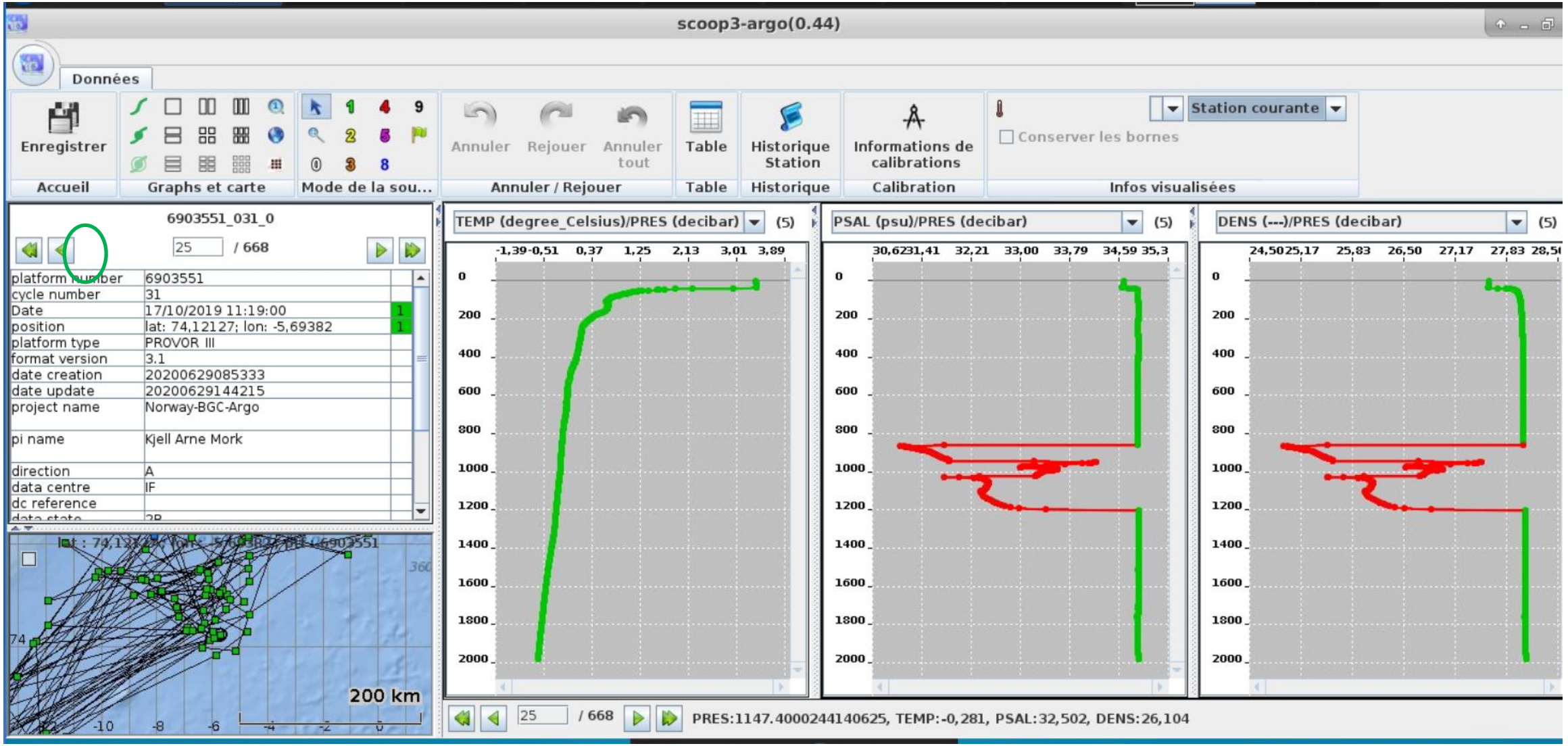
SCOOP part

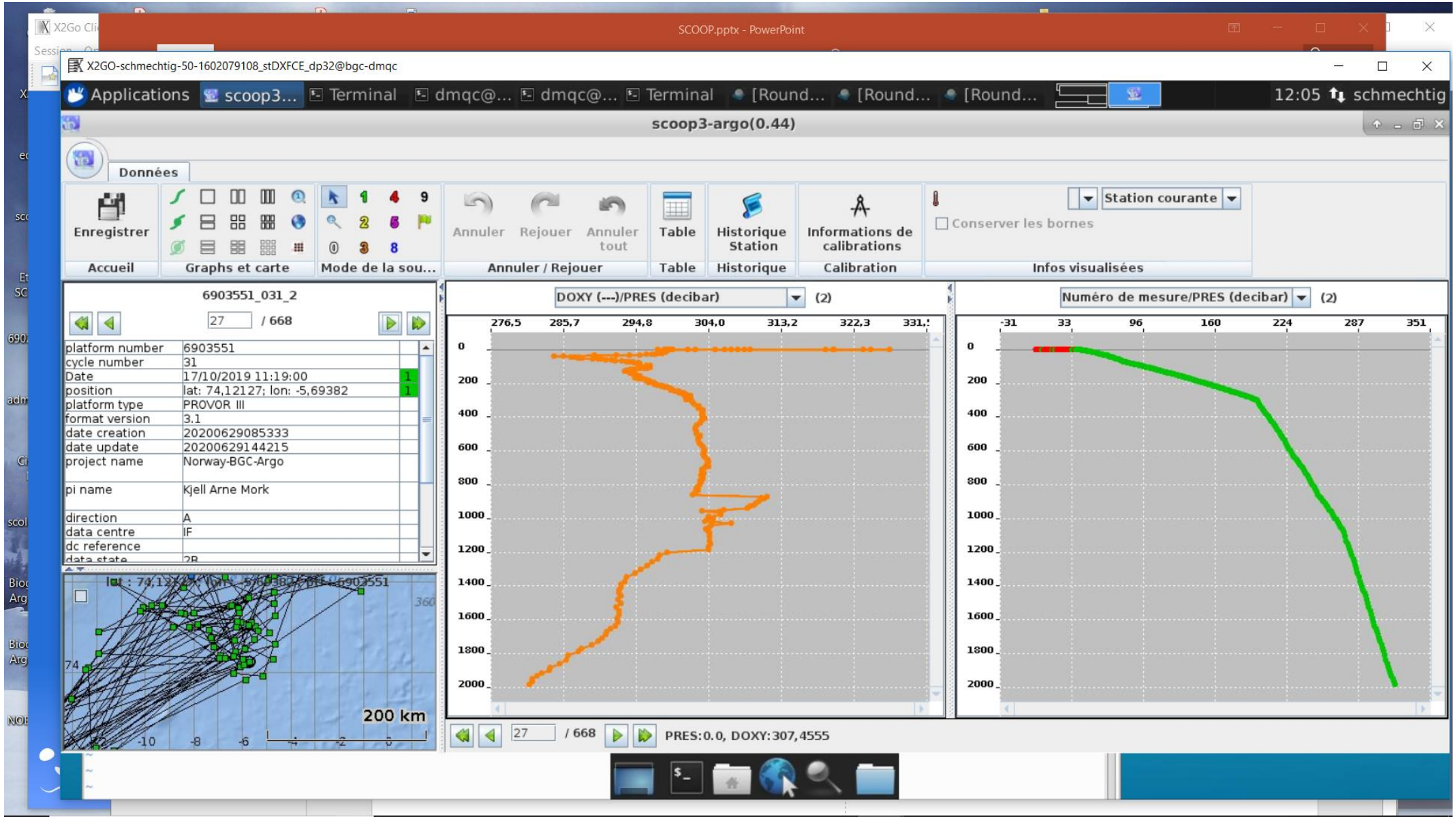
1. Fetch the full arborescence of float 6903551 ftp://ftp.ifremer.fr/ifremer/argo/dac/coriolis/6903551
2. ./scoop_argo.sh
3. Navigate through your arborescence

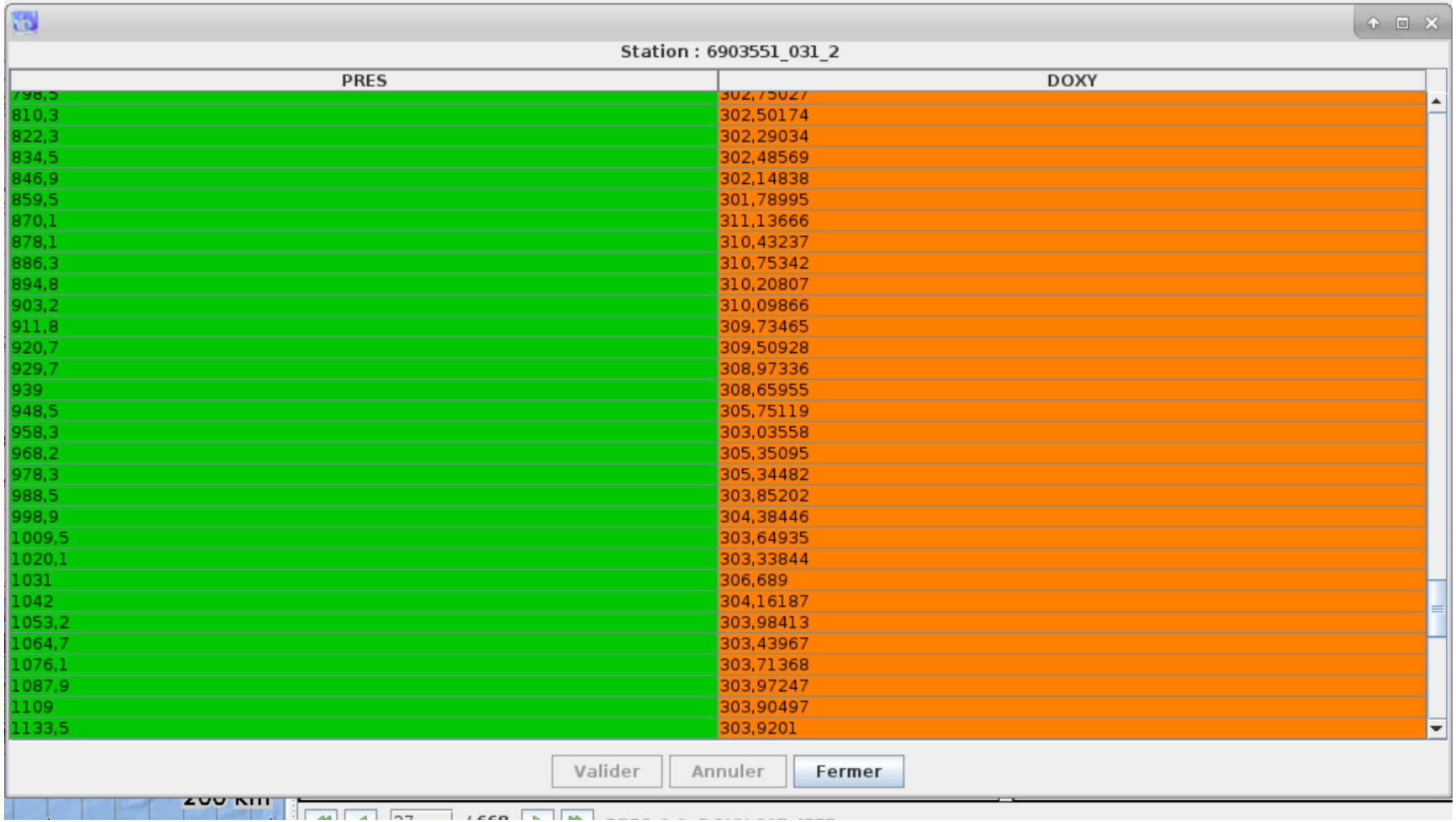
Tips for 2.

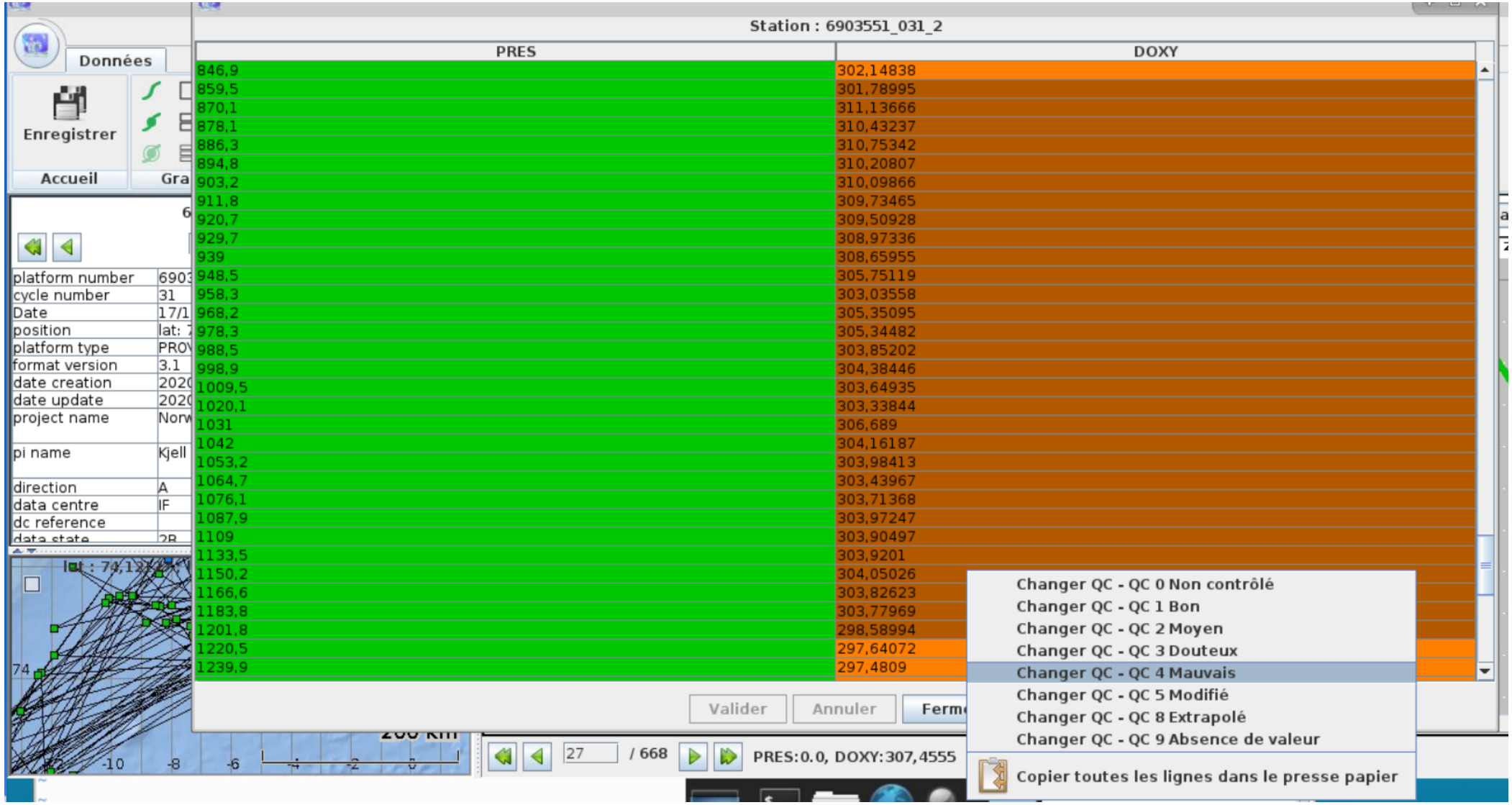
```
#!/bin/bash
SCOOP3_JAR=./scoop_argo/scoop3-argo-controller-0.44-executable.jar
PROPERTIES=./properties
java -Xmx1024m -Doracle.net.tns_admin='/home/tnsnames' -cp ${PROPERTIES}:${SCOOP3_JAR} fr.ifremer.scoop3.argo.application.ArgoApplication
```

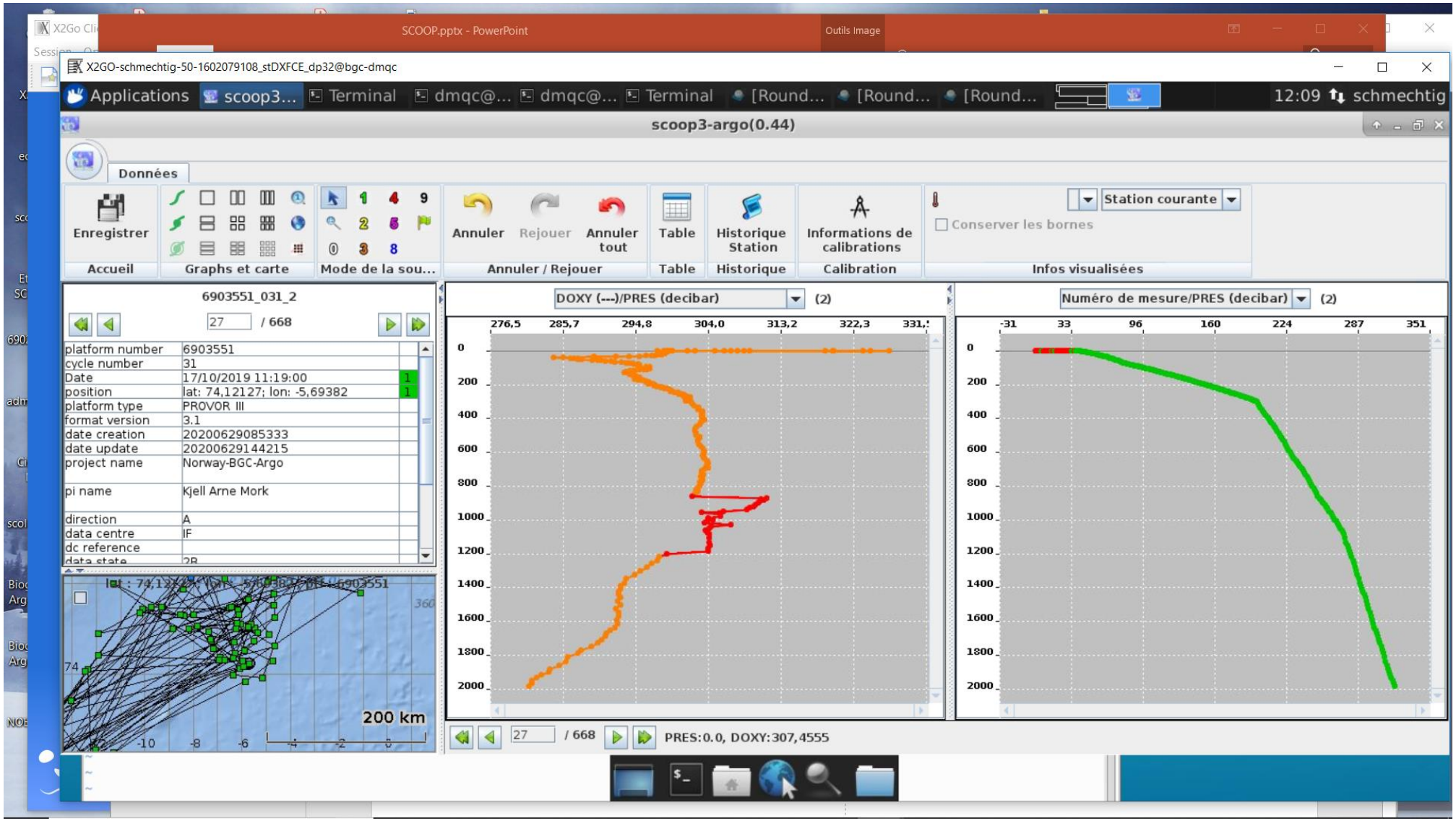
Sometimes there is a need to allocate more memory (for example for large CTS4 floats , 1024 => 2048)

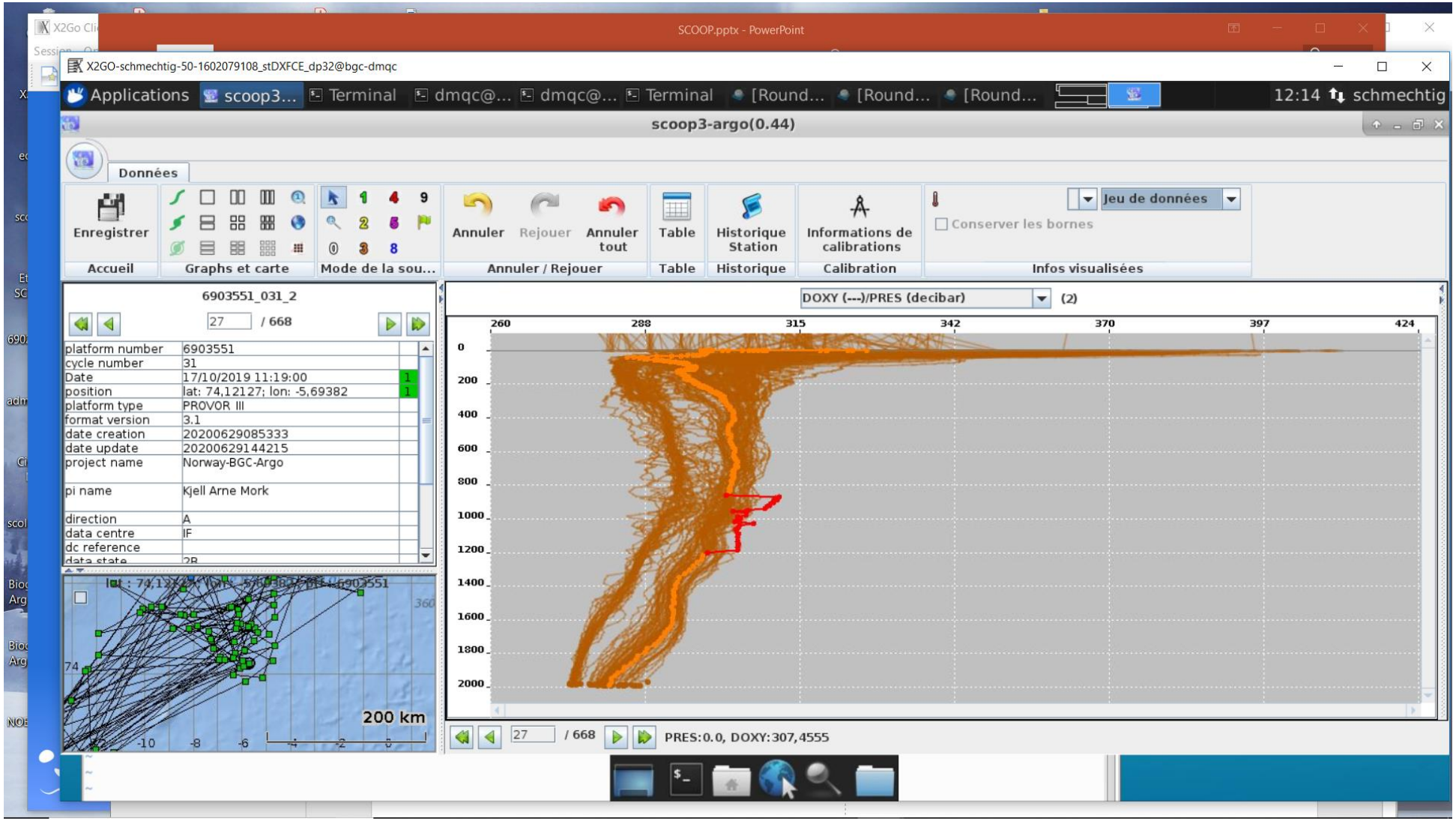

scoop3-argo(0.44)
Données
Enregistrer
Accueil
Graphs et carte
Mode de la sou...
Annuler
Rejouer
Annuler tout
Annuler / Rejouer
Table
Historique Station
Historique
Informations de calibrations
Calibration
Station courante
Conserver les bornes
Infos visualisées
6903551_031_0
25 / 668
platform number 6903551
cycle number 31
Date 17/10/2019 11:19:00
position lat: 74,12127; lon: -5,69382
platform type PROVOR III
format version 3.1
date creation 20200629085333
date update 20200629144215
project name Norway-BGC-Argo
pi name Kjell Arne Mork
direction A
data centre IF
dc reference
200 km
TEMP (degree_Celsius)/PRES (decibar)
PSAL (psu)/PRES (decibar)
DENS (---)/PRES (decibar)
(5)
PRES:1147.4000244140625, TEMP:-0,281, PSAL:32,502, DENS:26,104


SCOOP.pptx - PowerPoint
X2GO-schmechtig-50-1602079108_stDXFCE_dp32@bgc-dmqc
Applications
scoop3...
Terminal
dmqc@...
dmqc@...
Terminal
[Round...
[Round...
[Round...
12:05
schmechtig
scoop3-argo(0.44)
Données
Enregistrer
Accueil
Graphs et carte
Mode de la sou...
Annuler
Rejouer
Annuler tout
Annuler / Rejouer
Table
Historique Station
Historique
Informations de calibrations
Calibration
Station courante
Conserver les bornes
Infos visualisées
6903551_031_2
27
/ 668
platform number 6903551
cycle number 31
Date 17/10/2019 11:19:00
position lat: 74,12127; lon: -5,69382
platform type PROVOR III
format version 3.1
date creation 20200629085333
date update 20200629144215
project name Norway-BGC-Argo
pi name Kjell Arne Mork
direction A
data centre IF
dc reference
data state 2B
200 km
DOXY (---)/PRES (decibar)
(2)
Numéro de mesure/PRES (decibar)
(2)
PRES:0.0, DOXY:307,4555


Station : 6903551_031_2
PRES
DOXY
798,5
302,75027
810,3
302,50174
822,3
302,29034
834,5
302,48569
846,9
302,14838
859,5
301,78995
870,1
311,13666
878,1
310,43237
886,3
310,75342
894,8
310,20807
903,2
310,09866
911,8
309,73465
920,7
309,50928
929,7
308,97336
939
308,65955
948,5
305,75119
958,3
303,03558
968,2
305,35095
978,3
305,34482
988,5
303,85202
998,9
304,38446
1009,5
303,64935
1020,1
303,33844
1031
306,689
1042
304,16187
1053,2
303,98413
1064,7
303,43967
1076,1
303,71368
1087,9
303,97247
1109
303,90497
1133,5
303,9201
Valider
Annuler
Fermer


Station : 6903551_031_2
PRES
DOXY
846,9 302,14838
859,5 301,78995
870,1 311,13666
878,1 310,43237
886,3 310,75342
894,8 310,20807
903,2 310,09866
911,8 309,73465
920,7 309,50928
929,7 308,97336
939 308,65955
948,5 305,75119
958,3 303,03558
968,2 305,35095
978,3 305,34482
988,5 303,85202
998,9 304,38446
1009,5 303,64935
1020,1 303,33844
1031 306,689
1042 304,16187
1053,2 303,98413
1064,7 303,43967
1076,1 303,71368
1087,9 303,97247
1109 303,90497
1133,5 303,9201
1150,2 304,05026
1166,6 303,82623
1183,8 303,77969
1201,8 298,58994
1220,5 297,64072
1239,9 297,4809
Données
Enregistrer
Accueil
platform number
cycle number
Date
position
platform type
format version
date creation
date update
project name
pi name
direction
data centre
dc reference
Valider
Annuler
Changer QC - QC 0 Non contrôlé
Changer QC - QC 1 Bon
Changer QC - QC 2 Moyen
Changer QC - QC 3 Douteux
Changer QC - QC 4 Mauvais
Changer QC - QC 5 Modifié
Changer QC - QC 8 Extrapolé
Changer QC - QC 9 Absence de valeur
Copier toutes les lignes dans le presse papier
27
/ 668
PRES:0.0, DOXY:307,4555


SCOOP.pptx - PowerPoint
Outils Image
X2GO-schmechtig-50-1602079108_stDXFCE_dp32@bgc-dmqc
Applications
scoop3...
Terminal
dmqc@...
dmqc@...
Terminal
[Round...
[Round...
[Round...
12:09
schmechtig
scoop3-argo(0.44)
Données
Enregistrer
Accueil
Graphs et carte
Mode de la sou...
Annuler
Rejouer
Annuler tout
Annuler / Rejouer
Table
Historique Station
Historique
Informations de calibrations
Calibration
Station courante
Conserver les bornes
Infos visualisées
6903551_031_2
27
/ 668
platform number 6903551
cycle number 31
Date 17/10/2019 11:19:00
position lat: 74,12127; lon: -5,69382
platform type PROVOR III
format version 3.1
date creation 20200629085333
date update 20200629144215
project name Norway-BGC-Argo
pi name Kjell Arne Mork
direction A
data centre IF
dc reference
200 km
DOXY (---)/PRES (decibar)
(2)
Numéro de mesure/PRES (decibar)
(2)
PRES:0.0, DOXY:307,4555


SCOOP.pptx - PowerPoint
X2GO-schmechtig-50-1602079108_stDXFCE_dp32@bgc-dmqc
Applications
scoop3...
Terminal
dmqc@...
dmqc@...
Terminal
[Round...
[Round...
[Round...
12:14
schmechtig
scoop3-argo(0.44)
Données
Enregistrer
Accueil
Graphs et carte
Mode de la sou...
Annuler
Rejouer
Annuler tout
Annuler / Rejouer
Table
Historique Station
Historique
Informations de calibrations
Calibration
Jeu de données
Conserver les bornes
Infos visualisées
6903551_031_2
27
/ 668
platform number 6903551
cycle number 31
Date 17/10/2019 11:19:00
position lat: 74,12127; lon: -5,69382
platform type PROVOR III
format version 3.1
date creation 20200629085333
date update 20200629144215
project name Norway-BGC-Argo
pi name Kjell Arne Mork
direction A
data centre IF
dc reference
data state 2B
DOXY (---)/PRES (decibar)
(2)
200 km
PRES:0.0, DOXY:307,4555

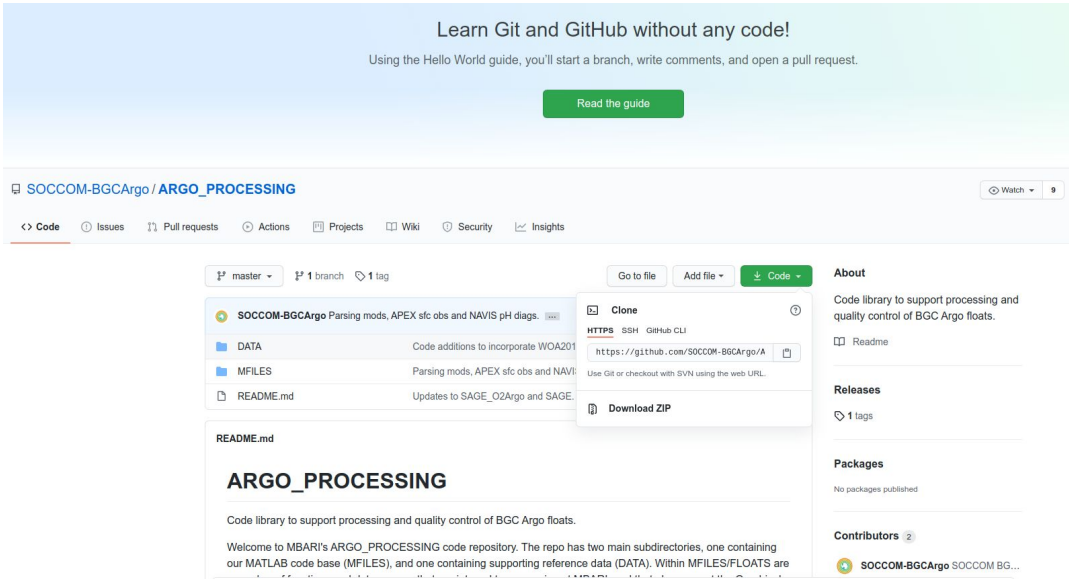
All the modifications made with scoop will be reported in the Bfile.
And now we’re ready to apply a DM adjustment

SAGE O_2-Argo: SOCCOM Assessment and Graphical Evaluation for Oxygen

How to do DM QC with SAGE O_2?

Contact: raphaelle.sauzede@imev-mer.fr

Where to find SAGE O_2 GUI?



Clone the GUI repository “ARGO_PROCESSING” from github here: https://github.com/SOCCOM-BGCArgo/ARGO_PROCESSING and place it somewhere on your local machine (for example /home/username/Documents/MATLAB/, where username is the username of the machine)

SAGE O_2: Why?

➜ visualize float oxygen data from Argo NetCDF files in comparison to **WOA climatology** and **NCEP reanalysis** products (used to estimate atmospheric oxygen partial pressure along a float track) in order to derive float specific gain correction values

Where to find the user manual of SAGE O_2:

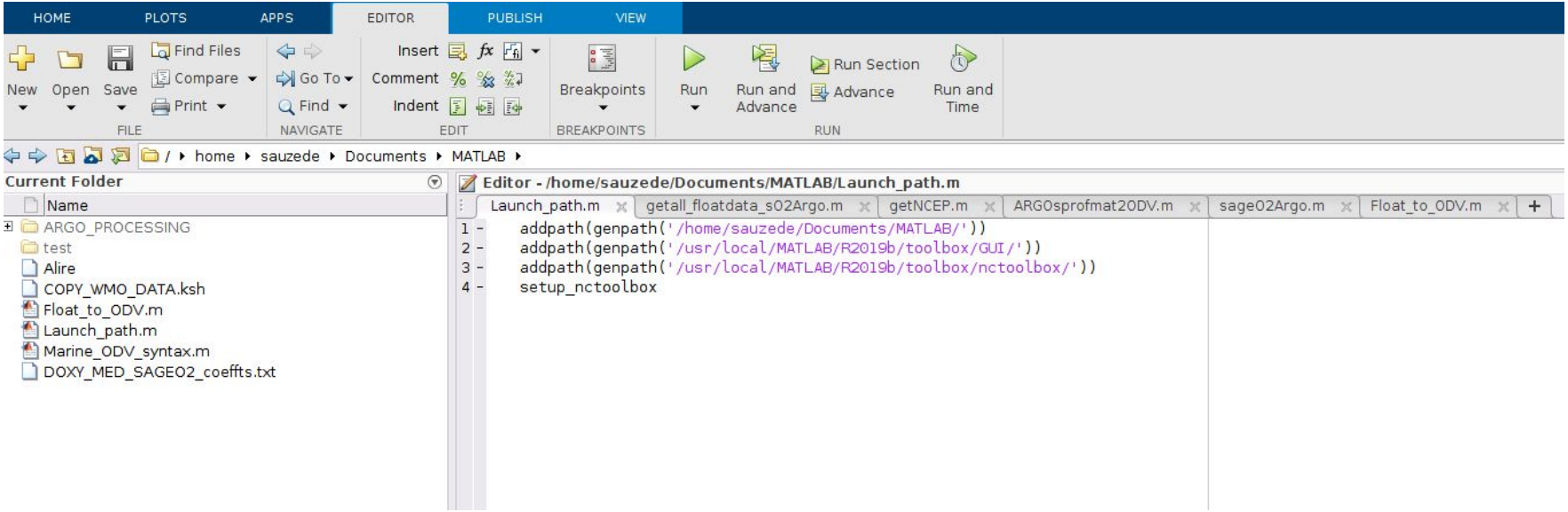
https://usermanual.wiki/Document/SageO2ArgoManual.1001023672/view

1- Toolbox required for installing SAGE O_2

- MATLAB must be properly installed and licensed on your machine before proceeding
- 2 freely-available external MATLAB toolboxes that must be downloaded prior to GUI use :

Toolbox	Download	Notes
GUI Layout Toolbox	https://www.mathworks.com/matlabcentral/fileexchange/47982-gui-layout-toolbox	Note the two separate download options for MATLAB versions before and after R2014b.
Nctoolbox-1.1.3	https://github.com/nctoolbox/nctoolbox	Be sure to permanently add the toolbox setup to your startup.m file. See notes under “setup” at the download link location.

2- Create a file: launch_path.m



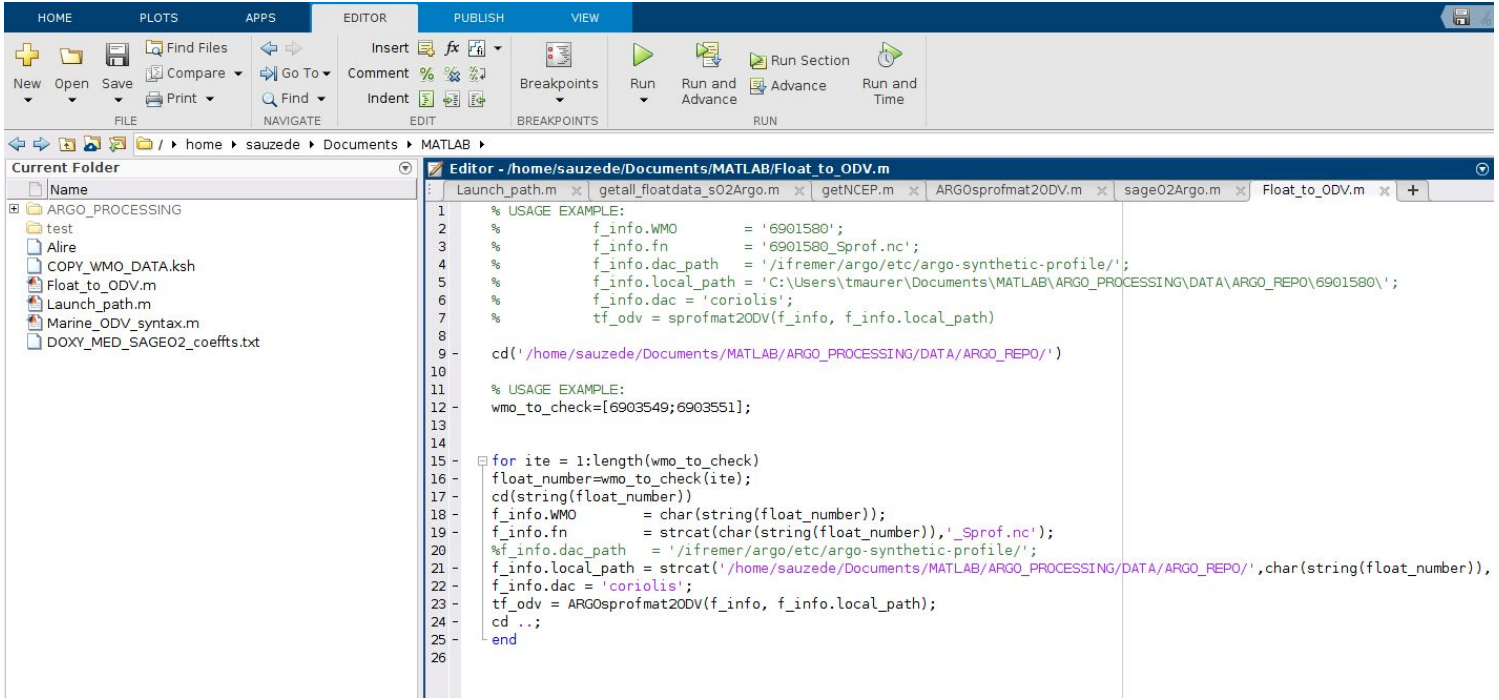
➔ and run it

3- Add Argo data to Argo repository

```
(base) sauzede@sauzede-Latitude-5490:~$ cd Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO/
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ ls
3902120      6901466  6901774  6902740     6902900  6902962  6903247
3902121      6901467  6901775  6902740_JP  6902901  6903024  6903249
3902122      6901470  6901897  6902803     6902903  6903025  6903262
3902123      6901471  6901898  6902804     6902904  6903026  6903266
3902124      6901476  6902687  6902828     6902905  6903153  6903549
3902125      6901487  6902701  6902870     6902906  6903180  6903550
4901805      6901573  6902733  6902871     6902907  6903204  6903551
6901460      6901577  6902734  6902872     6902908  6903222  ARGO_REPO_help.txt
6901462      6901596  6902735  6902873     6902909  6903225  test
6901463      6901657  6902736  6902874     6902935  6903237
6901464      6901770  6902737  6902875     6902936  6903238
6901464_ori  6901771  6902738  6902876     6902937  6903240
6901465      6901772  6902739  6902880     6902954  6903246
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ mkdir 6902954
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ cp /home/sauzede/ARGO_DATA/coriolis/6902954/*.nc 6902954/
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ ls 6902954
6902954_BRtraj.nc  6902954_prof.nc   6902954_Sprof.nc  ODV6902954.TXT
6902954_meta.nc    6902954_Rtraj.nc  6902954_tech.nc
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$
```

→ Need the Argo formatted *.BRtraj.nc, *meta.nc, and *Sprof.nc

4- Create ODV file: Float_to_ODV.m



➜ and run it to create ODV file for each float you want to process with SAGE O_2

NB: if you are on Linux

In ARGOSprofmat2ODM.m (in /ARGO_PROCESSING/MFILES/GUIS/SAGE_O2Argo/SProf_Conversion/):

Line 58: change HOMEDIR with PATH

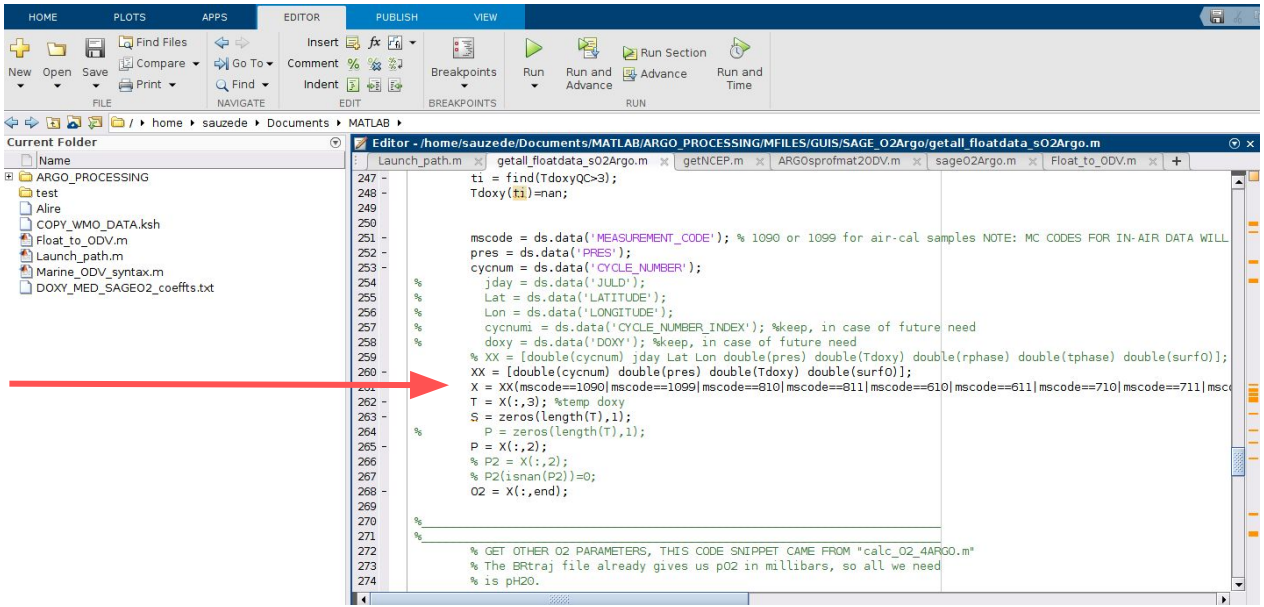
4- Create ODV file: Float_to_ODV.m

```
(base) sauzede@sauzede-Latitude-5490:~$ cd Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO/
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ ls
3902120      6901466  6901774  6902740     6902900  6902969  6903247
3902121      6901467  6901775  6902740_JP  6902901  6903024  6903249
3902122      6901470  6901897  6902803     6902903  6903025  6903262
3902123      6901471  6901898  6902804     6902904  6903026  6903266
3902124      6901476  6902687  6902828     6902905  6903153  6903549
3902125      6901487  6902701  6902870     6902906  6903180  6903550
4901805      6901573  6902733  6902871     6902907  6903204  6903551
6901460      6901577  6902734  6902872     6902908  6903222  ARGO_REPO_help.txt
6901462      6901596  6902735  6902873     6902909  6903225  test
6901463      6901657  6902736  6902874     6902935  6903237
6901464      6901770  6902737  6902875     6902936  6903238
6901464_ori  6901771  6902738  6902876     6902937  6903240
6901465      6901772  6902739  6902880     6902954  6903246
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ mkdir 6902954
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ cp /home/sauzede/ARGO_DATA/coriolis/6902954/*.nc 6902954/
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$ ls 6902954
6902954_BRtraj.nc  6902954_prof.nc   6902954_Sprof.nc  ODV6902954.TXT
6902954_meta.nc    6902954_Rtraj.nc  6902954_tech.nc
(base) sauzede@sauzede-Latitude-5490:~/Documents/MATLAB/ARGO_PROCESSING/DATA/ARGO_REPO$
```

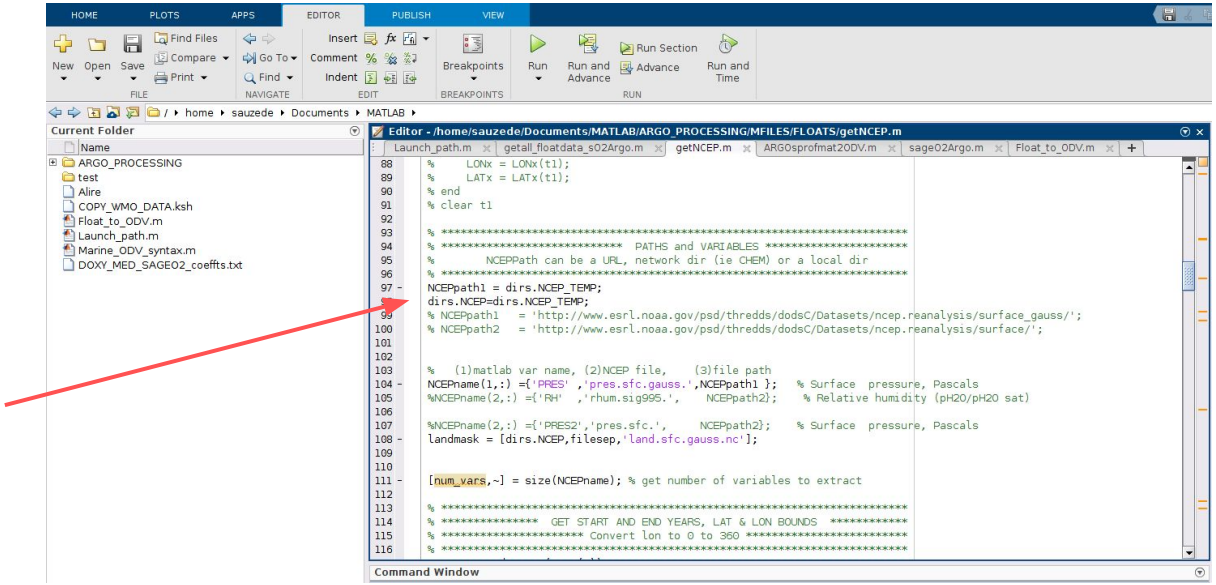
5- Modifications for measurement codes to find in air data

In getall_floatdata_sO2Argo.m (in /ARGO_PROCESSING/MFILES/GUIS/SAGE_O2Argo/):

Line 261: add mscodes 110/ 111/ 610/ 611/ 710/ 711/ 810/ 811



5- NCEP data (in air climatology)

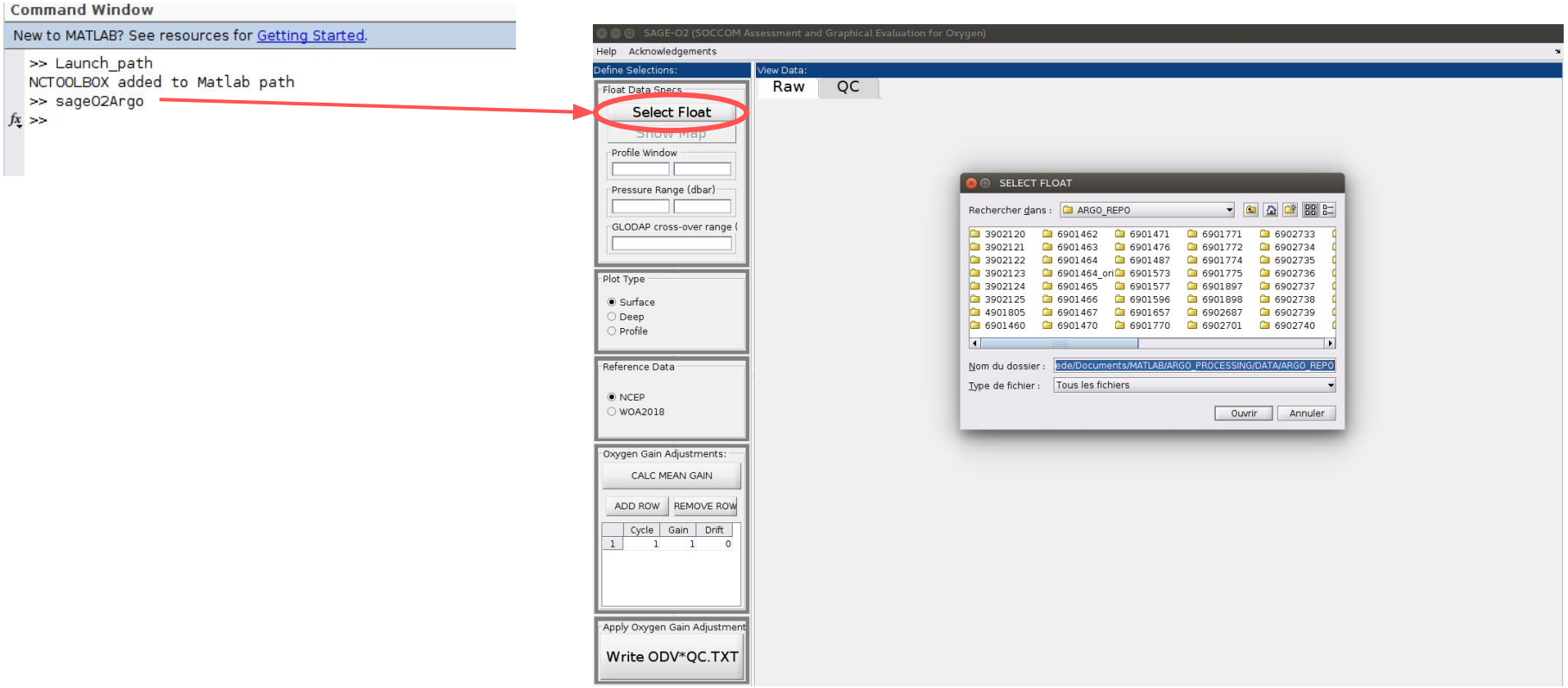


For info: getNCEP.m in /ARGO_PROCESSING/MFILES/FLOATS/ lines 97-100: I decommented NCEPpath1 = dirs.NCEP_TEMP; and I added dirs.NCEP = dirs.NCEP_temp

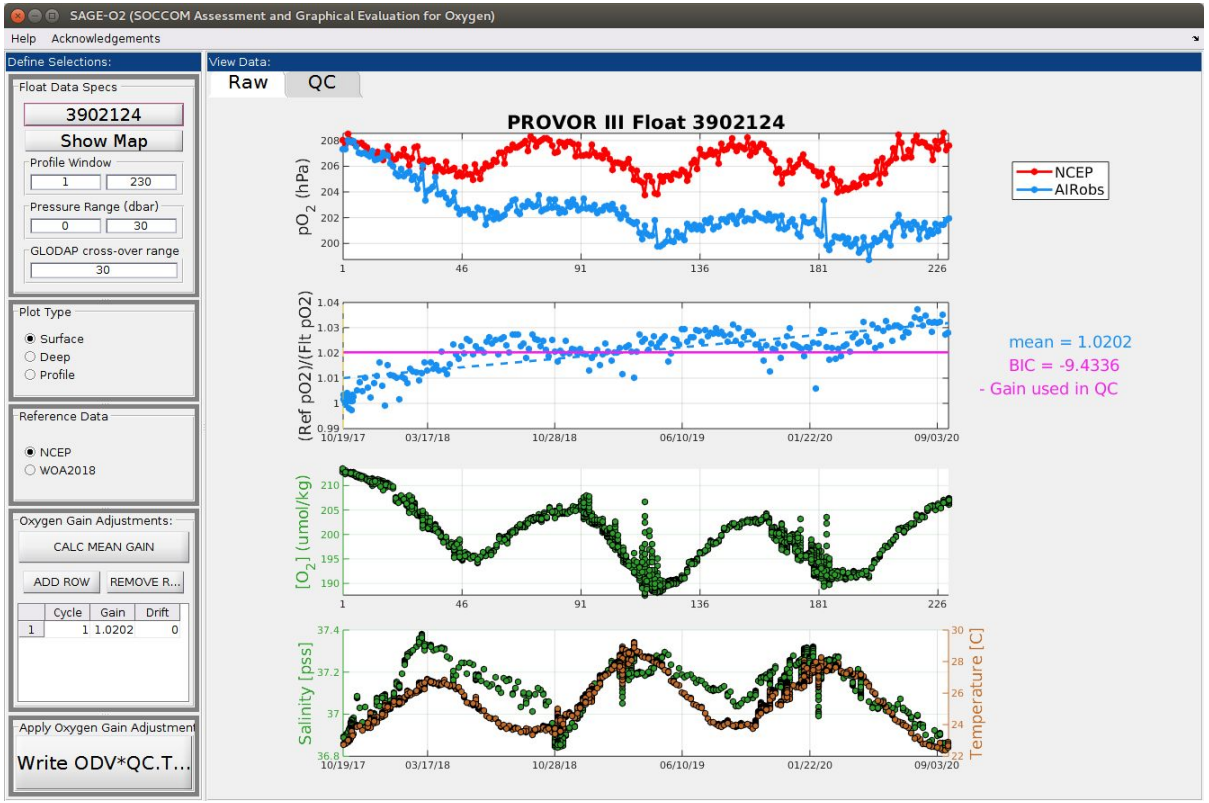
To download NCEP data: ftp://ftp.cdc.noaa.gov/Datasets/ncep.reanalysis/surface_gauss/

➜ download pres.sfc.gauss.2020.nc for year 2020 in NCEP_TEMPORARY folder

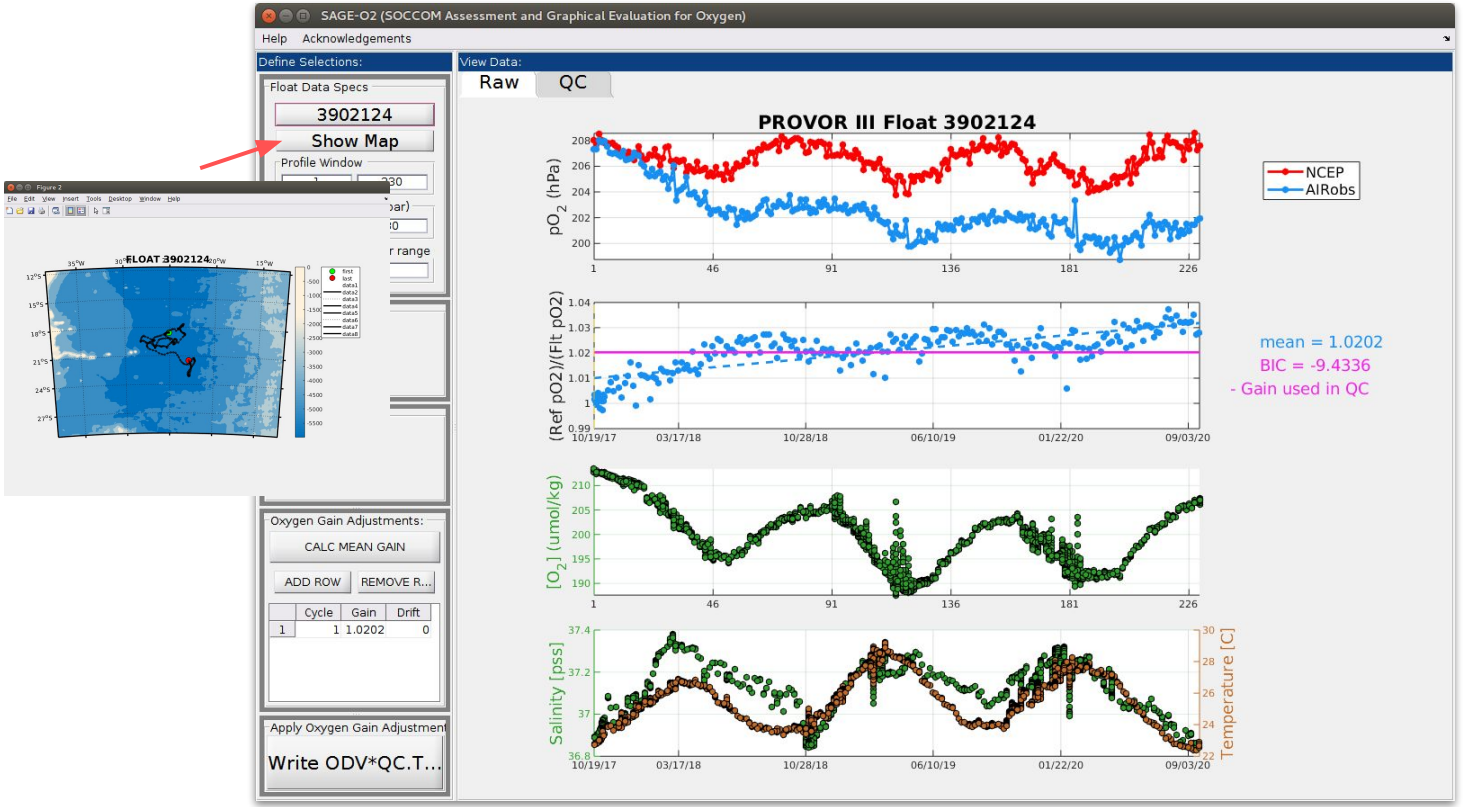
5- Launch SAGE O_2 in MATLAB



6- SAGE O_2 GUI


SAGE-O2 (SOCCOM Assessment and Graphical Evaluation for Oxygen)
Help
Acknowledgements
Define Selections:
Float Data Specs
3902124
Show Map
Profile Window
1
230
Pressure Range (dbar)
0
30
GLODAP cross-over range
30
Plot Type
Surface
Deep
Profile
Reference Data
NCEP
WOA2018
Oxygen Gain Adjustments:
CALC MEAN GAIN
ADD ROW
REMOVE R...
Cycle
Gain
Drift
1
1 1.0202
0
Apply Oxygen Gain Adjustment
Write ODV*QC.T...
View Data:
Raw
QC
PROVOR III Float 3902124
pO2 (hPa)
NCEP
AIRobs
(Ref pO2)/(Flt pO2)
mean = 1.0202
BIC = -9.4336
- Gain used in QC
[O2] (umol/kg)
Salinity [pss]
Temperature [C]
10/19/17
03/17/18
10/28/18
06/10/19
01/22/20
09/03/20

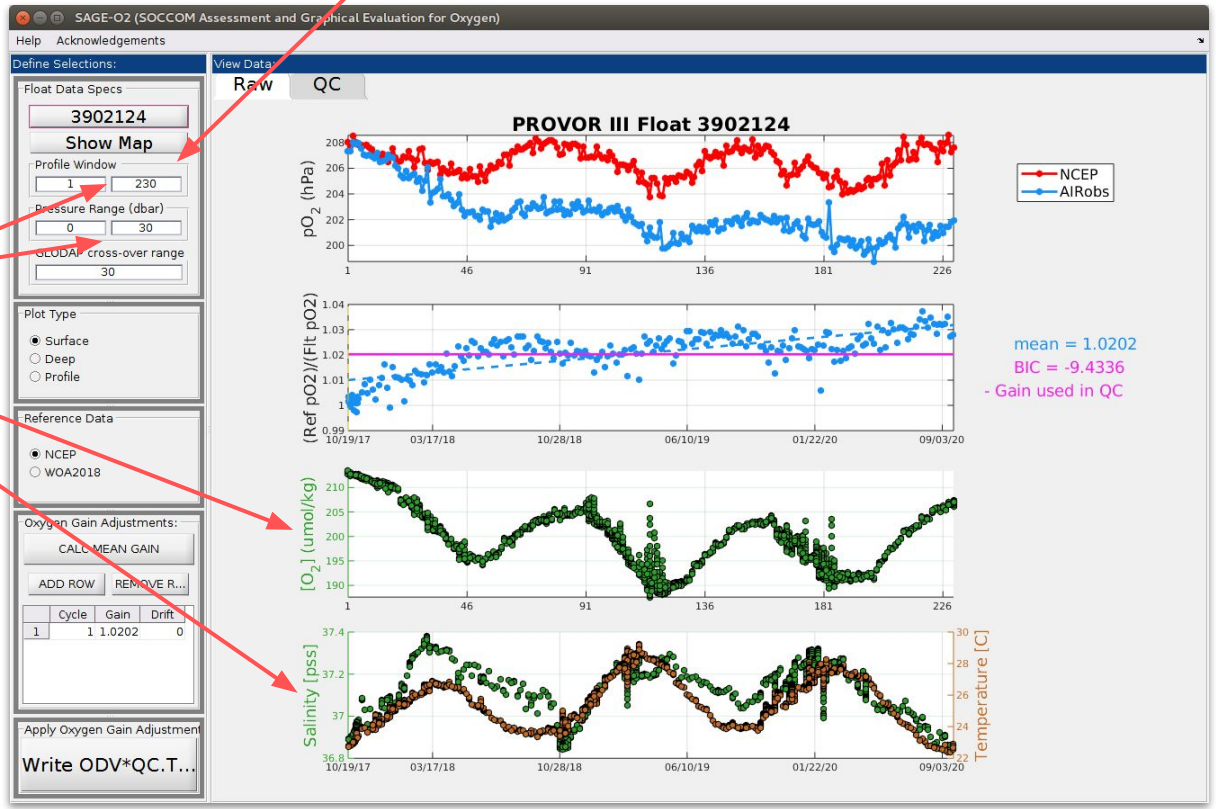
6- SAGE O_2 GUI


SAGE-O2 (SOCCOM Assessment and Graphical Evaluation for Oxygen)
Help
Acknowledgements
Define Selections:
Float Data Specs
3902124
Show Map
Profile Window
Oxygen Gain Adjustments:
CALC MEAN GAIN
ADD ROW
REMOVE R...
Cycle
Gain
Drift
1 1 1.0202 0
Apply Oxygen Gain Adjustment
Write ODV*QC.T...
View Data:
Raw
QC
PROVOR III Float 3902124
pO2 (hPa)
NCEP
AIRobs
(Ref pO2)/(Flt pO2)
mean = 1.0202
BIC = -9.4336
- Gain used in QC
[O2] (umol/kg)
Salinity [pss]
Temperature [C]
10/19/17
03/17/18
10/28/18
06/10/19
01/22/20
09/03/20
FLOAT 3902124

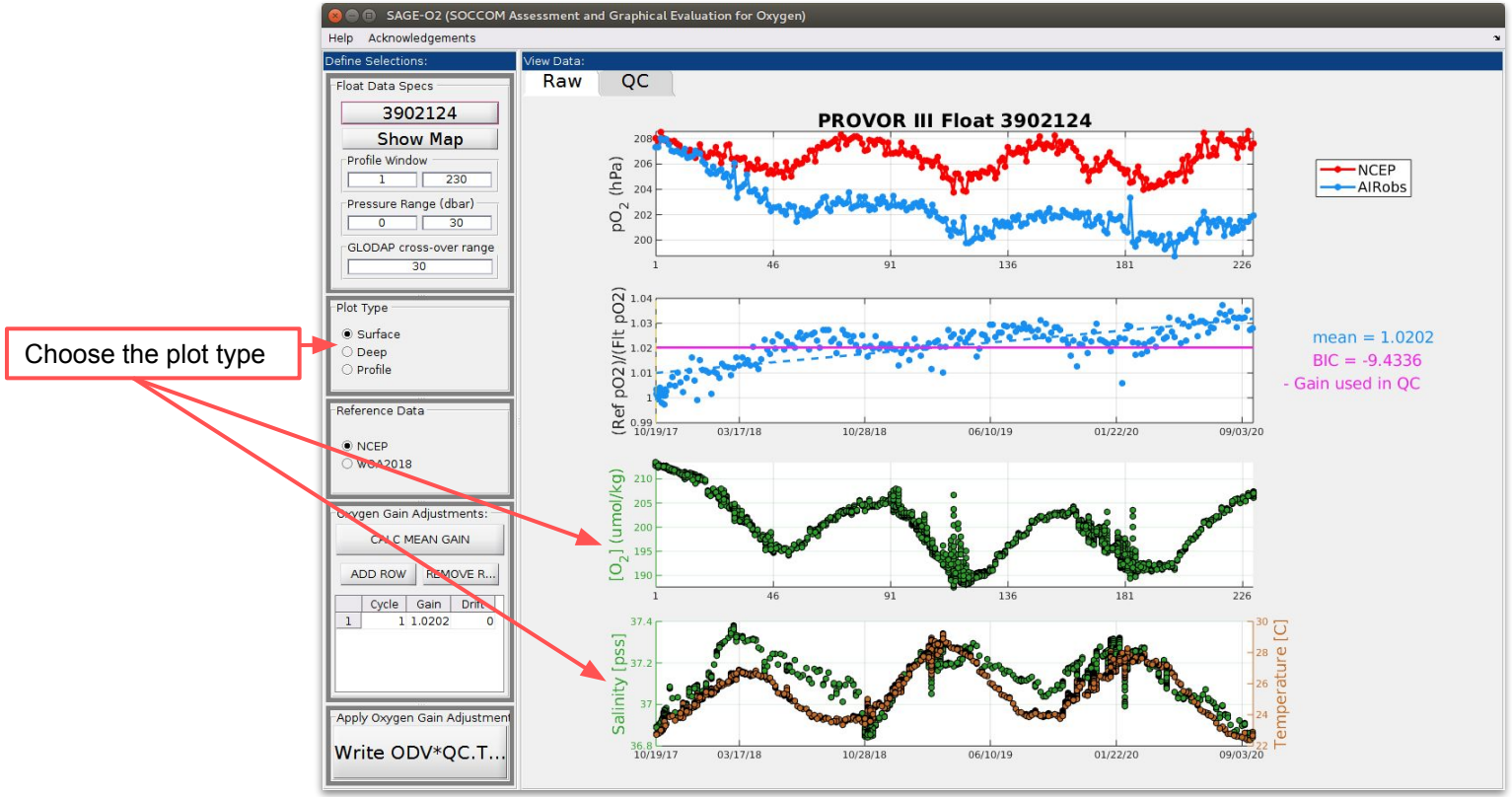
6- SAGE O_2 GUI

Number of cycle

Change the pressure and cycle range

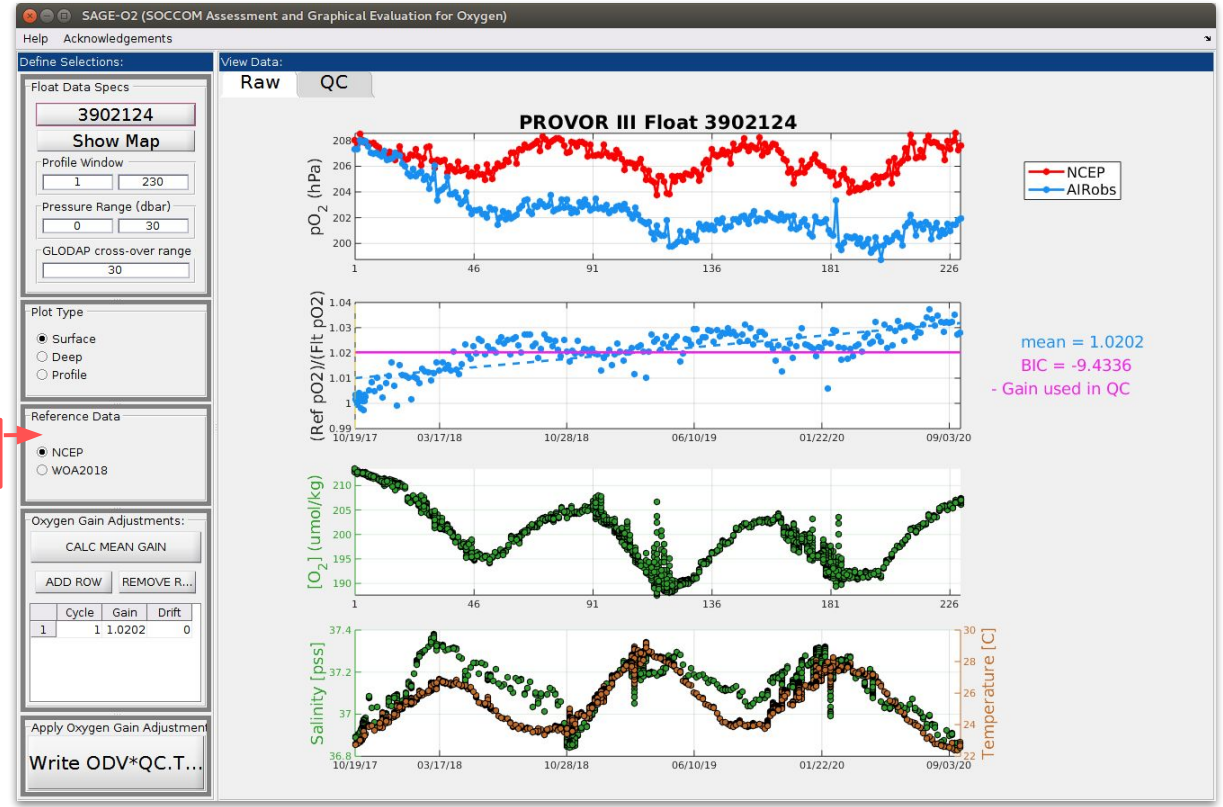


6- SAGE O_2 GUI

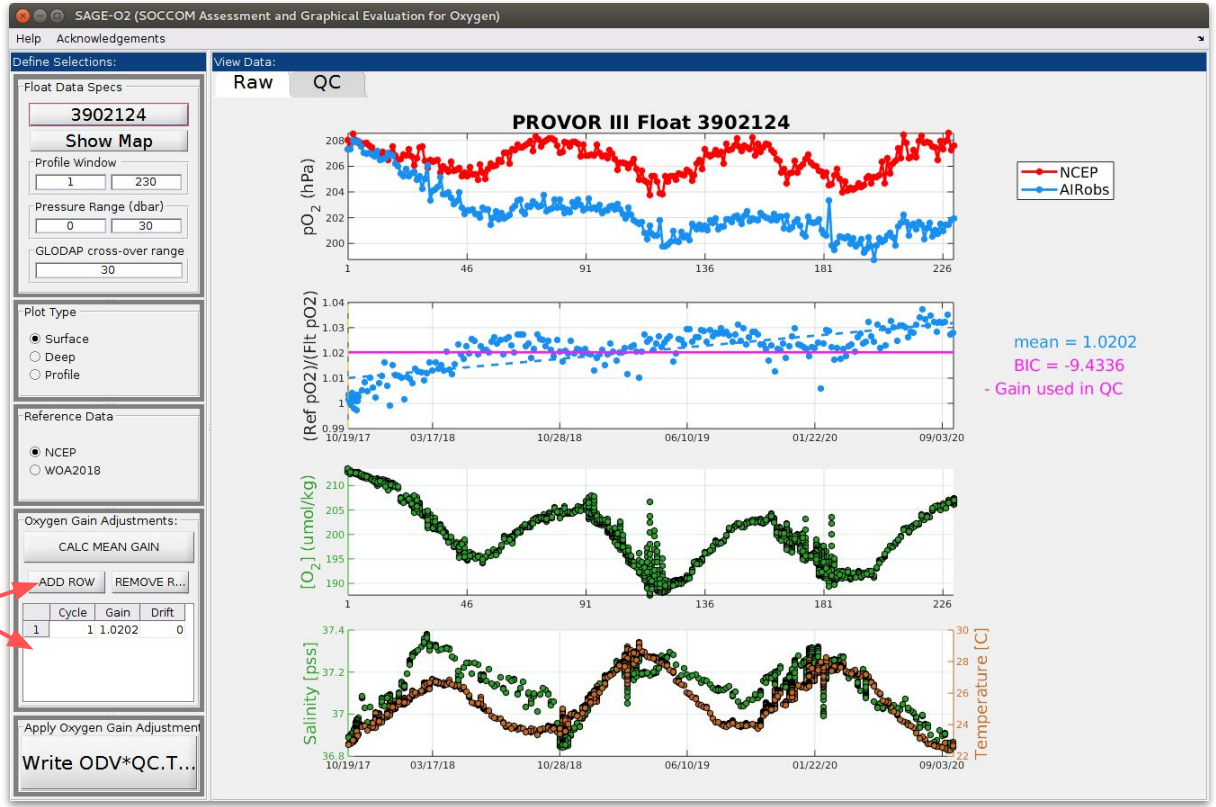

Choose the plot type
SAGE-O2 (SOCCOM Assessment and Graphical Evaluation for Oxygen)
Help
Acknowledgements
Define Selections:
Float Data Specs
3902124
Show Map
Profile Window
1
230
Pressure Range (dbar)
0
30
GLODAP cross-over range
30
Plot Type
Surface
Deep
Profile
Reference Data
NCEP
WOA2018
Oxygen Gain Adjustments:
CALC MEAN GAIN
ADD ROW
REMOVE R...
Cycle
Gain
1
1 1.0202
0
Apply Oxygen Gain Adjustment
Write ODV*QC.T...
View Data:
Raw
QC
PROVOR III Float 3902124
pO2 (hPa)
NCEP
AIRobs
(Ref pO2)/(Flt pO2)
mean = 1.0202
BIC = -9.4336
- Gain used in QC
[O2] (umol/kg)
Salinity [pss]
Temperature [C]
10/19/17
03/17/18
10/28/18
06/10/19
01/22/20
09/03/20

6- SAGE O_2 GUI

If NCEP available → choose between NCEP and WOA

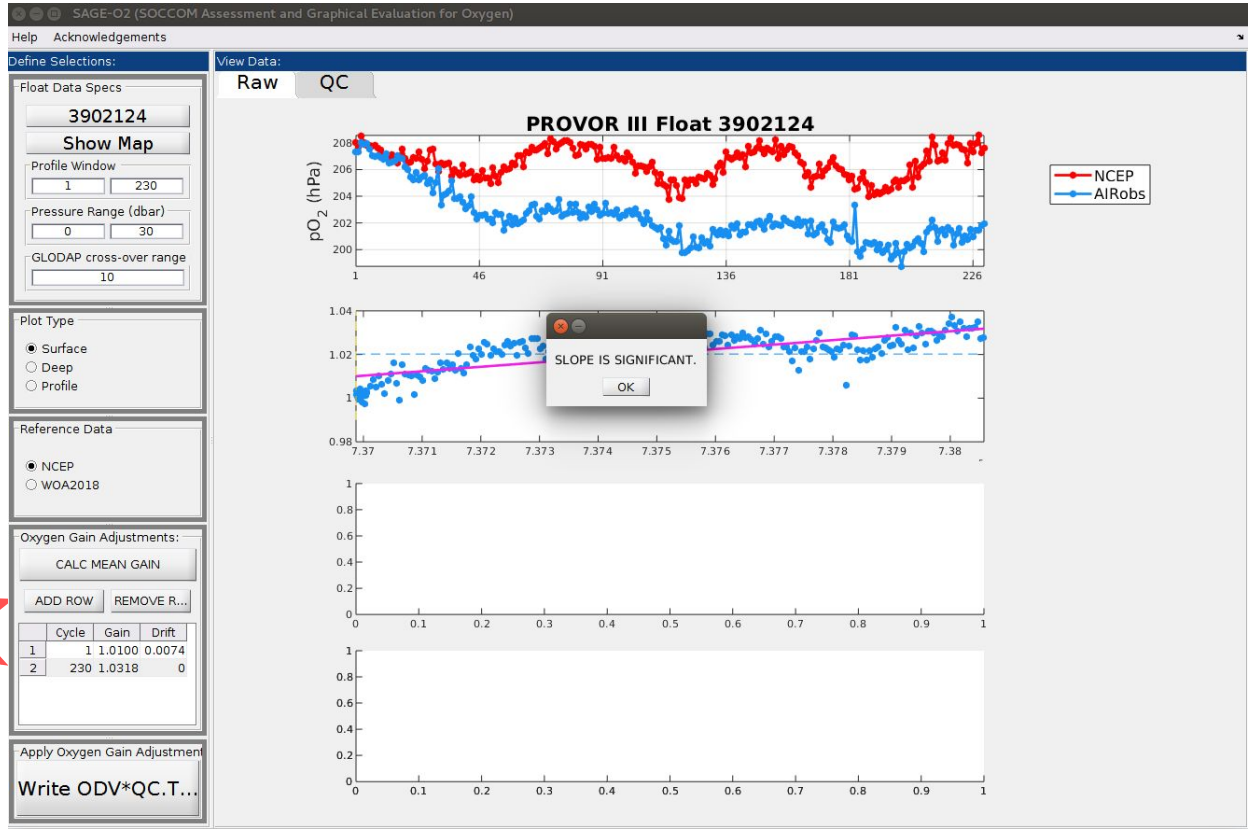


6- SAGE O_2 GUI



Add row and put the chosen cycle (last cycle for calculating drift and add several rows for adding breakpoints)

6- SAGE O_2 GUI



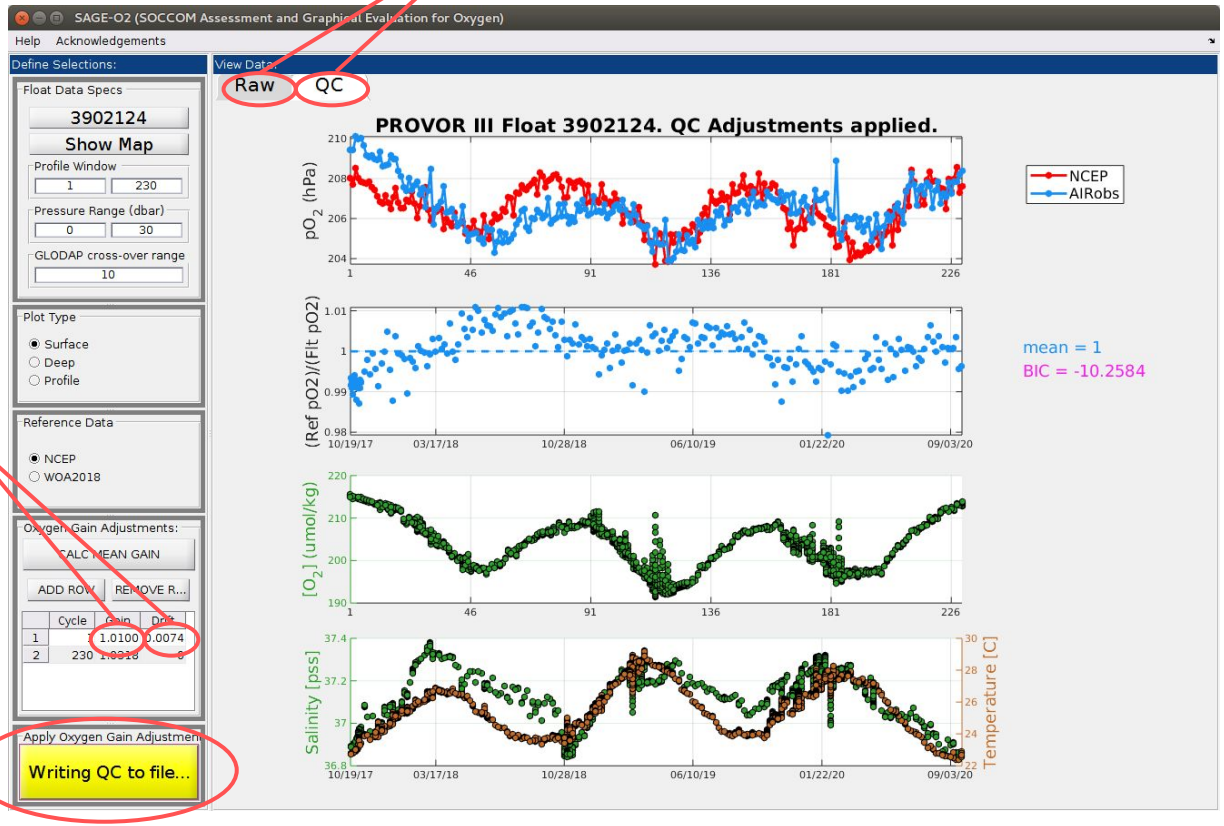
Add row and put the chosen cycle (last cycle for calculating drift and add several rows for adding breakpoints)

6- SAGE O_2 GUI

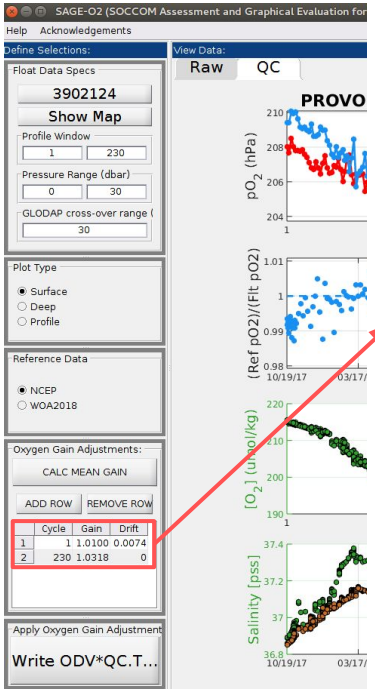
Choose to plot Raw or QC data

The gain and drift are given here

When you are happy write the results



7- Coefficients for oxygen adjustments



Cycle	Gain	Drift
1	Gain to apply from cycle 1 to 10	Drift to apply from cycle 1 to 10
10	Gain to apply from cycle 10 to 20	Drift to apply from cycle 10 to 20
20	Gain to apply from cycle 20 to ...	Drift to apply from cycle 20 to ...
...	...	...
70	xxx	0

These last values are not used to compute the oxygen gain adjustments

bgcArgoDMQC: A python package for performing Biogeochemical Argo quality control

Christopher Gordon

Fisheries and Oceans Canada

chris.gordon@dfo-mpo.gc.ca

biogeochemical Argo

Fisheries and Oceans Canada | Pêches et Océans Canada

bgcArgoDMQC

- A python package for performing DMQC on biogeochemical Argo oxygen data (calculating oxygen gain)

- An open source implementation of the SAGE-O2 matlab code – has been partially verified against SAGE output to ensure agreement between the two code sets (though more validation is still required)

- Long term, plan to implement QC methods for all BGC Argo variables, but only currently does oxygen

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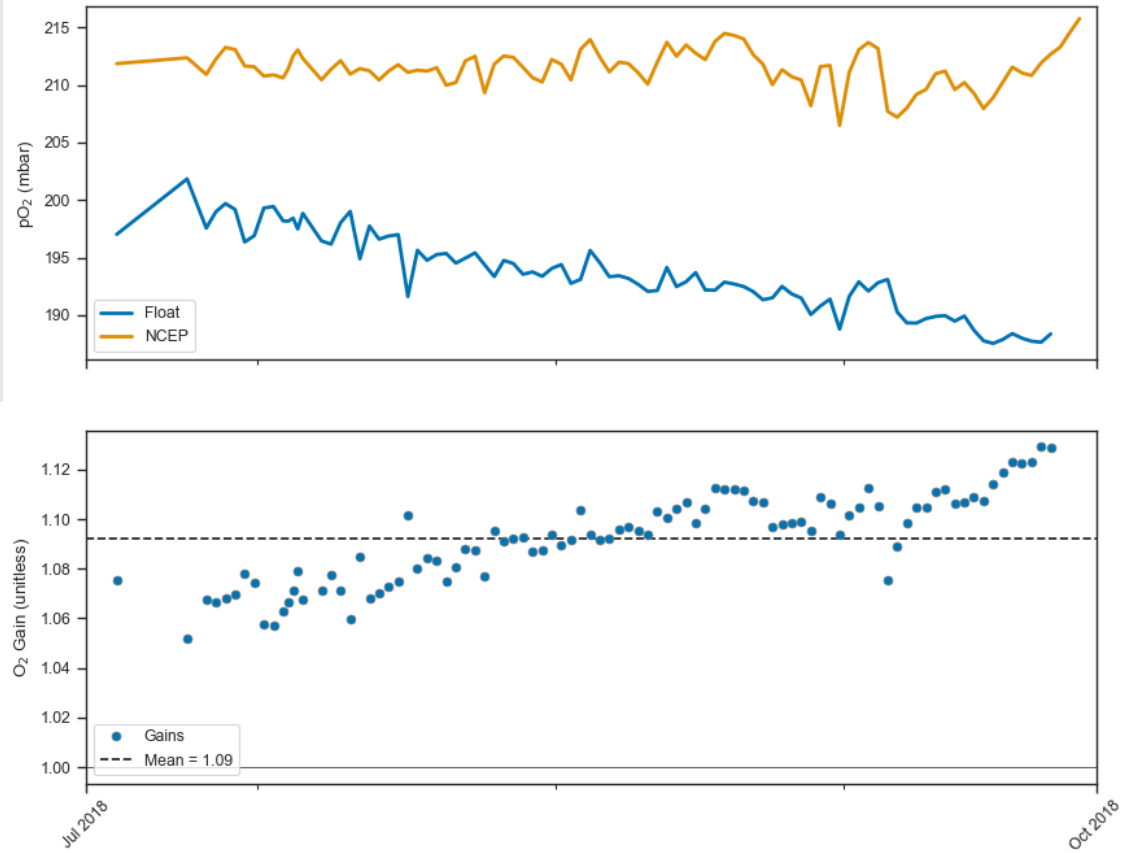
Basic package usage

```
import bgcArgo as bgc

# tell the package where to look for data on your personal machine
bgc.set_dirs(argo_path=argo_path, ncep_path=ncep_path, woa_path=woa_path)

# load a synthetic (Sprof) profile
syn = bgc.sprof(6902896)
# calculate gains in-air and using saturation data
inair_g = syn.calc_gains()
sat_g   = syn.calc_gains(ref='WOA)

# print out the mean gain and visualize
g = syn.plot('gain', ref='NCEP')

>>> print(f'Mean in-air gain: {np.nanmean(inair_g):.2f}')
>>> plt.show()
```

Out: 1.09



Future work & closing notes

- Package can be installed and used, but validation is not complete at this point. Package is in active development.

- There are many other functions of the package that I didn't cover today, including performing oxygen time-response correction, calculating gain with a carryover factor (Bittig et al. 2018), and more!

- If you're interested in collaborating as (1) and alpha user/tester, (2) contributing to a python tool for another variable or (3) generally helping with development of the package, or submitting issues via github - please get in touch!! My email is chris.gordon@dfo.mpo.gc.ca.

Fisheries and Oceans Canada Pêches et Océans Canada

Some useful links

- Github page: https://github.com/ArgoCanada/bgcArgoDMQC
- Package guide/documentation: https://bgcargodmqc.readthedocs.io
- Try it out (via pangeo binder): https://binder.pangeo.io/v2/gh/ArgoCanada/bgcArgoDMQC/master?filepath=notebooks%2FbgcArgoDMQC-basic-usage.ipynb

LOCODOX: a tool for Argo Oxygen correction

Ifremer: Virginie Thierry, Thomas Bouinot, Cathy Lagadec, Thierry Reynaud

Altran Company: Emilie Brion, Marine Gallian, Anne Piron, Patricia Zunino,

https://archimer.ifremer.fr/doc/00630/74190/
https://github.com/euroargodev/LOCODOX

LOCODOX

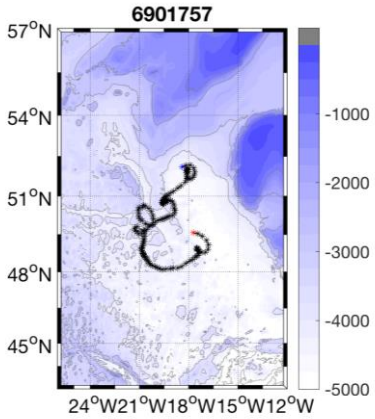
- MATLAB interactive tool that corrects dissolved oxygen concentration data acquired by Argo profiling floats.
- It works with Argo v3.1 netcdf files and provides files with corrected and well formatted delayed mode Argo data compliant with the Argo format.
- LOCODOX corrects only oxygen data available in the vertical profiles (not in trajectory)
- Three types of correction are proposed:
  - a pressure dependent correction
  - a temporal drift correction
  - a slope (gain) and/or offset correction
- The methodologies are based on Takeshita et al, 2013, Bittig and Kortzinger, 2018 methods.

Steps

- Argo data reading and processing
- Reference data reading and processing; Colocalization of reference data to the argo trajectory, interpolation of reference profile data to the argo level;
- Pressure dependent correction
- Computation of the oxygen sensor temporal drift computed and application: 2 methods available (based on either WOA or inair measurements)
- Computation of the gain correction of the oxygen profiles and application (3 methods available: WOA, ref profile, in air);
- Correction applied and NetCDF fields updated following the Argo format v3.1 recommendations;

Pressure dependent correction

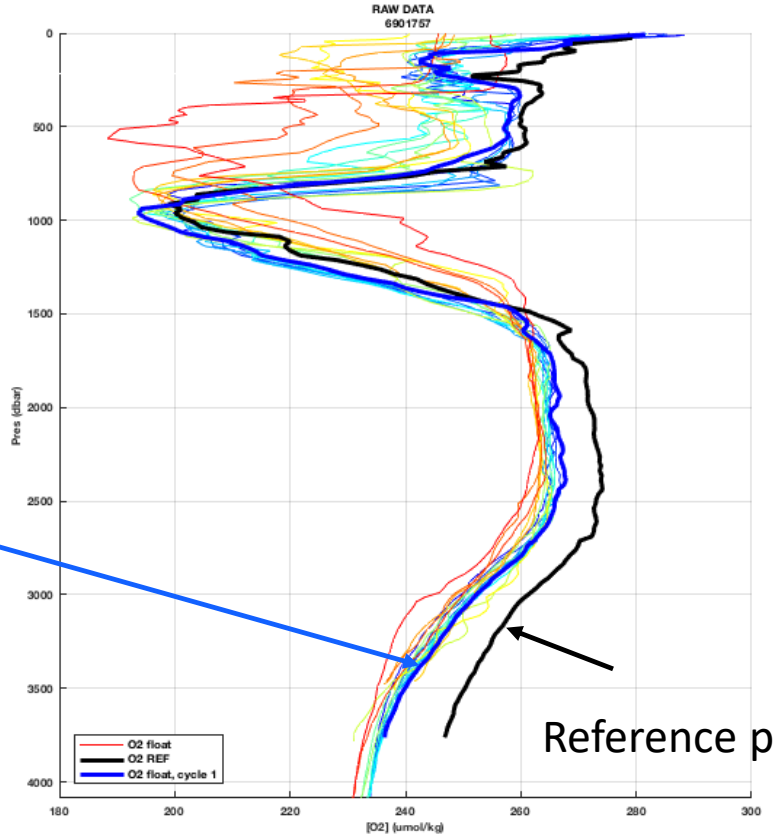
- DOXY_corr=DOXY * (1 + *coeff**PRES/1000)
- Coeff typically varies between 0 and 0.01
- Manual determination of the coefficient



Additional pressure effect
Deep Argo float: 6901757

After correction:
PSAT_adjusted=a*PSAT
It remains a pressure bias

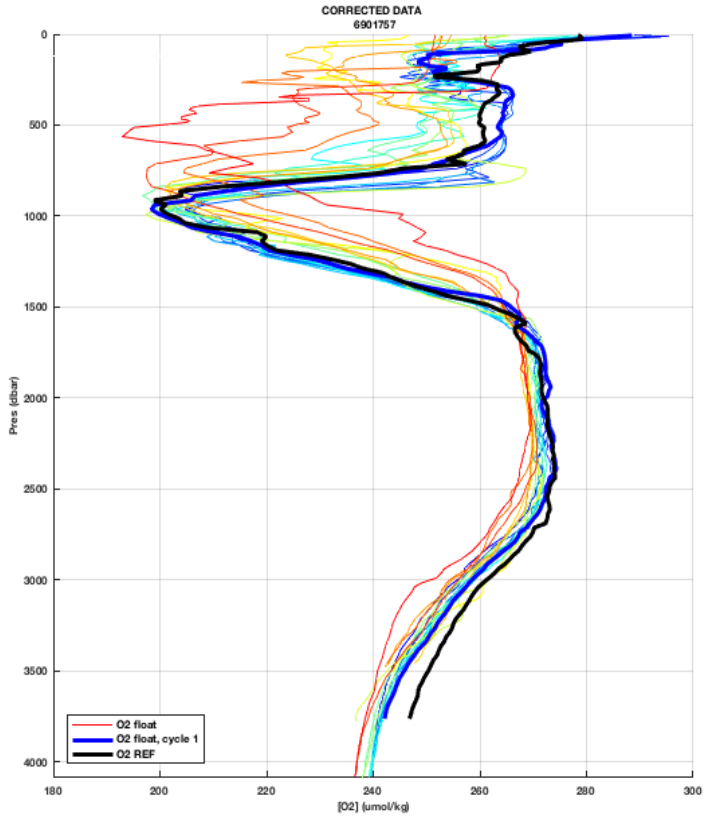
Before correction



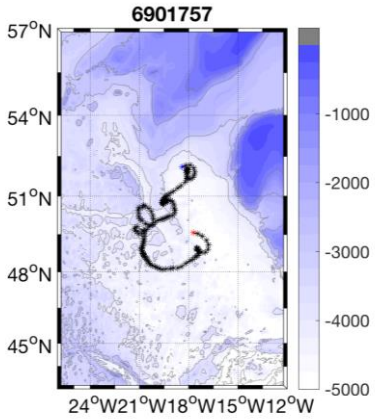
Argo profile to be compared to the refrence profile

Reference profile

DOXY (mumol/kg)

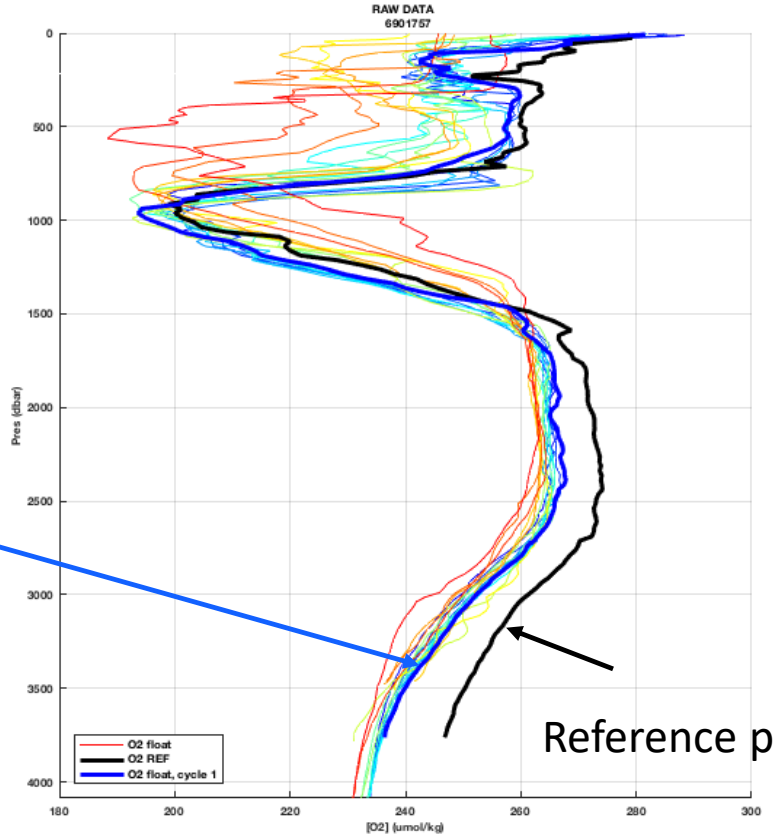


DOXY (mumol/kg)



Additional pressure effect
Deep Argo float: 6901757

Before correction

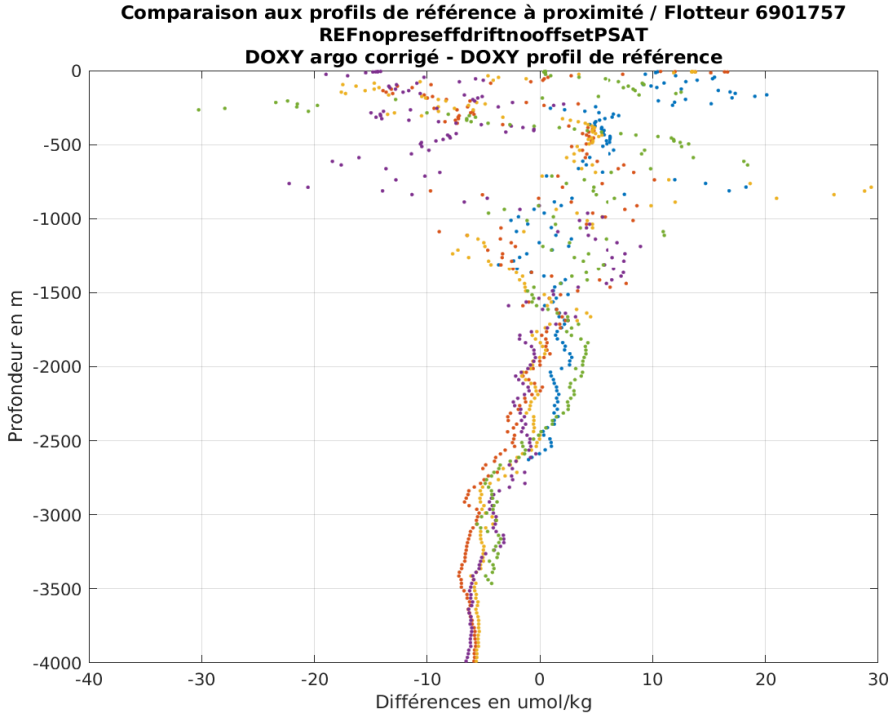


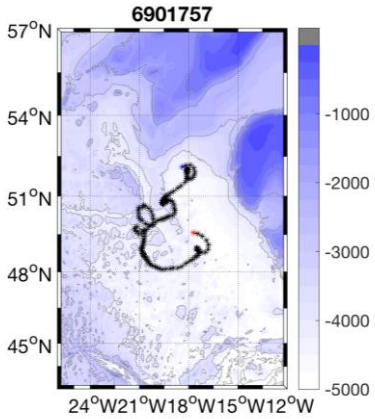
Argo profile to be compared to the refrence profile

Reference profile

DOXY (mumol/kg)

Comparison to nearby CTD profiles
<50km
<2 years

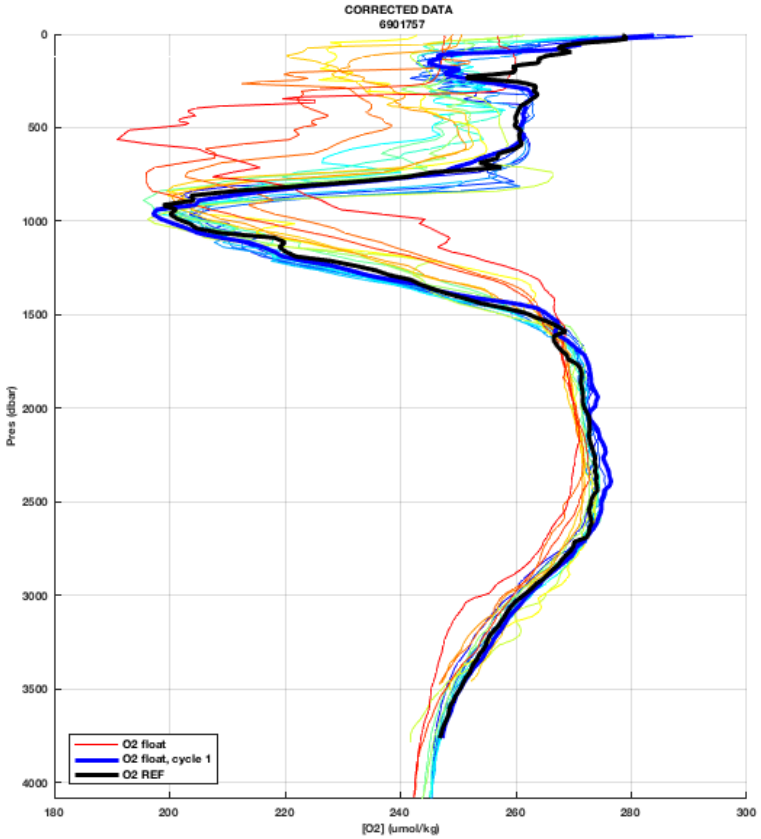


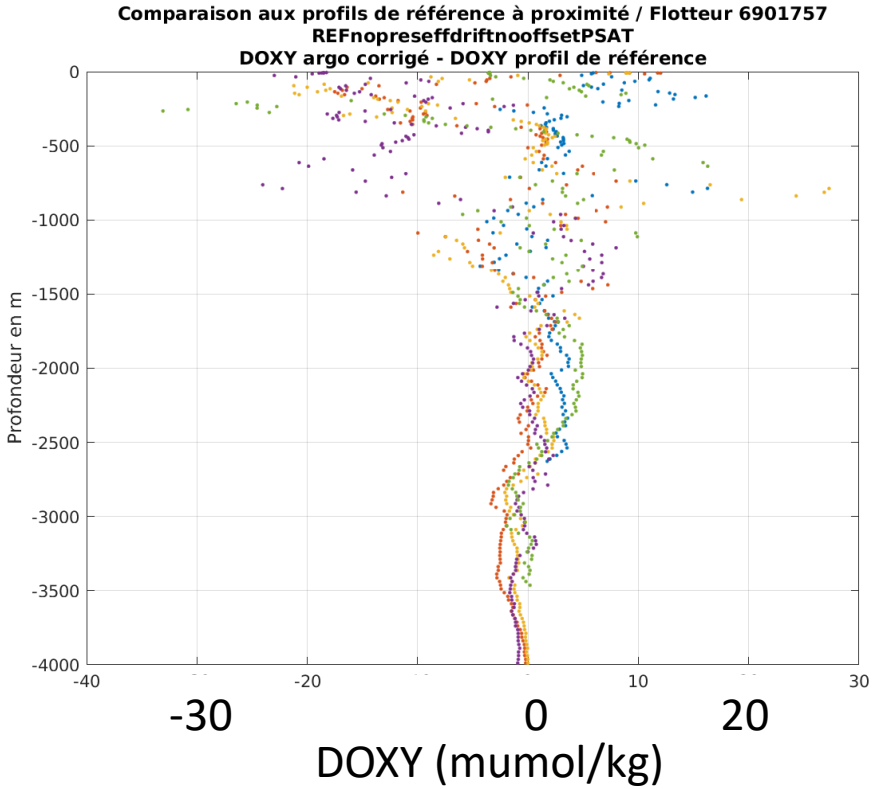


Additional pressure effect
Deep Argo float: 6901757

Apply an additional pressure correction on the raw data
DOXY_corr=DOXY*(1+0.01*PRES/1000)
PSAT_adjusted=a*PSAT

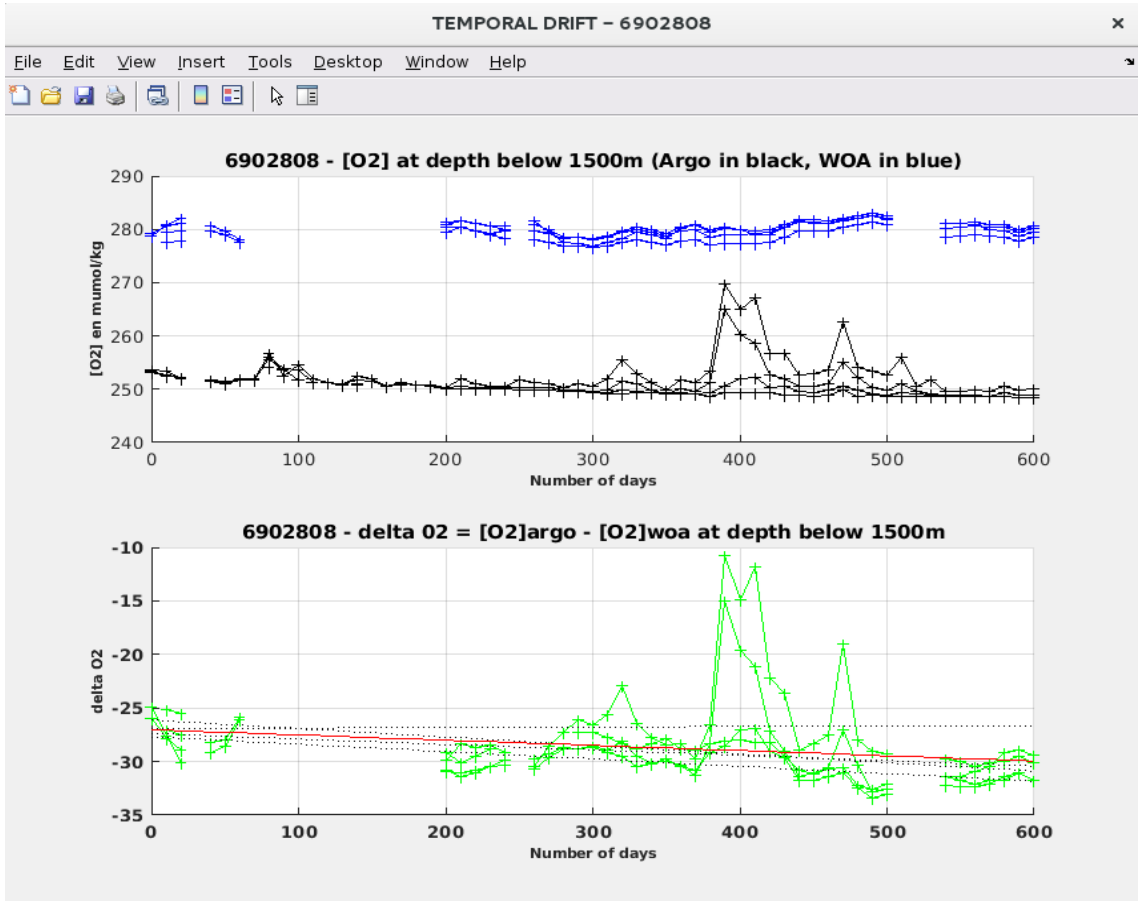
Comparison to nearby CTD profiles
<50km
<2 years



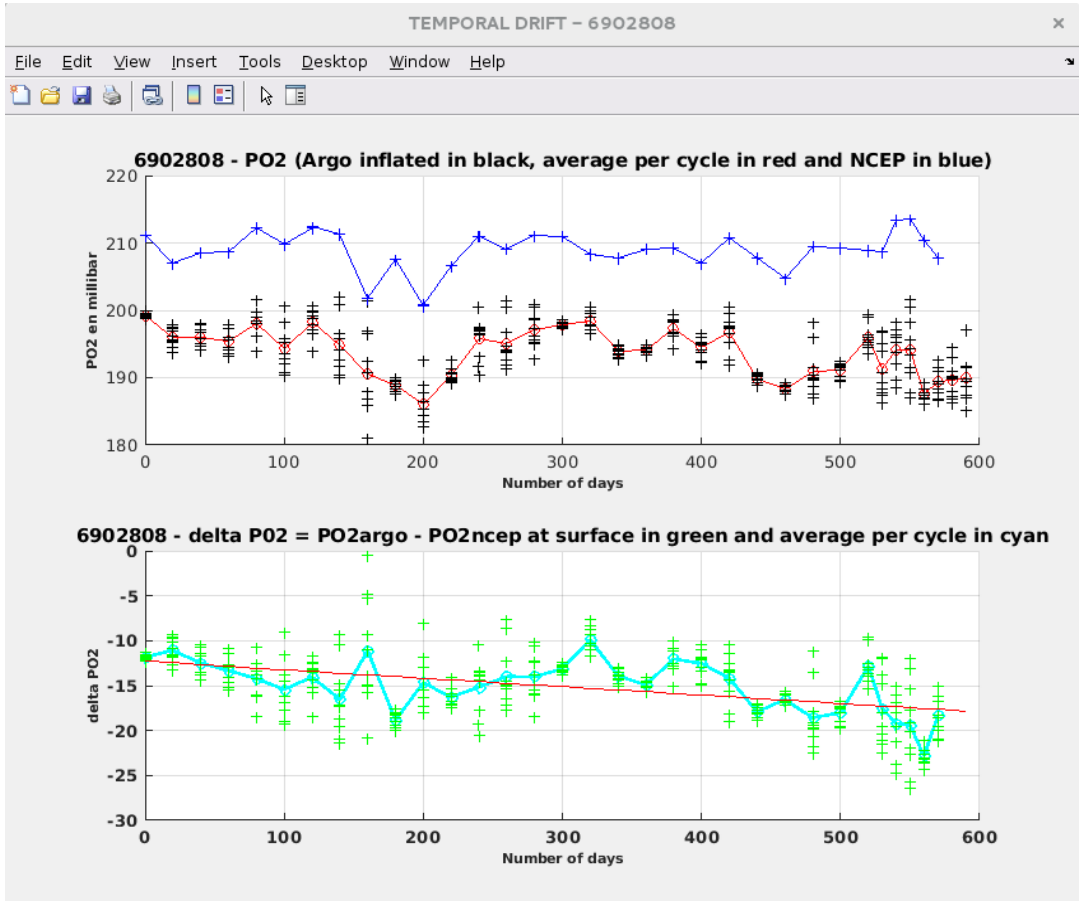


Drift computation

Comparison between float data and WOA at depth > 1000 dbar



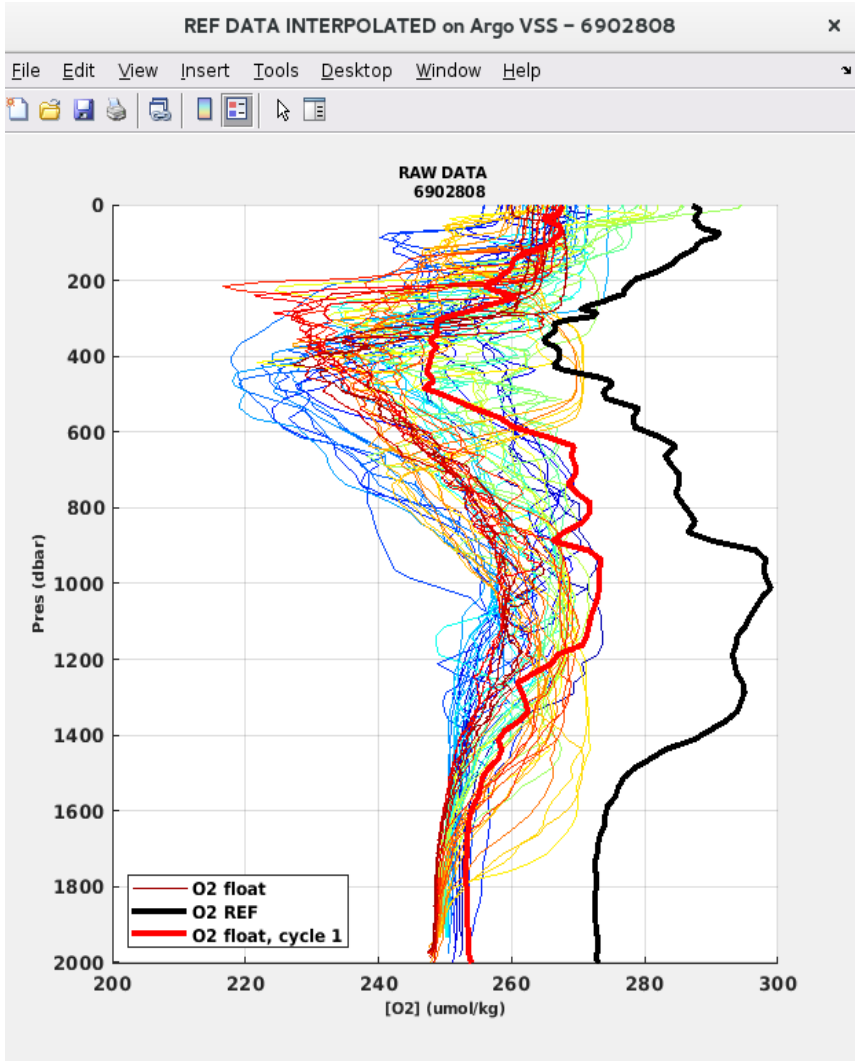
Comparison between NCEP and in air float measurements



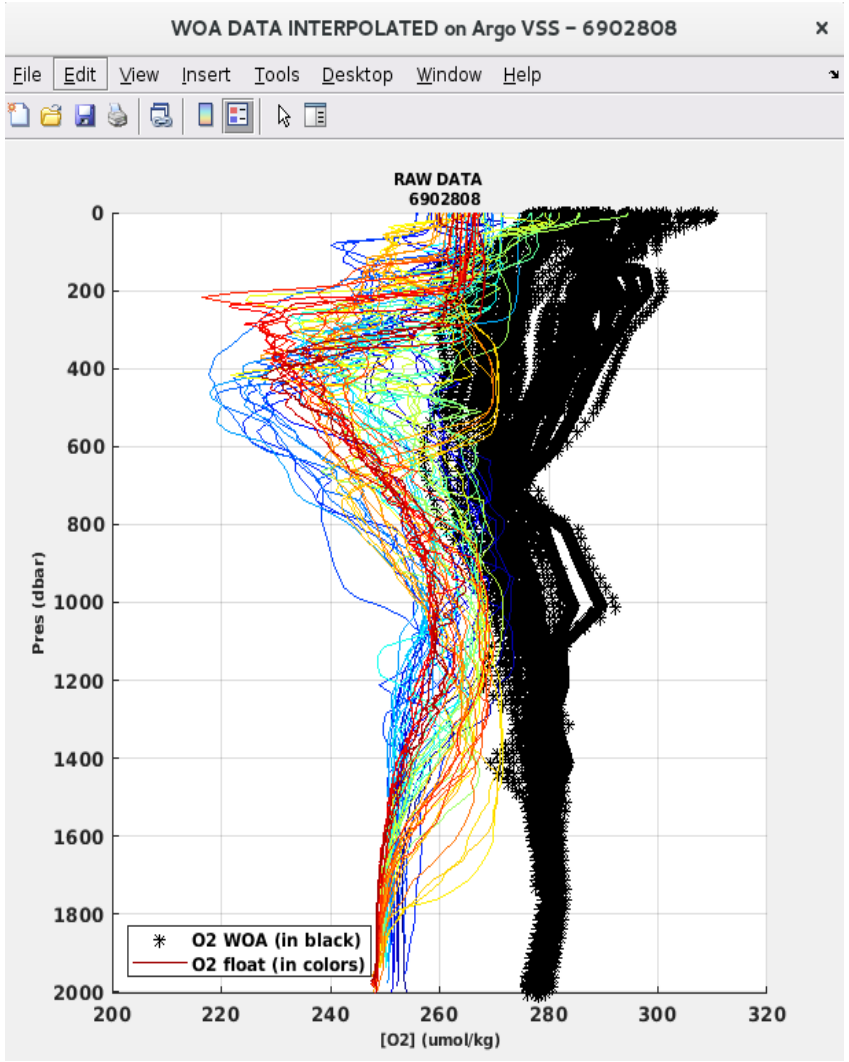
- Possibility to choose the drift equation (linear, polynomial) or to stop the drift after a given date

Gain correction

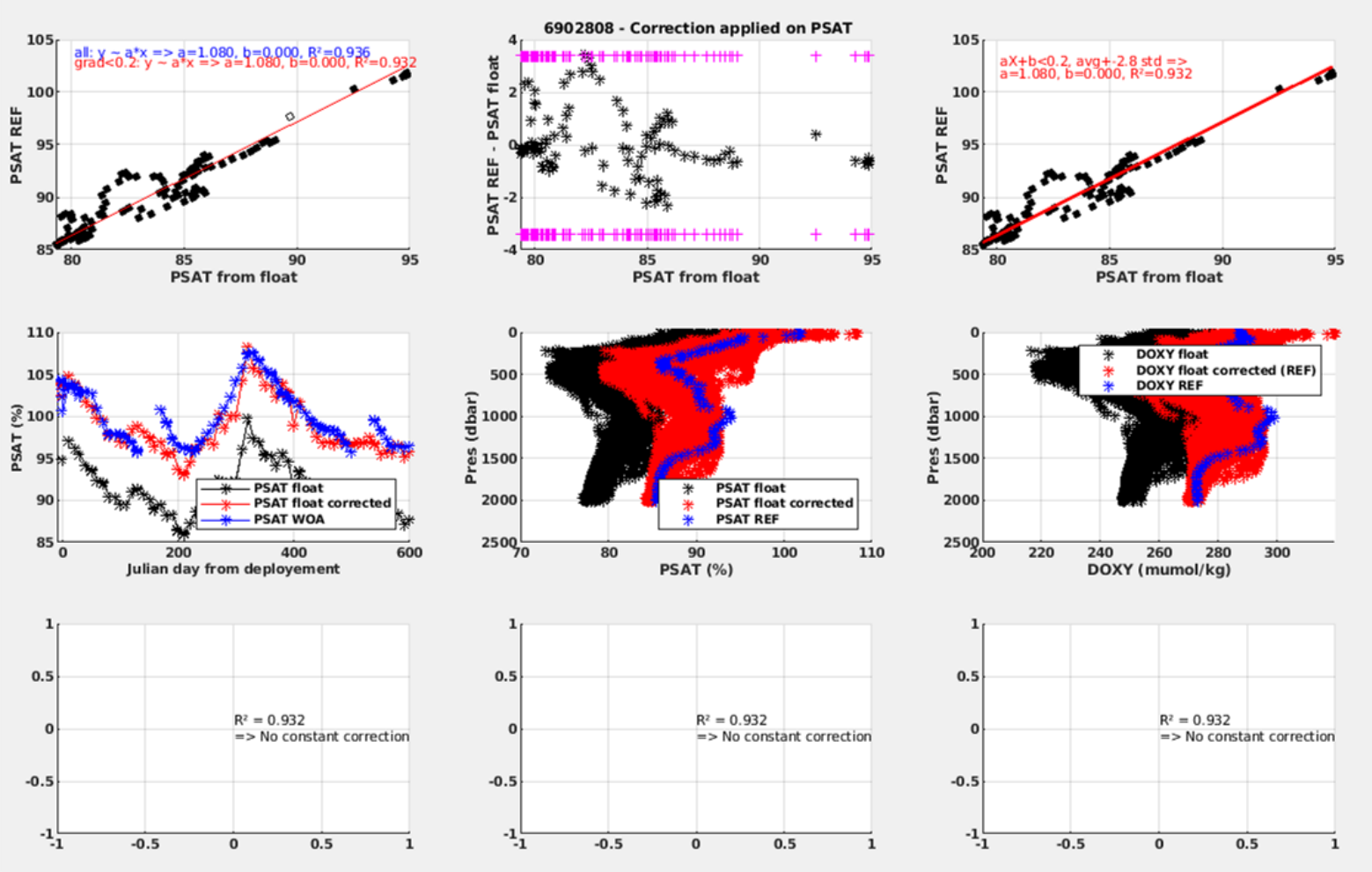
Comparison to an in situ ref profile (REF method)



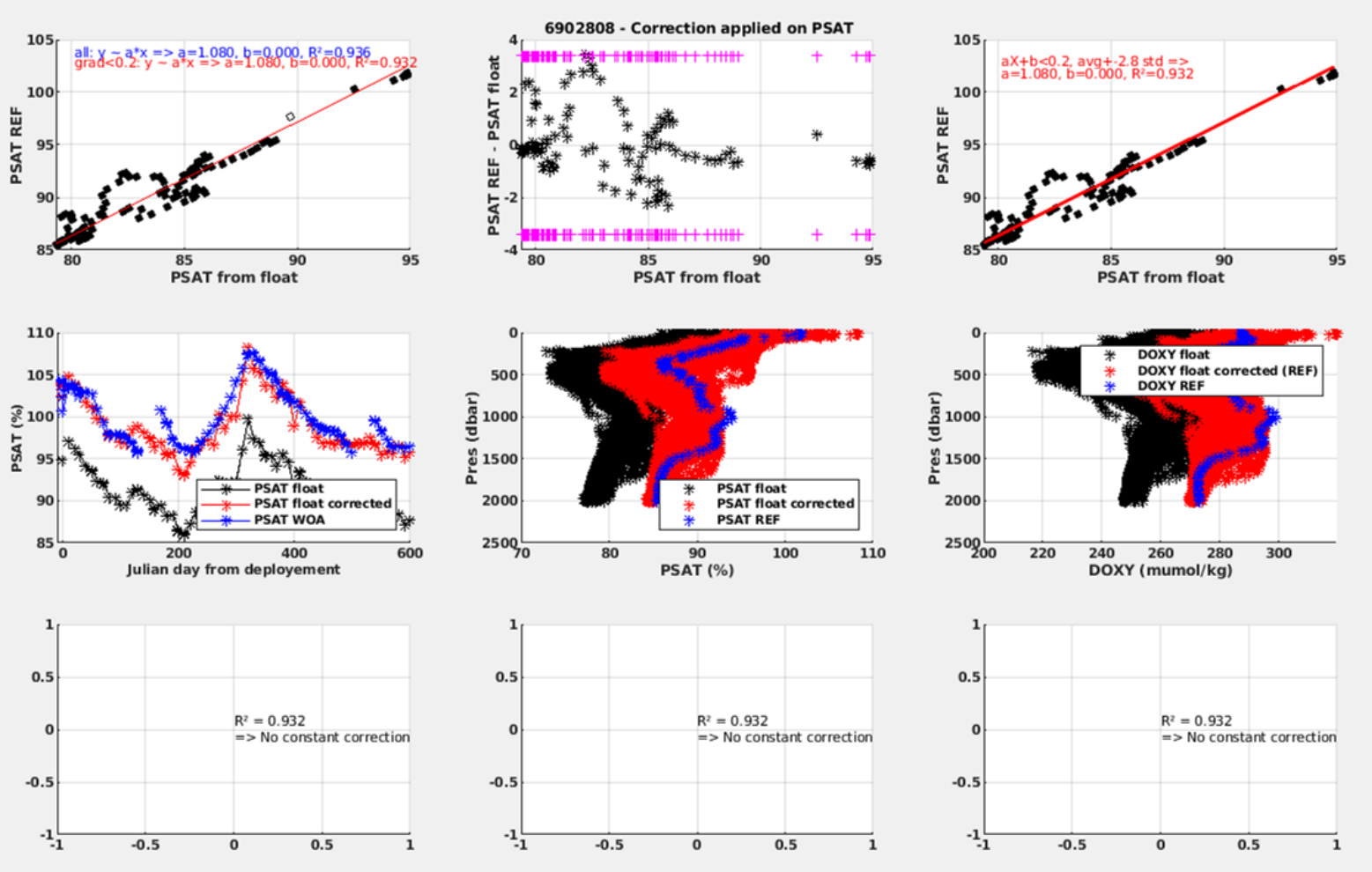
Comparison to WOA (WOA method)

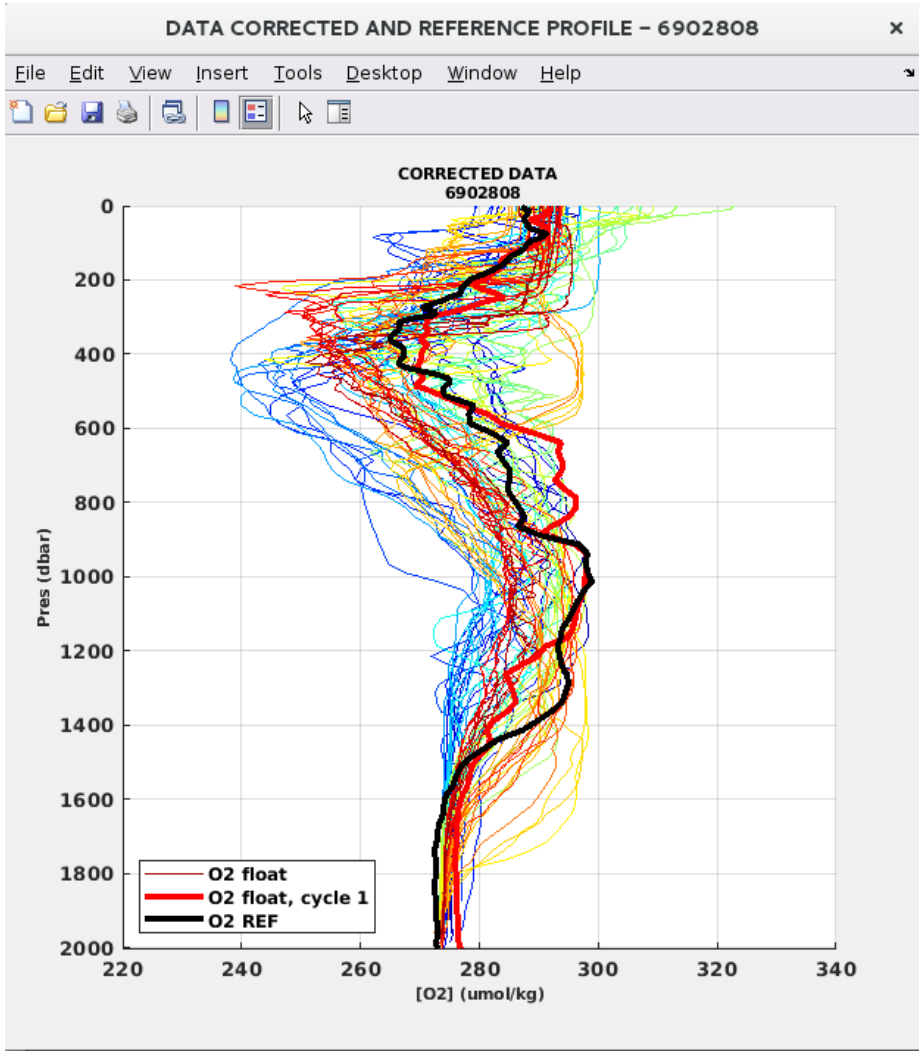


Gain correction: based on *in situ* reference profile

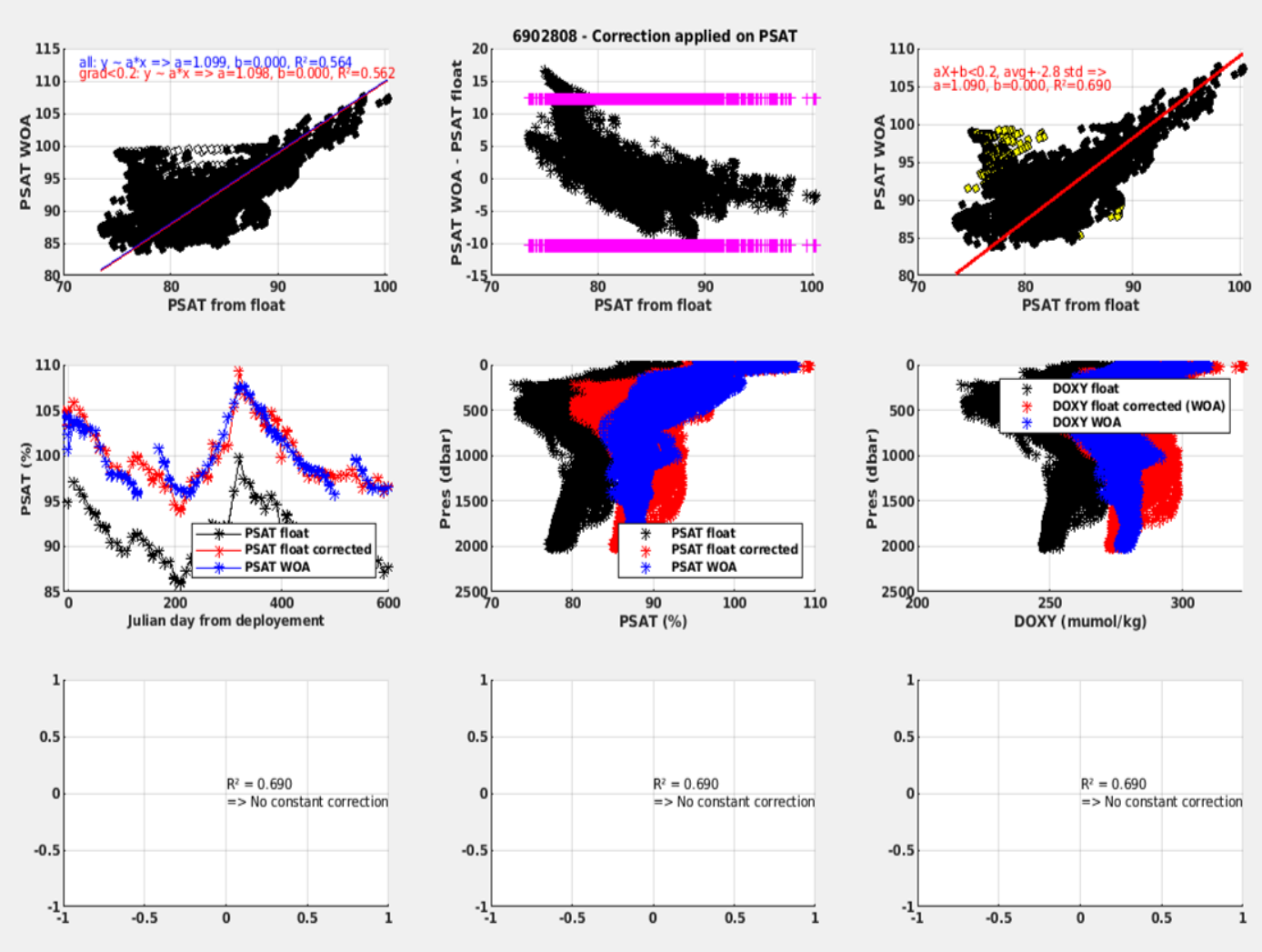


Gain correction: based on *in situ* reference profile

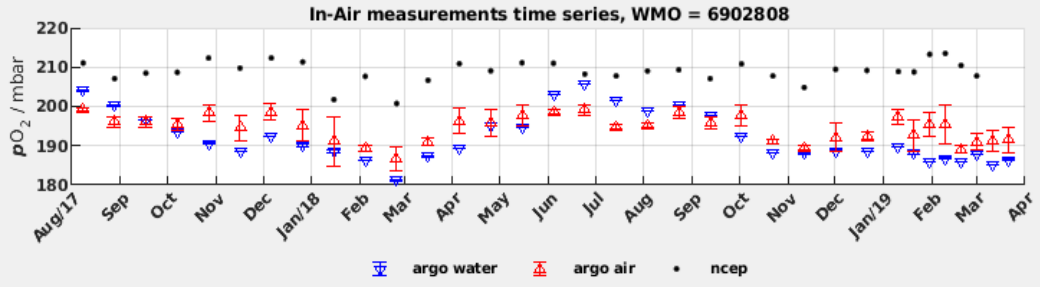


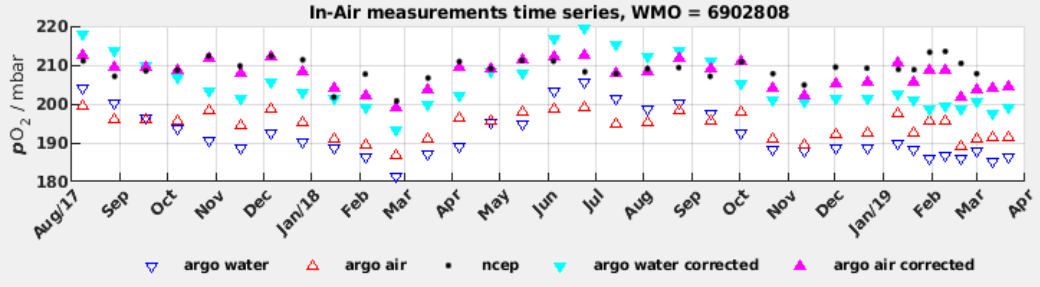


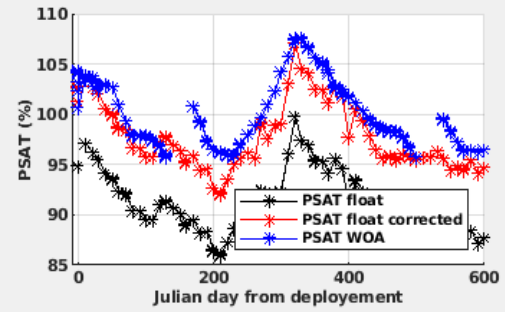
Gain correction: based on WOA

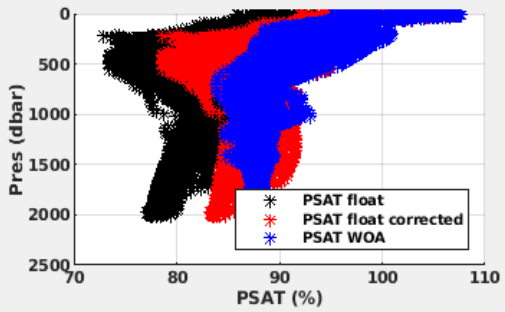


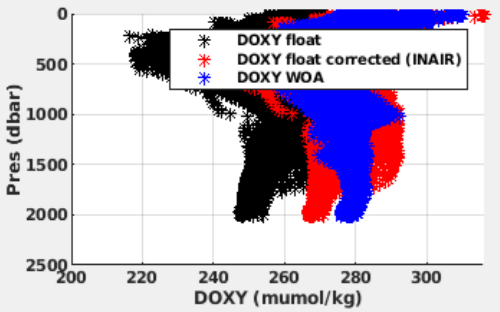
Gain correction: based on in air measurements

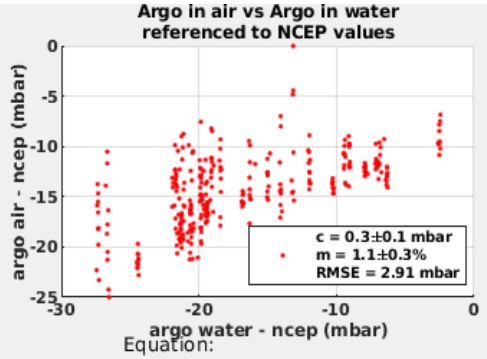










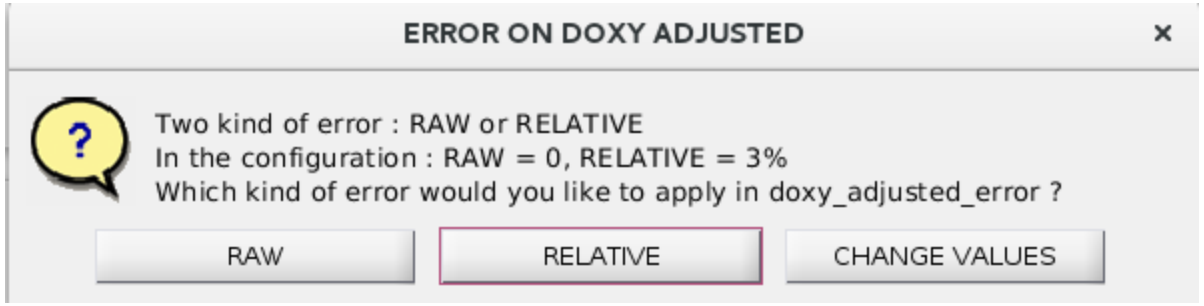


Equation:
PO2_inair ~ c*PO2_inwater + ((1-c)/m)PO2_ncep

Coefficients:
m= 1.07 +/- 0.30 %
c = 0.34 +/- 0.05 mBar

Stats:
pValues = 3.48e-31
c pValues = 9.29e-138
Number of obs : 320
RMSE : 2.907
R-Squared : 0.510
Adjusted R-Squared : 0.508

Files writting



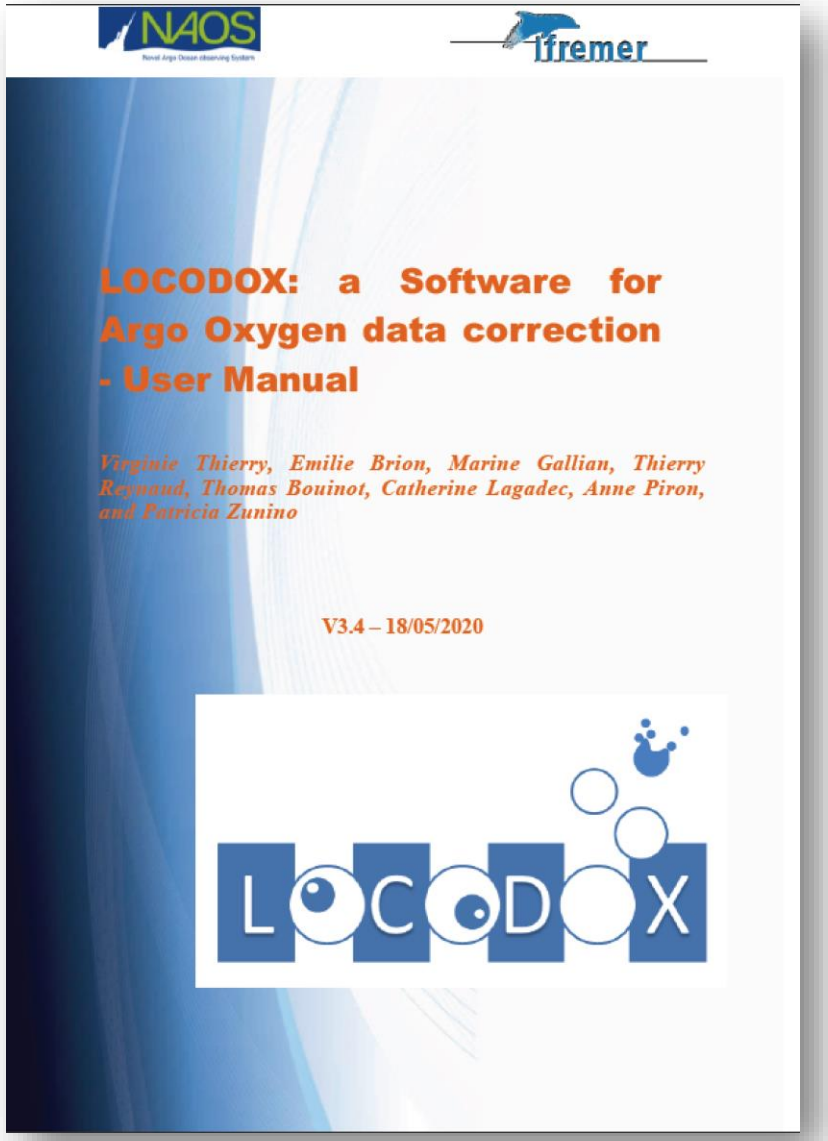
- Write netcdf files that can enter the Argo data flow as is (with all ADJUSTED fields updated)

Output files: fully compliant with Argo rules

- SCIENTIFIC_CALIB_EQUATION (N_CALIB=1)= PPOX = f(DOXY); PPOX1=PPOX - drift_coef
- SCIENTIFIC_CALIB_EQUATION (N_CALIB=2)= PSAT=f(PPOX1); PSAT_ADJUSTED=A*PSAT+B;DOXY_ADJUSTED=f(PSAT_ADJUSTED)
- SCIENTIFIC_CALIB_COEFFICIENT (N_CALIB=1) = « drift_coef = -0.01 »
- SCIENTIFIC_CALIB_COEFFICIENT (N_CALIB=2) = « A=1.077; B=0 »
- SCIENTIFIC_CALIB_COMMENT (N_CALIB=1) = « PPOX converted from DOXY; Time drift correction on PPOX (drift computed from NCEP data) »
- SCIENTIFIC_CALIB_COMMENT (N_CALIB=2) = Percent saturation corrected as a linear function of PSAT; Comparison to the reference profile ov18_d_102 (isobaric match as in Takeshita et al. (2013)) on cycle 1; PSAT converted from DOXY and DOXY_ADJUSTED converted from PSAT_ADJUSTED

Some comments

- The REF method needs a user defined reference data base
- The locodox_config.m files define some user choices
  - Path and directories
  - O2 correction parameter
    - Include or not carry over effect
    - Drift equation type and depth to be considered for drift calculation based on WOA
  - Data selection parameter
    - Use DM or RT PRES, TEMP and PSAL data
    - QC to be used for PRES, TEMP, PSAL and DOXY
    - Measurement codes for In-Air and Near-surface samples
  - Other choices relative to plots, configuration, etc..



https://archimer.ifremer.fr/doc/00630/74190/

https://github.com/euroargodev/LOCODOX

Software provided as it is

Contact:
T. Reynaud (thierry.reynaud@ifremer.fr)

Some comments

- LOCODOX works with either DOXY or PSAT
  - ➢ Need to implement the possibility to work with PPOX
- The correction equation is in the form:
  - DOXY_corr1 = DOXY * (1 + *coeff**PRES/1000)
  - DOXY_corr2 = DOXY_corr1 + A*time
  - DOXY_ADJUSTED=Gain*DOXY_corr2
  - ➢ Need to implement the recommended equation (see Catherine's presentation), particularly to be able to propagate DM adjustment in real-time
- ➢ Need to add the possibility to have break point on drift computation
- Need to improve documentation (User Manual and Github repository)
- I would like to perform an intercomparison of the different methods and to compare with SAGEO2 outputs

DM filler tool

Objectives of this presentation:

https://github.com/catsch/DM_FILLER

- Writing DM mode files can be tricky, time consuming, a nightmare …
- particularly for BGC files
- … More particularly for Provor CTS4 / CTS5 floats

⇒ I’ve made a R Tool that fills DM BD files
⇒ There is no obligation to use it
⇒ I just want to show that it exists (and that is not too complicated to use)
⇒ I will be happy to fill DM files for you with your adjustment

Main tools

Fill_DM_BP.sh => Script shell to define you input and generate the launch script

lance_DM_BP.sh => Script Shell to launch the writing of the DM

WRITE_DM_BP.R => R code with (History_xxx, scientific_xxx….)

Specific tools for DOXY

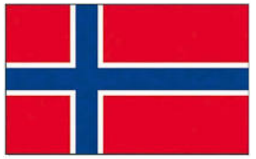
DOXY_adj.R => R code To calculate the DOXY Adjustment

DOXY_to_PPOX.R => Routine’s based on Henry’s work to go from DOXY to PPOX

PPOX_to_DOXY.R => and vice versa

Example of text file sent by Siv Lauvset

```
FLOAT_NAME      6903551
CYCLE_NUMBER    "2-107"
DOXY_ADJUSTED_ERROR     equivalent to 19.2 mbar
DOXY_ADJUSTED_QC        1
SCIENTIFIC_CALIB_EQUATION       "DOXY_ADJUSTED=A*DOXY+B; "
SCIENTIFIC_CALIB_COEFFICIENT    "A=1.064; B=0 "
SCIENTIFIC_CALIB_COMMENT        "Partial pressure corrected as a linear function of PPOX using continuous in-air
measurements as in Johnson et al (2015); PPOX converted from DOXY and DOXY_ADJUSTED converted from
PPOX_ADJUSTED; ERROR calculated as 2std(A) x 205mbar + 2mbar "
NOTES   "Missing Float profile(s) for station(s): 1 108. Software: SAGE-O2 (https://github.com/SOCCOM-
BGCArgo/ARGO_PROCESSING). On cycle 31 there is bad PSAL data between 854-1202 dbar. The DOXY data in this range
is therefore given a flag 4 "

CYCLE_NUMBER    2-5
PRES>1940
DOXY_ADJUSTED   FillValue
DOXY_ADJUSTED_ERROR     FillValue
DOXY_ADJUSTED_QC        4

CYCLE_NUMBER    31
PRES>854
PRES<1202
DOXY_ADJUSTED   FillValue
DOXY_ADJUSTED_ERROR     FillValue
DOXY_ADJUSTED_QC        4
```



Fill_DM_NORWAY.sh
lance_DM_NORWAY.sh
WRITE_DM_NORWAY.R

```
dmqc@bgc-dmqc:/DMQC/PROGRAM/DM_FILLER$ ./Fill_DM_NORWAY.sh
```

```
##########################################
### Welcome in the DM mode filler Tool ###
##########################################
What WMO nc files you want to fill with DM ?
```

6903551

```
What is the parameter that interests you ?
 Enter
 1 for CHLA
 2 for BBP700
 3 for NITRATE
 4 for CDOM
 5 for DOXY
```

5

```
There are 109 B files to treat for 6903551 float
 How do you want to define the files to treat?
 Enter
 0  -For All profiles (you have one adjustment for the whole float life)
 1  -You want to define precisely the profile slot step by step for adjustment or from greylist
```

0

```
 You want to put the same adjustment on all the profiles
 Enter the Offset
0.
 Enter the slope
1.064
 Enter the Drift
0
```

From Siv Adjustment information

0, 1.064, 0

```
How this correction will improve the QC after the adjustment?
 Enter
 1 -If the ADJUSTED DOXY should be considered as GOOD (QC=1)
 2 -If the ADJUSTED DOXY should be considered as PROBABLY GOOD (QC=2)
```

1

```
 Enter the DOXY_ADJUSTED_ERROR
```

19.2

```
 Enter the SCIENTIFIC_CALIB_COMMENT, you want to write in the nc File [max 256 CHAR]
```

Partial pressure corrected as a linear function of PPOX using continuous in-air measurements as in Johnson et al (2015), PPOX converted from DOXY and DOXY_ADJUSTED converted from PPOX_ADJUSTED, ERROR calculated as 2std(A) x 205mbar + 2mbar

```
The DM input file is done, you can check it: DM_list_6903551

If it is Ok,
Enter on the command line
./lance_DM_NORWAY.sh

If it is not, go back ./to Fill_DM_NORWAY.sh
 or contact me :
 schmechtig@obs-vlfr.fr
```

./lance_DM_NORWAY.sh ……ET VOILA

Extract from DM_list_6903551

```
filename;filename_core;metadata_filename;param;type;offset;slope;drift;param_error;qc;scientific_comment;date_update
../../DATA/WORK/6903551/profiles/BR6903551_002.nc;../../DATA/WORK/6903551/profiles/R6903551_002.nc;../../DATA/RT/6903551/6903551_meta.nc;DOXY;
AD;0.;1.064;0;19.2;1;Partial pressure corrected as a linear function of PPOX using continuous in-air measurements as in Johnson et al (2015),
PPOX converted from DOXY and DOXY_ADJUSTED converted from PPOX_ADJUSTED, ERROR calculated as 2std(A) x 205mbar + 2mbar;20201119200030
../../DATA/WORK/6903551/profiles/BR6903551_003.nc;../../DATA/WORK/6903551/profiles/R6903551_003.nc;../../DATA/RT/6903551/6903551_meta.nc;DOXY;
AD;0.;1.064;0;19.2;1;Partial pressure corrected as a linear function of PPOX using continuous in-air measurements as in Johnson et al (2015),
PPOX converted from DOXY and DOXY_ADJUSTED converted from PPOX_ADJUSTED, ERROR calculated as 2std(A) x 205mbar + 2mbar;20201119200030
../../DATA/WORK/6903551/profiles/BR6903551_004.nc;../../DATA/WORK/6903551/profiles/R6903551_004.nc;../../DATA/RT/6903551/6903551_meta.nc;DOXY;
AD;0.;1.064;0;19.2;1;Partial pressure corrected as a linear function of PPOX using continuous in-air measurements as in Johnson et al (2015),
PPOX converted from DOXY and DOXY_ADJUSTED converted from PPOX_ADJUSTED, ERROR calculated as 2std(A) x 205mbar + 2mbar;20201119200030
../../DATA/WORK/6903551/profiles/BR6903551_005.nc;../../DATA/WORK/6903551/profiles/R6903551_005.nc;../../DATA/RT/6903551/6903551_meta.nc;DOXY;
AD;0.;1.064;0;19.2;1;Partial pressure corrected as a linear function of PPOX using continuous in-air measurements as in Johnson et al (2015),
PPOX converted from DOXY and DOXY_ADJUSTED converted from PPOX_ADJUSTED, ERROR calculated as 2std(A) x 205mbar + 2mbar;20201119200030
../../DATA/WORK/6903551/profiles/BR6903551_006.nc;../../DATA/WORK/6903551/profiles/R6903551_006.nc;../../DATA/RT/6903551/6903551_meta.nc;DOXY;
AD;0.;1.064;0;19.2;1;Partial pressure corrected as a linear function of PPOX using continuous in-air measurements as in Johnson et al (2015),
PPOX converted from DOXY and DOXY_ADJUSTED converted from PPOX_ADJUSTED, ERROR calculated as 2std(A) x 205mbar + 2mbar;20201119200030
../../DATA/WORK/6903551/profiles/BR6903551_007.nc;../../DATA/WORK/6903551/profiles/R6903551_007.nc;../../DATA/RT/6903551/6903551_meta.nc;DOXY;
AD;0.;1.064;0;19.2;1;Partial pressure corrected as a linear function of PPOX using continuous in-air measurements as in Johnson et al (2015),
PPOX converted from DOXY and DOXY_ADJUSTED converted from PPOX_ADJUSTED, ERROR calculated as 2std(A) x 205mbar + 2mbar;20201119200030
```

Towards a uniform DM DOXY equation

Right now the DM_FILLER_TOOL equation for DOXY_ADJUSTMENT is :

PPOX_DOXY_ADJUSTED=as.numeric((1.+**DRIFT**/100.*(profile_date_juld-launch_date_juld)/365.))*(**SLOPE***PPOX_DOXY)+**OFFSET**

(Not the same exact definition mainly for the DRIFT ouput from SAGEO2, explained in FromSAGEO2_to_DMFILLER.docx)

Henry ‘s suggestion is that all DACs refer to the same equation which should be

scientific_calib_equation:
PPOX_DOXY_ADJUSTED=**OFFSET**+(**SLOPE***(1+**DRIFT**/100.*(profile_date_juld-launch_date_juld)/365)+**INCLINE_T***TEMP)*PPOX_DOXY

Example:
scientific_calib_coefficient:
OFFSET=0, SLOPE=1.0373, DRIFT=0.510, INCLINE_T=0,
launch_date_juld=20161017070000

- **SLOPE**: Oxygen slope/gain factor to correct for large 'storage drift', which is a multiplicative correction

- **PPOX_DOXY and PPOX_DOXY_ADJUSTED**: The optodes sense the partial pressure, so in correcting on partial pressure, we follow the sensing principle. (Under some circumstances (offset=0), it's with above equation equivalent to correct on DOXY or on %sat, but with PPOX we can't do anything wrong under any circumstances, while with the others we potentially could.)

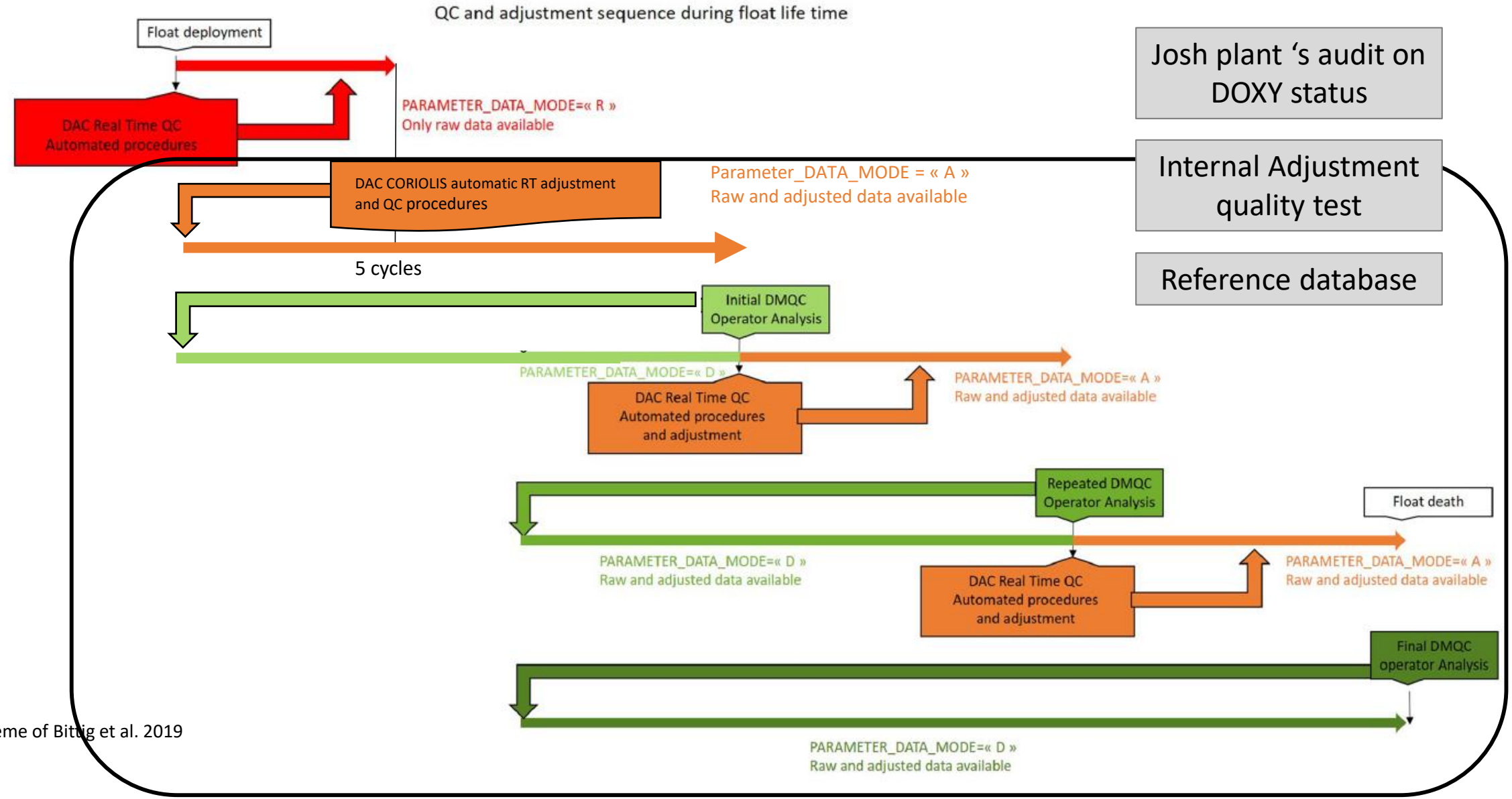
- **DRIFT** and **launch_data_juld**: correct potential small in-situ drift, for which we need a start date (drift correction in time, not in cycle number due to potentially variable cycle frequency)

- **INCLINE_T**: temperature inclination of the gain factor, which can be observed in older, batch-calibrated optodes because of incomplete temperature-compensation

- **OFFSET**: zero-offset, which can be observed in older, batch-calibrated optodes because of incomplete O2-phase-compensation (basically all the floats of the Takeshita et al. 2013 study; newer, multi-point calibrated optodes do not show a zero offset)

In many cases, especially new ones as well as preliminary assessments after a few cycles, only SLOPE (and maybe DRIFT) may be needed, and OFFSET=0, DRIFT=0, INCLINE_T=0 and launch_date_juld will remain at their defaults. But it would be a consistent scheme across different groups/DACs and thus easier to parse/analyze.

Coriolis Strategy to detect adjustment anomalies and get rid of the blaklog



Josh plant ‘s audit on DOXY status

Internal Adjustment quality test

Reference database

Modified scheme of Bittig et al. 2019

Josh plant ‘s audit on DOXY status = Listing of potential bad cycle

ftp://ftp.mbari.org/pub/BGC_argo_audits/DOXY/

//DOXY BGC Argo audit report
//File created on 07-Jul-2020 11:29:06 by jplant
//Created with bgc_argo_DOXY_audit
//BGC Argo float list generated from argo_bio-profile_index.txt.gz
//All data were extracted from the merged synthetic profile (Sprof) files
//Sprof files were dowloaded from the GDAC on 06/26/2020
//286 of 1468 inspected floats did have Sprof files
//Data inclusion filters:
// DOXY profile not on grey list
// PRES <= 20.0
// TEMP_QC or PSAL_QC or DOXY_QC or DOXY_ADJUSTED_QC not equal 4
// (PSAL_QC & DOXY_QC) not equal 3
// (PSAL_ADJUSTED_ QC & DOXY_ADJUSTED_QC) not equal 3
//145988 profiles inspected
//Outlier metric = DOXY gain (G_raw)
//Doxy gain (G_raw) = [WOA O2 %sat / DOXY O2 %sat]
//Outlier detection method = Median Absolute Deviation (MAD)
//DOXY median gain = 1.0760
//DOXY MAD gain = 0.0463
//DOXY_ADJUSTED median gain = 1.0047
//DOXY_ADJUSTED MAD gain = 0.0264
//Outlier threshhold, Z_raw > 5
//Reference:
// Leys et al. (2013). Detecting outliers: Do not use standard deviation around the mean,
// use absolute deviation around the median. https://doi.org/10.1016/j.jesp.2013.03.013

GAIN = (WOA % O2 sat) / (DOXY % O2 sat)

M = median of fleet test values (GAIN) (from all floats)

M_{anom} = abs(GAIN-M)

MAD = median(M_{anom})*B B = 1.4826 (for a normal distribution)

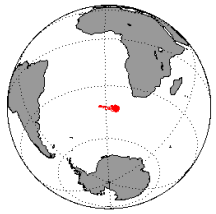
Z score = M_{anom} / MAD (outlier Z_raw > 5)

DAC	PI	SPROF DATE_UPDATE	DATA MODE	WMO	cycle	profile date	lon	lat	WOA T	WOA S	WOA O2 %sa	PRES	TEMP	PSAL	flt O2 %sat	flt O2adj %s	G_raw	G_adj	Z_raw	Z_adj
coriolis	Herve Claustre	6/26/2020 3:56	A	3902123	218	6/10/2020 12:32	-22.51	7.74	28.11	35.54	103.68	5.35	28.45	35.89	165.33	174.54	0.62	0.59	9.83	15.8
coriolis	Herve Claustre	6/26/2020 3:56	A	3902123	219	6/15/2020 17:38	-22.53	7.89	28.13	35.52	103.56	5.51	28.17	36.02	129.82	137.06	0.8	0.76	6	9.4
coriolis	Herve Claustre	6/26/2020 3:56	A	3902123	220	6/20/2020 13:27	-22.55	8.06	28.05	35.53	103.38	4.79	28.27	36.19	172.67	182.29	0.59	0.56	10.43	16.8
coriolis	Herve Claustre	6/26/2020 3:56	A	3902123	221	6/25/2020 8:45	-22.56	8.14	27.99	35.52	103.22	5.72	29.2	35.07	158.92	167.78	0.65	0.61	9.26	14.9
coriolis	Bernard BOURLES	6/25/2020 3:58	R	3902131	62	7/15/2018 11:56	5.9	-6.71	23.46	35.56	97.5	9.62	22.07	35.37	75.78	NaN	1.4	NaN	7.02	NaN
coriolis	Bernard BOURLES	6/25/2020 3:58	R	3902131	74	10/11/2018 12:04	6.31	-6.98	23.38	35.89	104.28	9.6	22.58	35.92	80.68	NaN	1.33	NaN	5.4	NaN
coriolis	Bernard BOURLES	6/25/2020 3:58	R	3902131	108	9/16/2019 11:49	1.45	-6.14	23.03	35.84	102.6	11.65	22.18	35.19	77.36	NaN	1.36	NaN	6.14	NaN
coriolis	Marcel Babin	3/17/2020 4:18	D	4901802	13	7/21/2016 15:30	-61.77	69.6	0.59	32.1	109.58	11.41	-0.31	32.47	90.01	95.45	1.22	1.15	3.13	5.6
coriolis	Marcel Babin	3/17/2020 4:18	D	4901802	14	7/22/2016 15:36	-61.68	69.63	0.71	32.1	109.6	11.74	-0.92	32.53	88.78	94.15	1.24	1.17	3.54	6.3
coriolis	Marcel Babin	4/18/2020 3:57	D	4901804	4	7/23/2017 15:32	-60.69	69.64	1.3	32.17	109.7	10.27	-0.6	31.56	95.38	96.37	1.15	1.14	1.67	5.2
coriolis	Marcel Babin	4/18/2020 3:57	D	4901804	6	7/25/2017 15:32	-60.65	69.64	1.41	32.21	109.67	11.79	-0.58	31.88	94.36	95.29	1.17	1.16	1.97	5.7
coriolis	Marcel Babin	4/18/2020 4:17	D	4901805	15	8/6/2017 15:22	-60.73	69.89	2.14	32.12	108.36	14.8	-1.21	32.43	86.36	92.42	1.26	1.17	3.88	6.4

Usefull information

Internal Adjustment quality test

https://doi.org/10.13155/76709

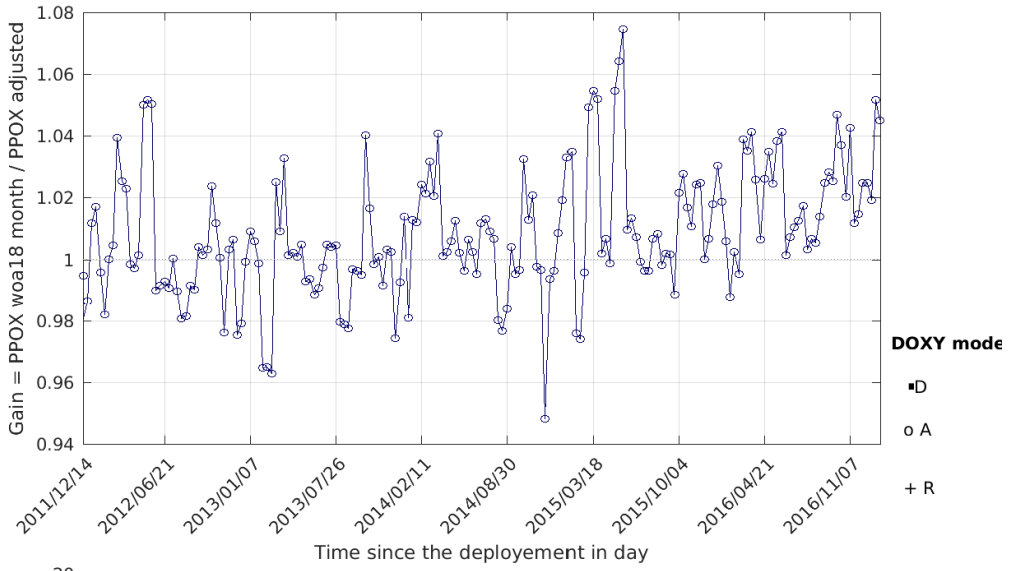


6900954 (coriolis)
PROVOR (AANDERAA OPTODE 3830)
PI : Sabrina SPEICH

- New estimation of the GAIN from DOXY_ADJUSTED variable

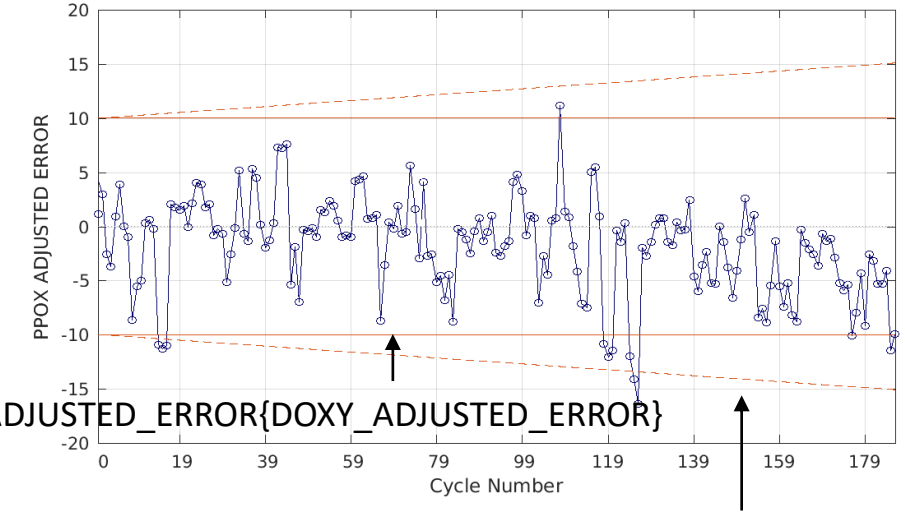
Adjusted_GAIN= PPOX_WOA18_monthly / PPOX_DOXY_ADJUSTED

PPOX_woa{PSAT_woa,TEMP_float,PSAL_float,Patm = 1atm}
PPOX_float{MOLAR_DOXY_float,TEMP_float,PSAL_float,Patm = 1atm}



- Error adjustment comparison with information available in the files (PPOX_DOXY_ADJUSTED_ERROR{DOXY_ADJUSTED_ERROR}

ERROR of the adjustment =
(1-adjusted_GAIN).* PPOX_WOA18_monthly



PPOX_DOXY_ADJUSTED_ERROR{DOXY_ADJUSTED_ERROR}

- Alert for 5 cycles = Inform PI that his float needs a DM adjustment
  for 10 cycles = cycles in greylist waiting PI action

$ERROR_{adjustment}$ > PPOX_DOXY_ADJUSTED_ERROR

PPOX_ADJUSTED_ERROR with time evolution as recommanded in http://dx.doi.org/10.13155/46542 (soon)

Coriolis Strategy to detect adjustment anomalies and get rid of the blaklog

Which information to be learned?

Josh plant ‘s audit on DOXY status

Every 3 months

- Potential bad profiles
- Potential wrong RT or DM adjustment

Internal Adjustment quality test

Every ?? months

- Potential wrong or no-longer appropriate RT or DM adjustment
- Highligh drifting O2 sensor

Actions

Other floats

- Inform PI after 5 cycles
- Put cycles in greylist after 10 cycles

Floats in charge

➔ **Prioritize float for a (review of) DM adjustment**

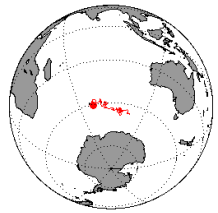
- Drifting sensor
- Mode A with no longer appropriate adjustment in Josh ‘s audit

➔ **Change QC flag** if necessary

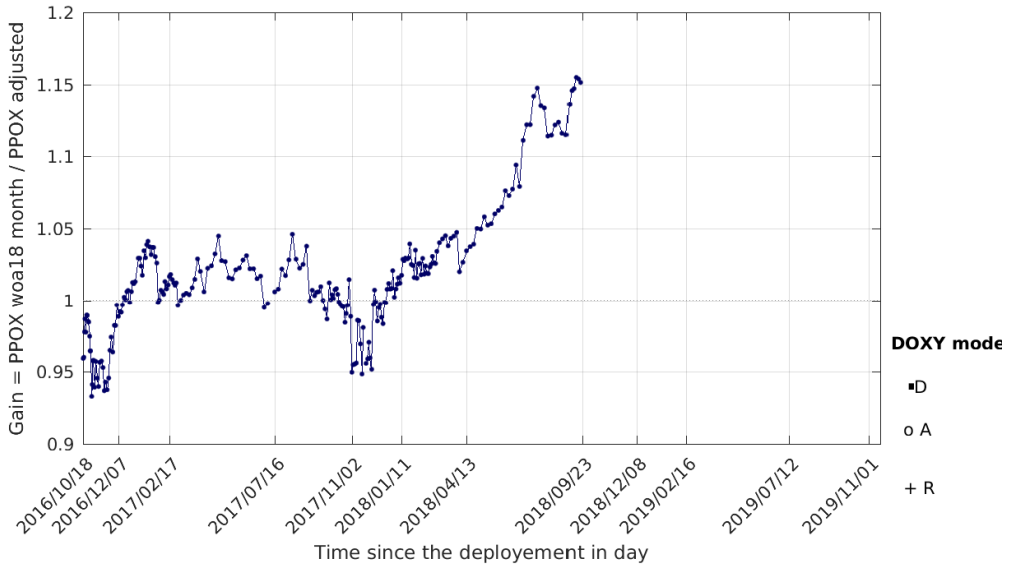
➔ **Add in the coriolis master** list if we are sure of our adjustment

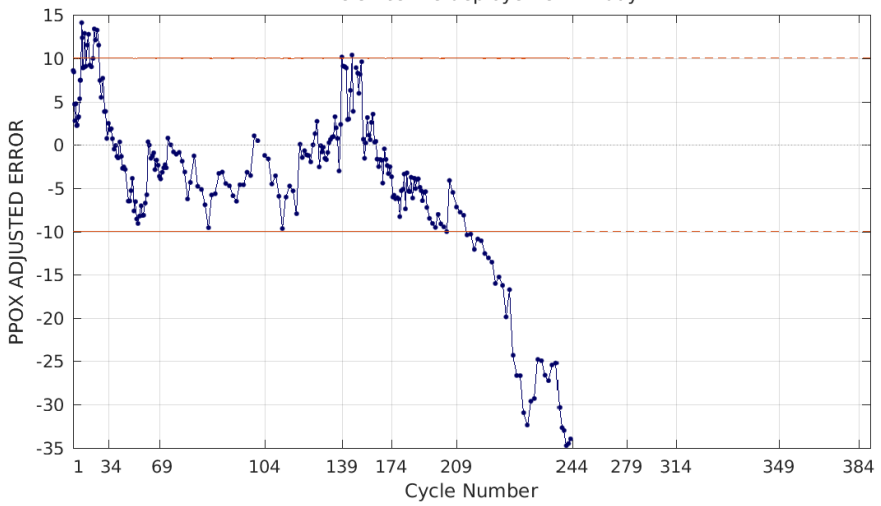
Josh's Audit

E	WMO	cycle	profile date	lon		flt O2 %sat	flt O2adj %sa	G_raw	G_adj	Z_raw
	6902687	130	3/6/2018 6:02		.54	79.65	79.18	1.2	1.2	2.62
	6902688	154	6/27/2018 6:22		.01	122.54	121.86	0.84	0.85	5
	6902737	241	9/14/2018 5:40		.98	80	92.21	1.31	1.14	5.12
	6902737	242	9/17/2018 9:39		.99	80.3	92.55	1.31	1.14	5.09
	6902737	342	6/7/2019 4:26		.86	77.03	88.79	1.32	1.14	5.25
	6902798	46	6/19/2017 11:07		.98	61.26	NaN	1.46	NaN	8.26
	6902798	57	9/5/2017 11:03		.02	73.17	NaN	1.35	NaN	5.98

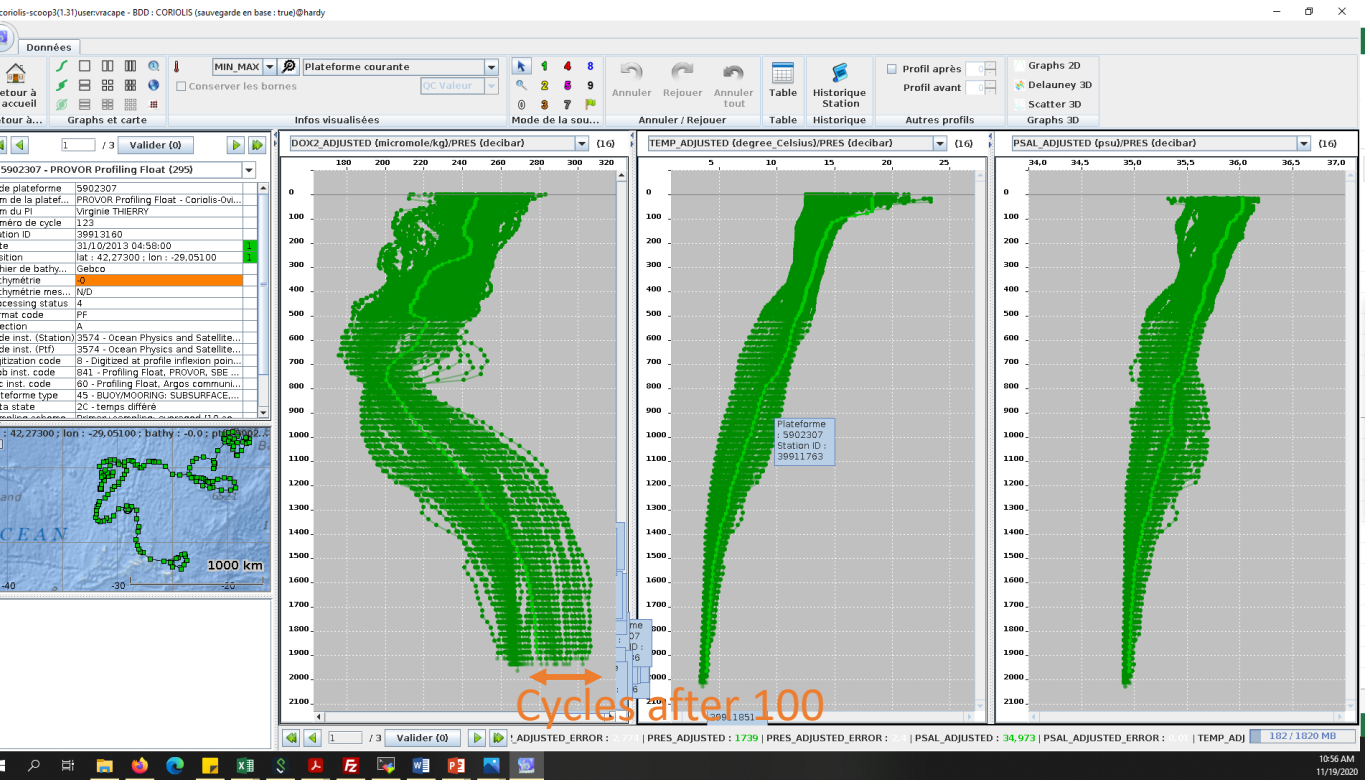


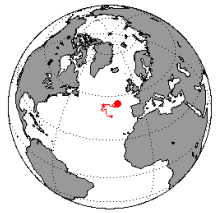
6902737 (coriolis)
PROVOR III (AANDERAA OPTODE 4330)
PI : Herve Claustre



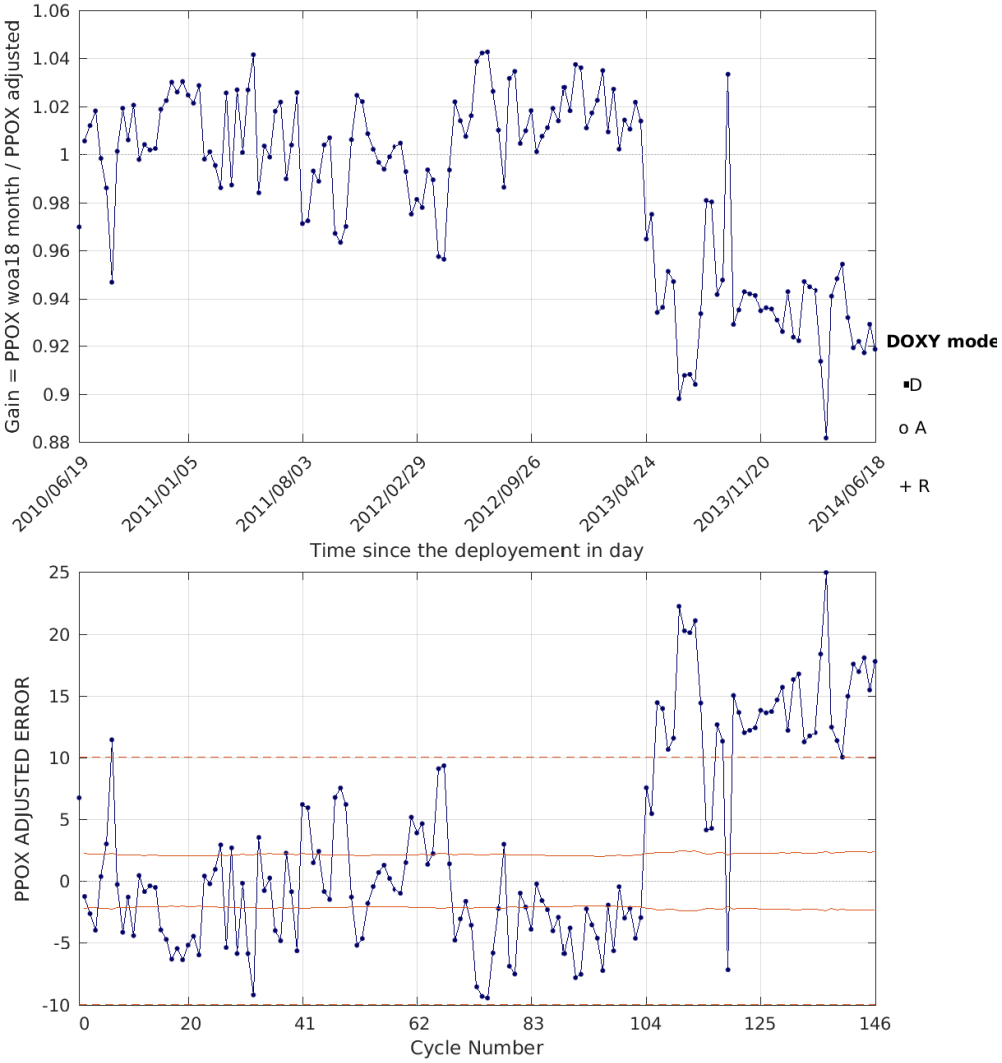


Abstent of Josh's Audit





5902307 (coriolis)
PROVOR (AANDERAA OPTODE 3830)
PI : Virginie THIERRY



Building a reference database for DOXY

ideas to lay the basis for future activities

What for ?

To be able validate our Real Time Adjustment (made on WOA) by comparison with an independent data set
To be able to compare our DM data with reference profiles
(in the futur) To raise alert automatically

Which datasets :

GLODAP data set (last release) merged with CARIMED to complete the Mediterranean Sea(Marta alvarez) data set

➔ Need high quality baltic data set /Black sea data set

Selected DOXY profiles from BGC-ARGO floats

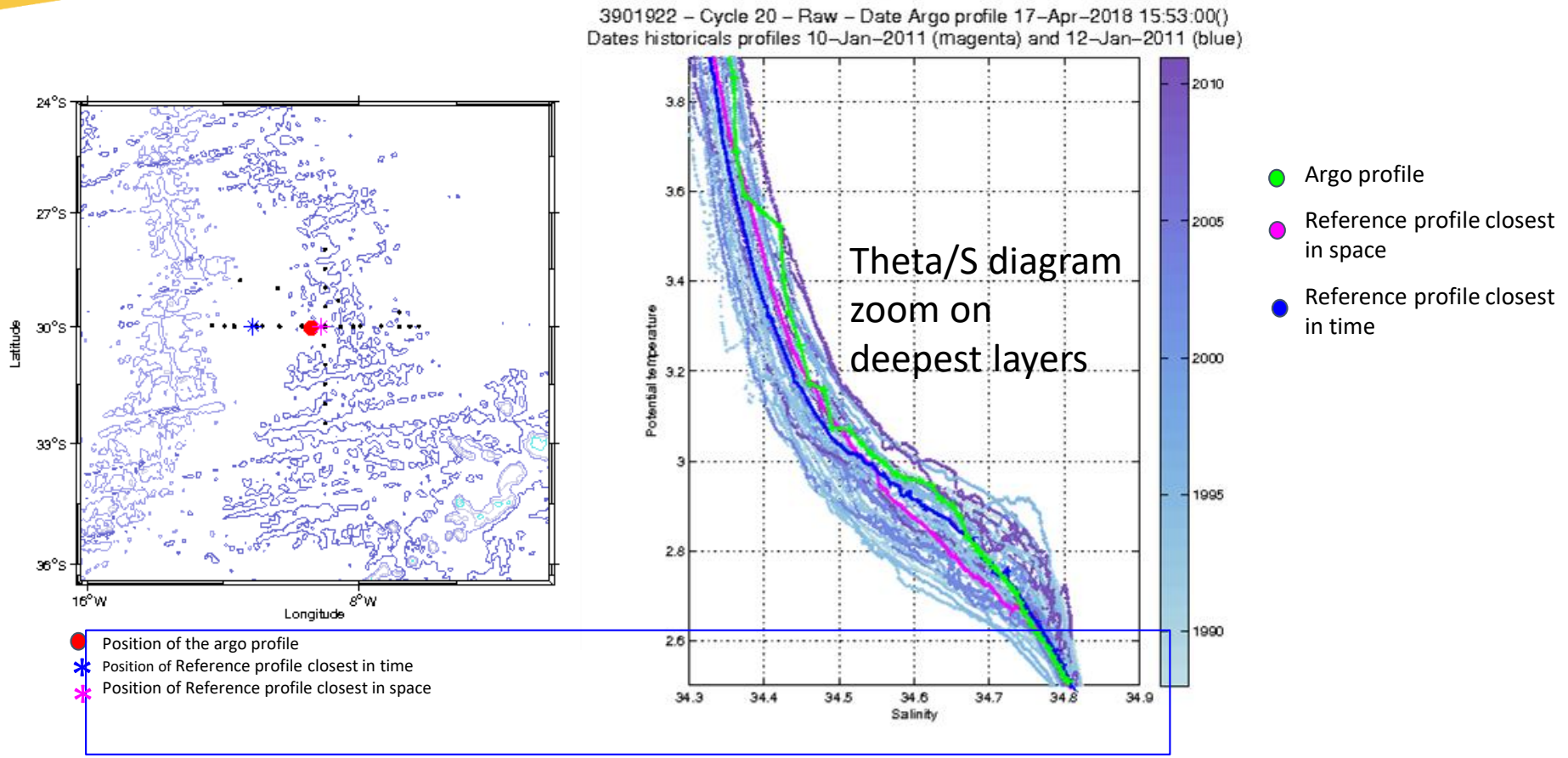
➔ only Float with multi-point calibration
➔ passing with success the glodap procedure ?

Building a reference database for DOXY

ideas to lay the basis for future activities

How?

- Not stored in the same database to be able to set up some metrics comparison on each dataset
- First step, using salinity correction experiment



- CTD Reference database organized in 10°x10° box .mat files
- Comparaison of the Argo profile to 50 selected reference CTD profiles.
- Selection of the 50 profiles => use of a correlation coefficient and defined covariance scales to be consistent with the selection done in the OWC software.

Slide from C. Cabanes, Iops, France

Building a reference database for DOXY

ideas to lay the basis for future activities

How?

- Not stored in the same database to be able to set up some metrics comparison on each dataset

- First step, using salinity correction experiment

  Issue for O_2

  - Database format

    Reference database for Argo is a (.mat) file

    Netcdf, csv => to be included in an ERDDAP like interface (WMS)
  - Database embargo
  - Citation
  - Quality control to include
  - Tools to work with the database

    Profiles selection (distance, date,potential vorticity)

    Depth interpolation (reference level)

Building a reference database for DOXY

ideas to lay the basis for future activities

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  - ❖ Tools to work with the database

    Profiles selection (distance, date,potential vorticity)

    Depth interpolation (reference level)

- Second step (and later when we will have enought data) build a min/max O_2 gridded product to raise alert
  - ❖ Define a grid resolution (horizontally and vertically)
  - ❖ Define min/max value (how?)