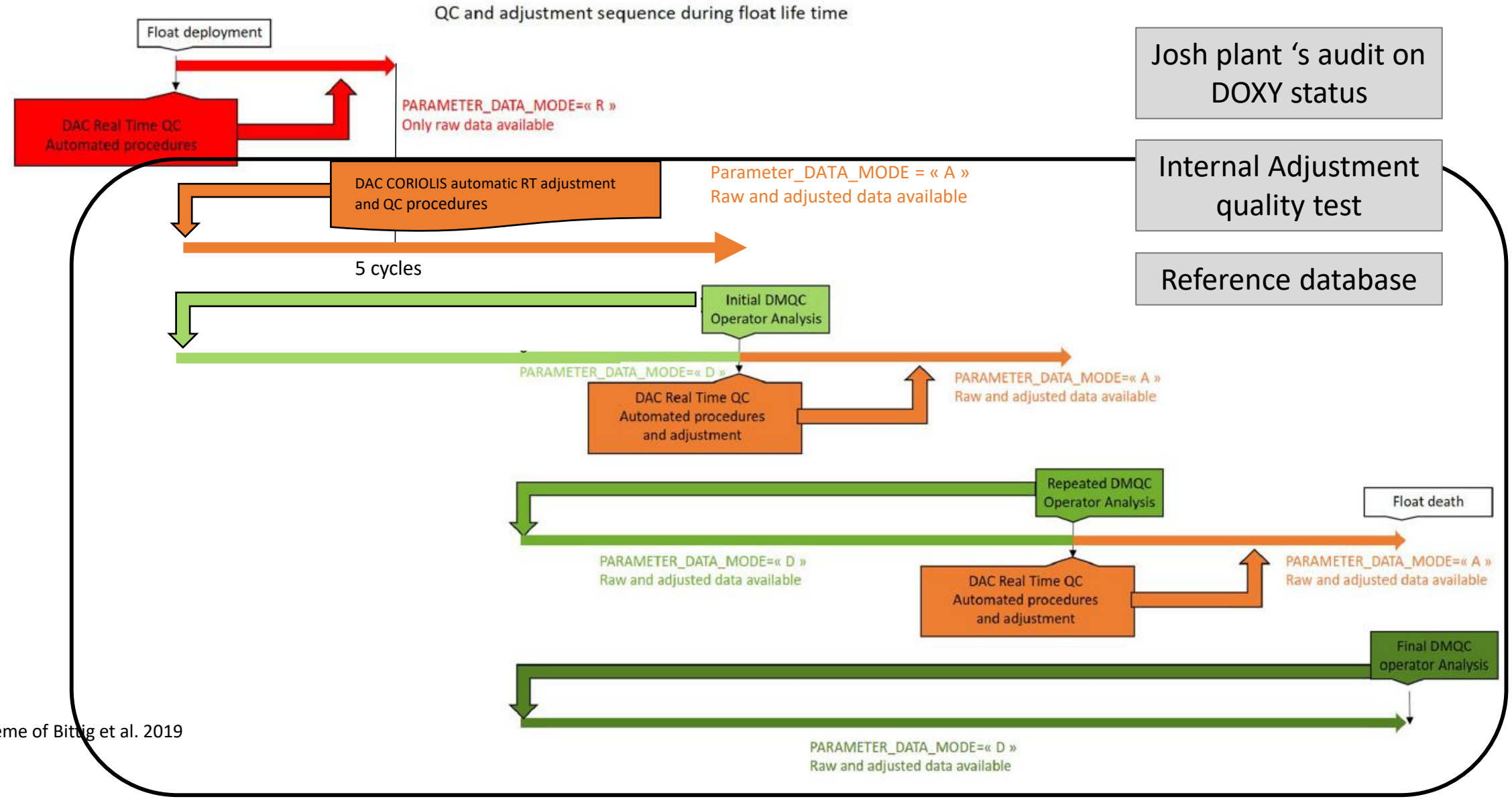
Coriolis Strategy to detect adjustment anomalies and get rid of the blaklog



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)

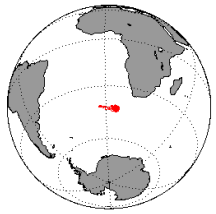
Z score = M_{anom} / MAD (outlier Z_raw > 5)

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

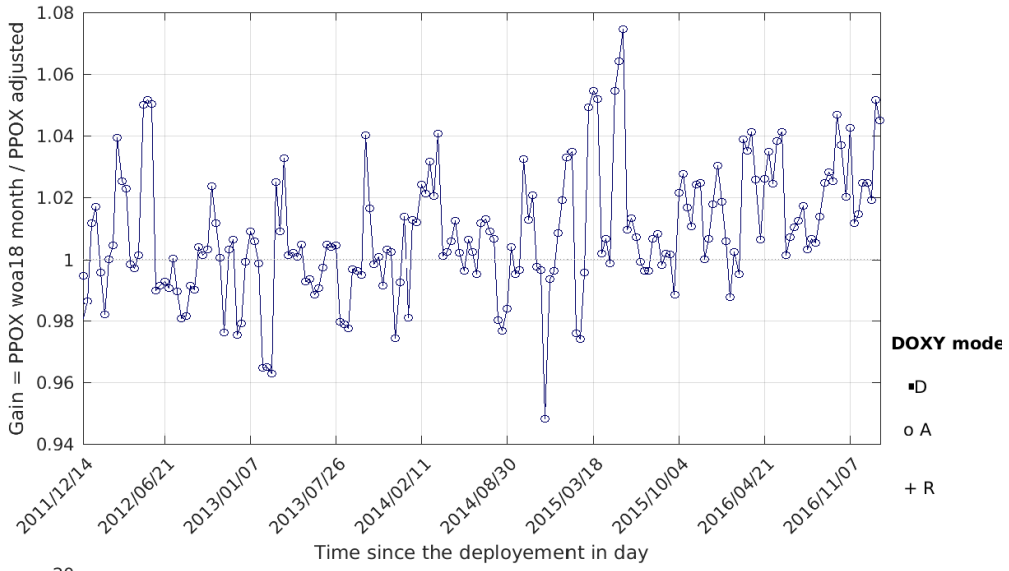


6900954 (coriolis)
PROVOR (AANDERAA OPTODE 3830)
PI : Sabrina SPEICH

- New estimation of the GAIN from DOXY_ADJUSTED variable

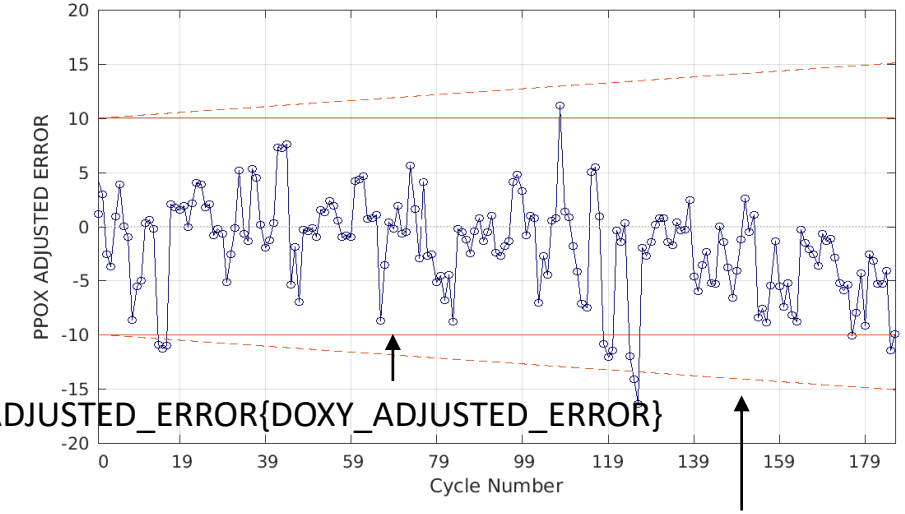
Adjusted_GAIN= PPOX_WOA18_monthly / PPOX_DOXY_ADJUSTED

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**

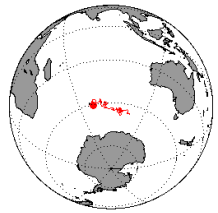
- Drifting sensor
- Mode A with no longer appropriate adjustment in Josh ‘s audit

➔ **Change QC flag** if necessary

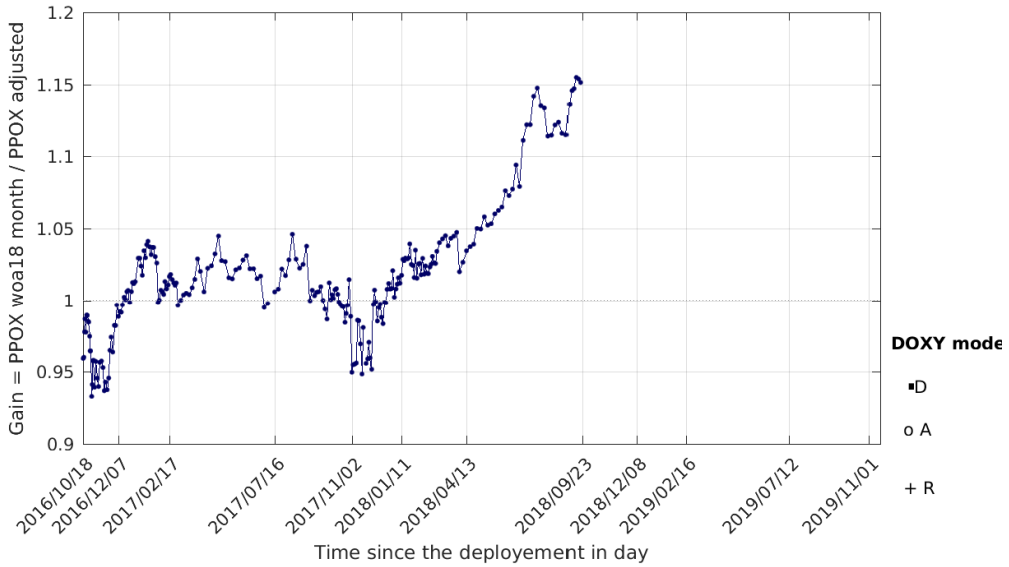
➔ **Add in the coriolis master** list if we are sure of our adjustment

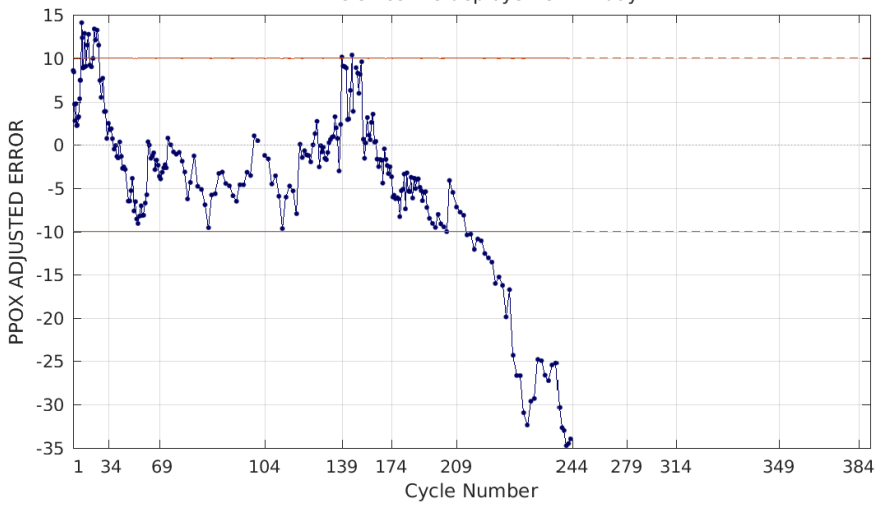
Josh's Audit

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

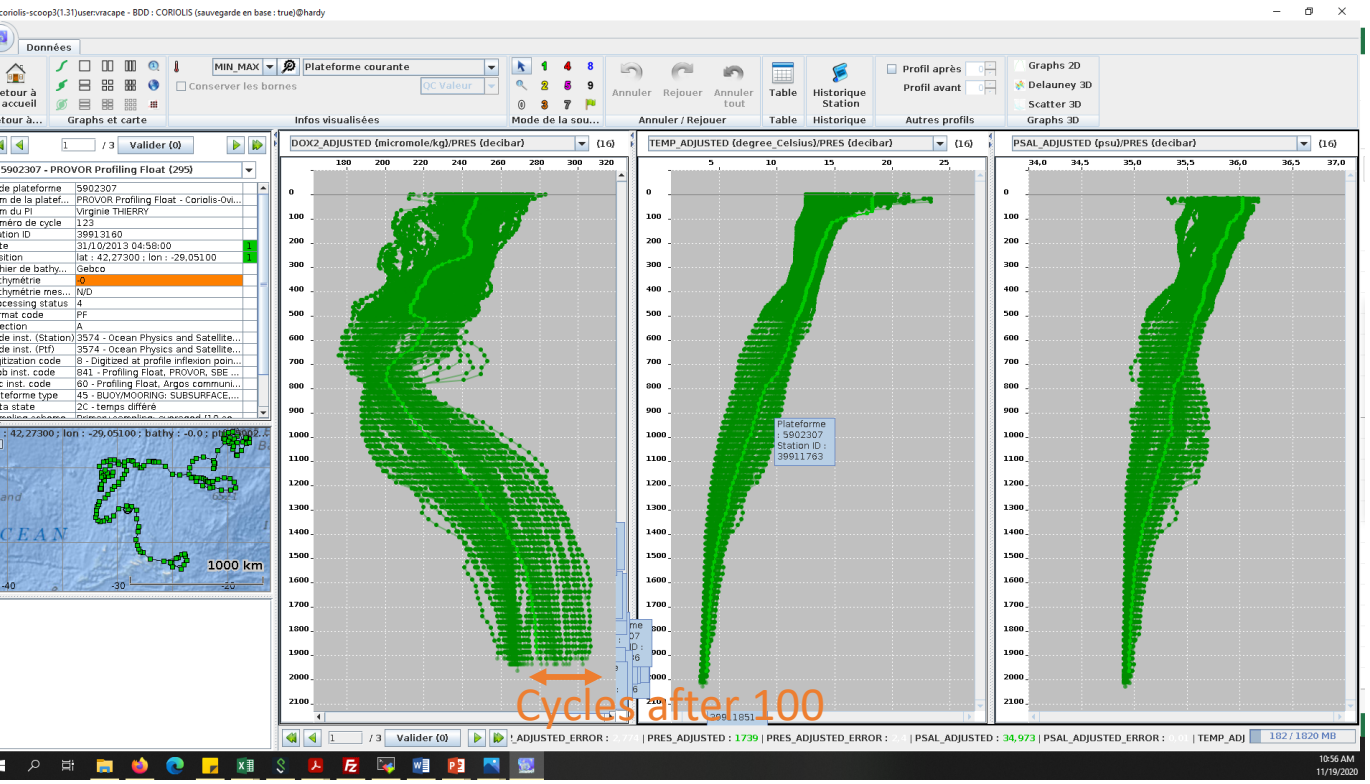


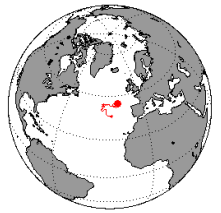
6902737 (coriolis)
PROVOR III (AANDERAA OPTODE 4330)
PI : Herve Claustre



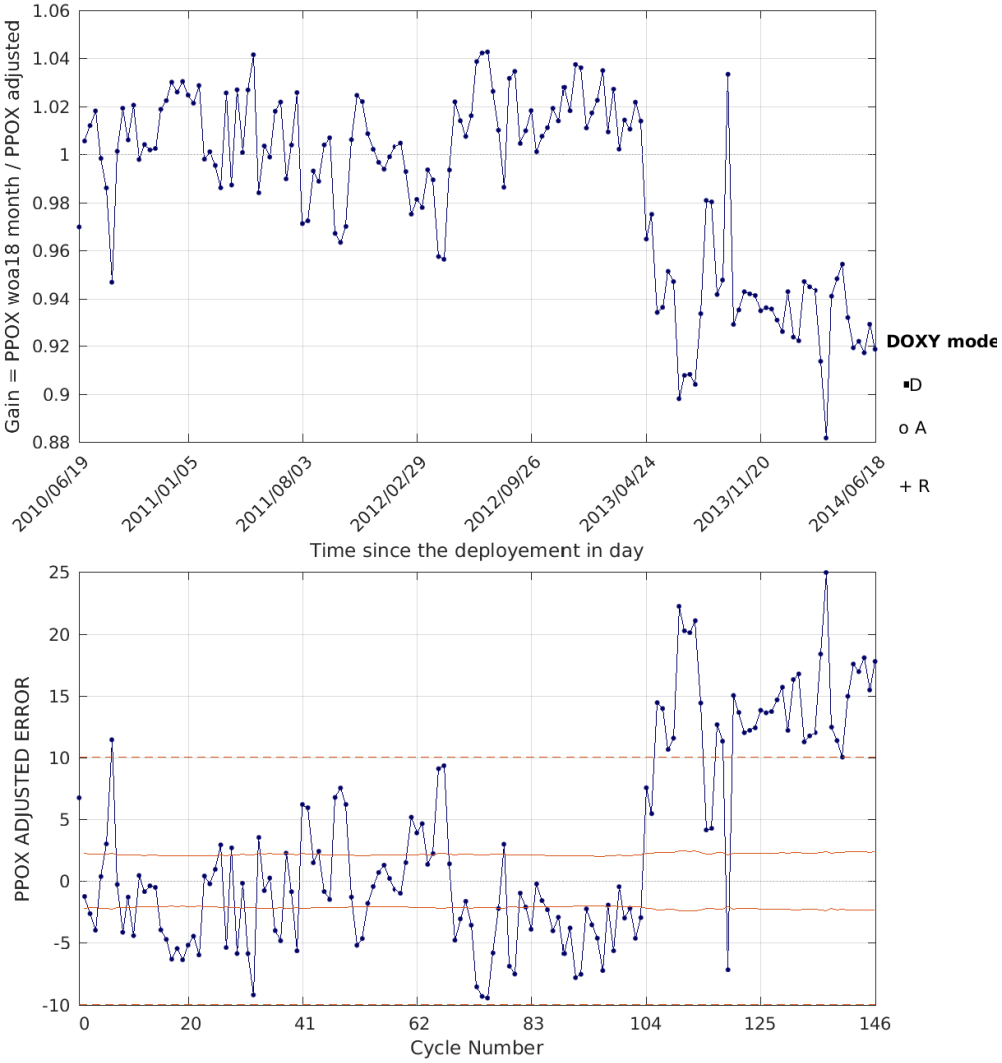


Abstent of Josh's Audit





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

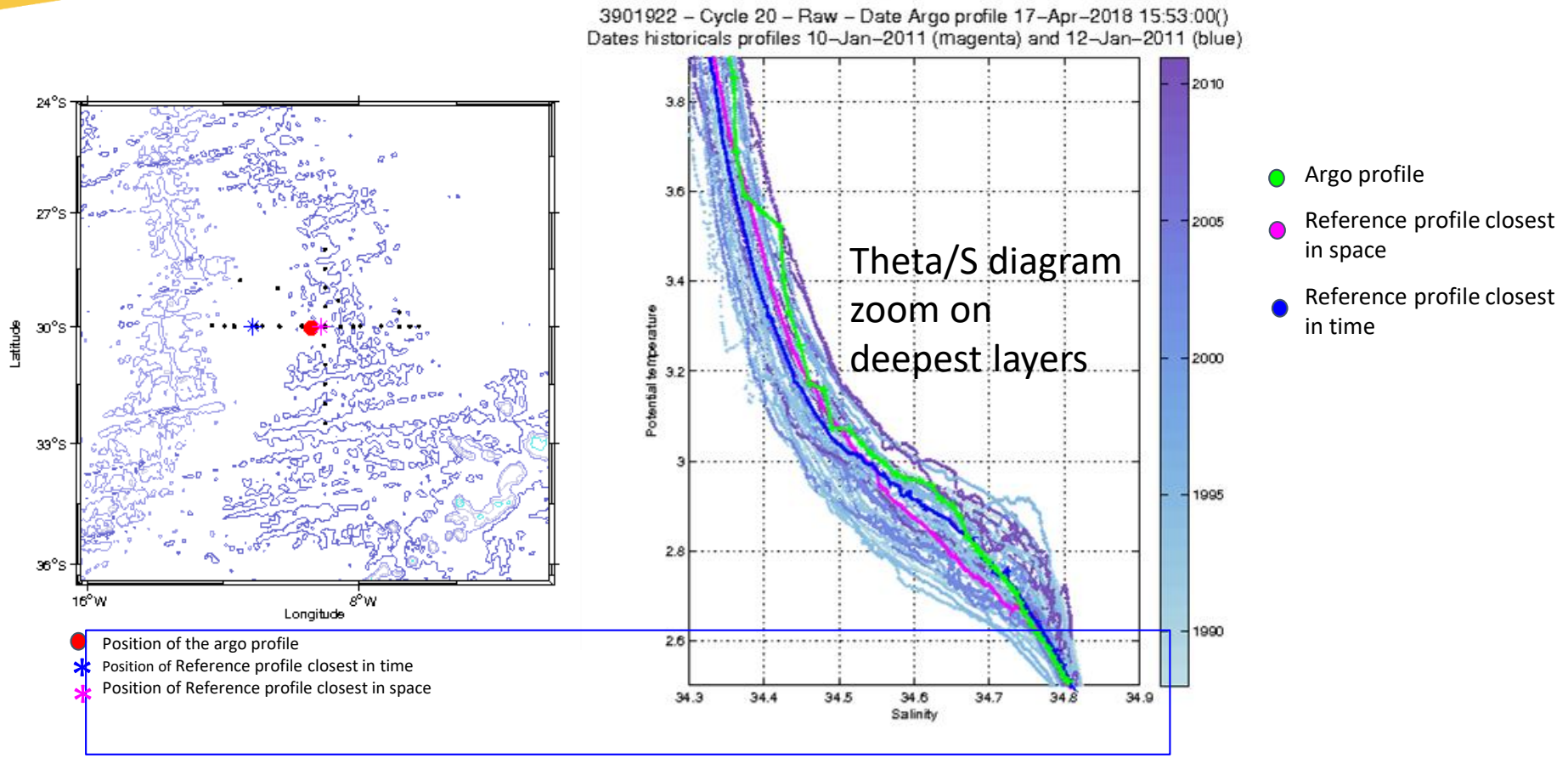
➔ only Float with multi-point calibration
➔ passing with success the glodap procedure ?

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

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- 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)

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    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?)