GROOM II
GLIDERS FOR RESEARCH, OCEAN OBSERVATION & MANAGEMENT : INFRASTRUCTURE AND INNOVATION

EuroSea

EuroGOOS
European Global Ocean Observing System

European Data Management Workshop

23th June 2022

Focus on Real Time Data Management of Oxygen

This project has received funding the European Union's Horizon 2020 research and innovation programme under grant agreement No 951842.

Agenda

- Meeting objectives
- Assessment of real time oxygen data uptake
- The Oxygen SOP : https://oceangliderscommunity.github.io/Oxygen_SOP/sections/oxygen_rtqc.html#required-metadata-real-time-data-processing-quality-control
  - *The recommended configuration*
  - *Pending case of the uncompensated salinity*
  - *RTQC*
  - *Oxygen time respond correction in real time – Example of Argo*
- Wrap up

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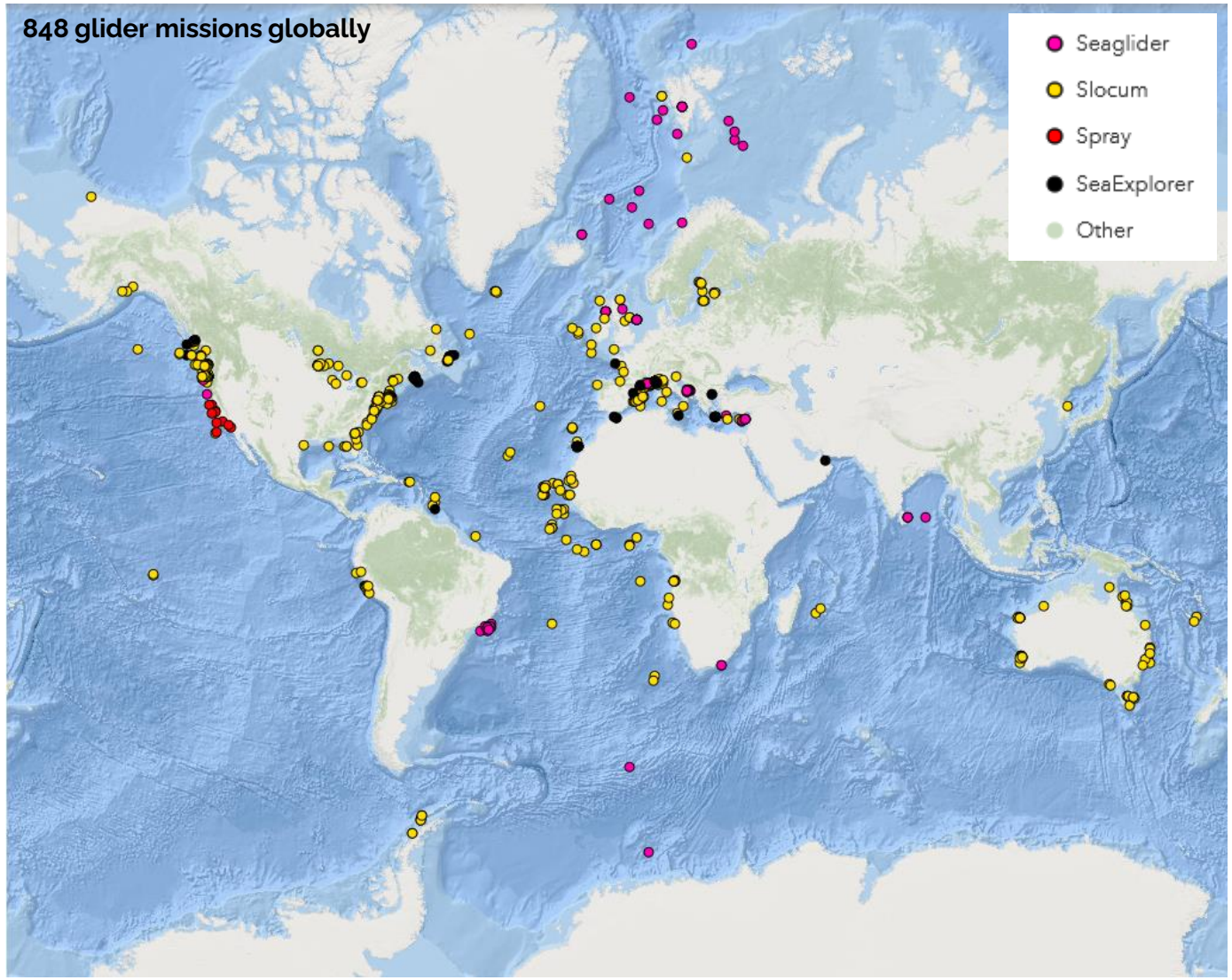
I. Meeting Objectives

- Acknowledge the gap between the oxygen observation effort and the oxygen data uptake in real time
- Encourage community engagement in the Oxygen SOP
- Discuss key technical issues related to Oxygen management in real time

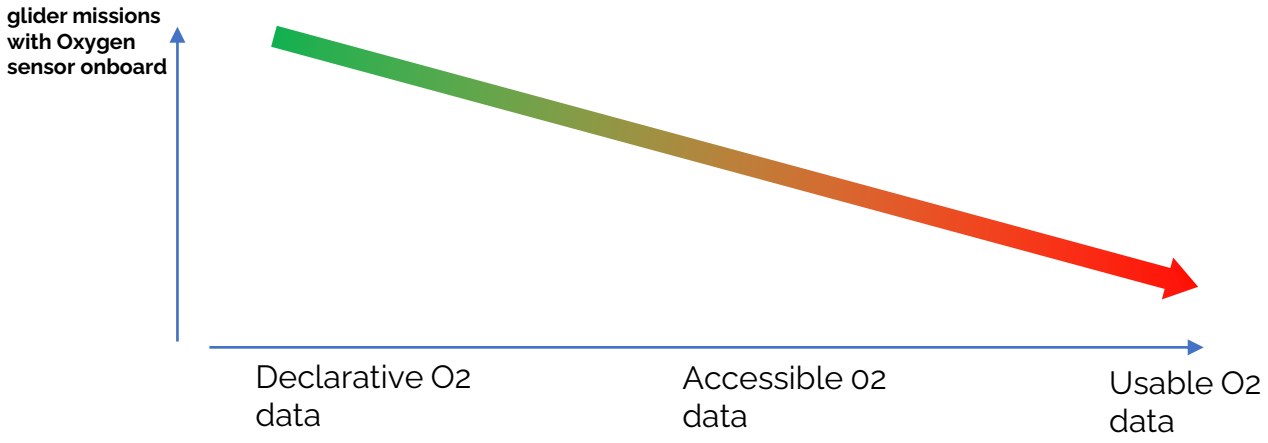


II. Assessment of the real time oxygen data uptake

Assessment of real time oxygen data uptake

Huge gap from declarative data to re-usable observations

- Declarative data ; Oxygen sensor register with the deployment
- Accessible observations : Oxygen data is reaching the GDAC and is made available.
- Usable (and re-usable) observations : Oxygen data can be re-used by the community



Assessment of real time oxygen data uptake

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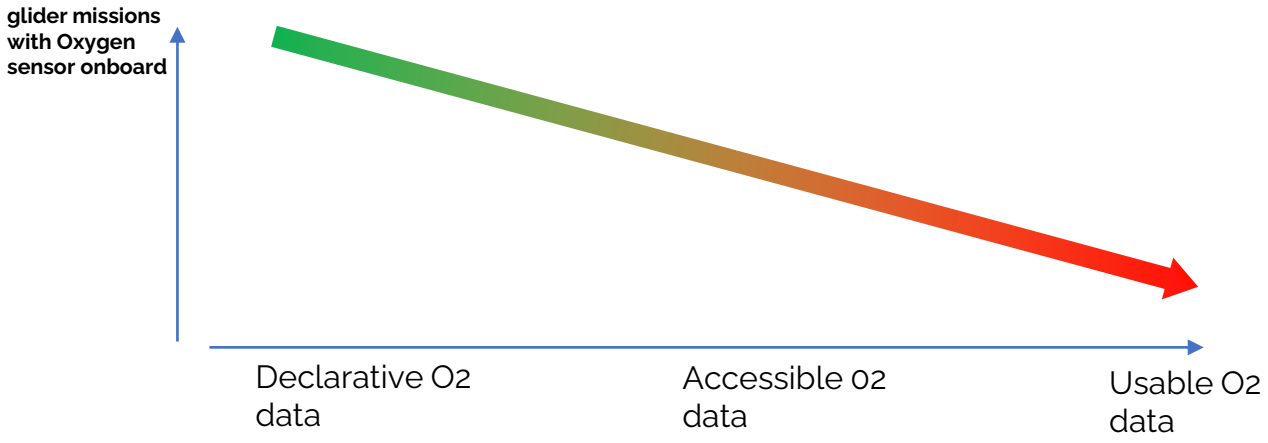


<u>Here is a tangible exemple</u> :
On a subset of 312 historical oxygen glider missions collected at the GDAC

67 missions (20%) have a sensor S/N, intermediate parameter, and calibration parameter (in the file or through the calibration sheet)

21 of those 61 mission have been studied

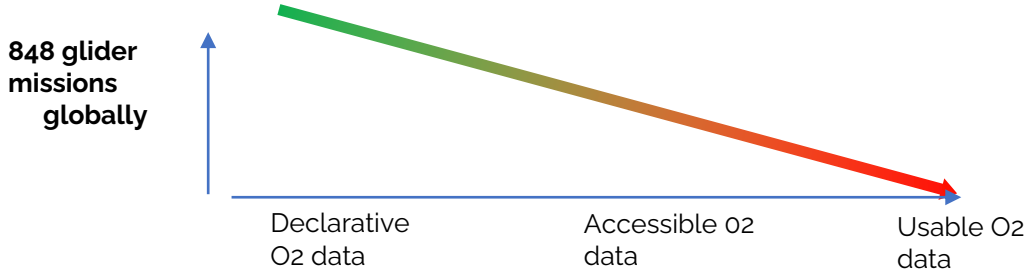
For 20 of them, DOXY from the glider do not match with DOXY computed by the scientist. But it can be computed following a scientific methodology

For only 1 mission, the DOXY calculated by the glider matched with the DOXY caculated by the scientist using the coefficient and intermediate parameters.

Use the Oxygen SOP to reduce the slope

https://oceangliderscommunity.github.io/Oxygen_SOP/sections/oxygen_rtqc.html#required-metadata-real-time-data-processing-quality-control

→ **Community review is needed !**



Needed Metadata :

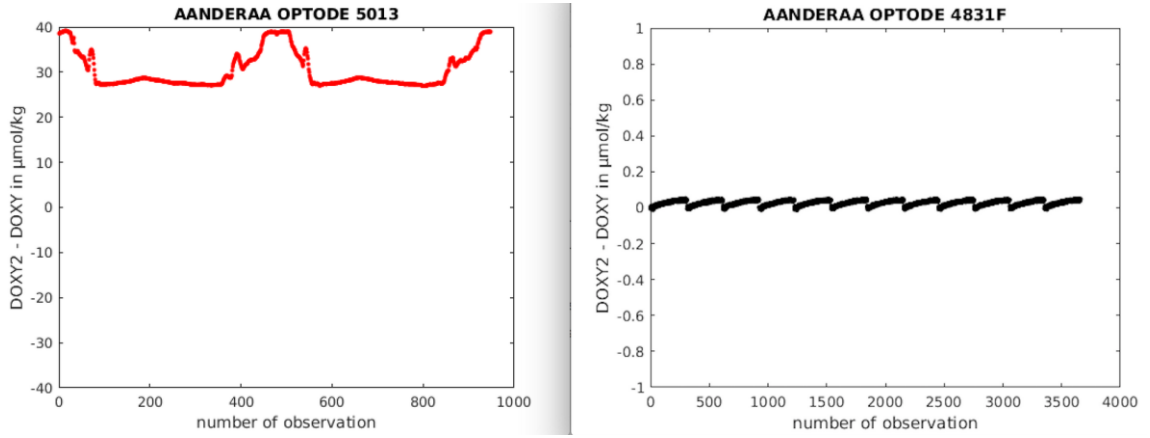
- Sensor Model,
- Sensor Serial Number,
- Calibration date,
- Calibration coefficient

→ **how to better manage the cal sheet ?**

Needed intermediate parameter needed :

http://vocab.nerc.ac.uk/search_nvs/OG1/?searchstr=DOXY&options=identifier,preflabel,altlabel,status_accepted&rbaddfilter=inc&searchstr2=

→ **how to benefit from existing tools ?**



Recomended configuration for the calculation of DOXY :

https://archimer.ifremer.fr/doc/00287/39795

→ **Is it relevant for all sensors ? (the case of Optode 3835)**

Why Intermediate parameters are essential

Argo cookbook : https://archimer.ifremer.fr/doc/00287/39795/94062.pdf

Sensor Model			Input parameter										
			201	202	203	204	205	206	207	208	209	210	211
			MOLAR_DOXY	BPHASE_DOXY	DPHASE_DOXY	TPHASE_DOXY	C1PHASE_DOXY & C2PHASE_DOXY	VOLTAGE_DOXY	FREQUENCY_DOXY	PHASE_DELAY_DOXY	MLPL_DOXY	LED_FLASHING_COUNT_DOXY & COUNT_DOXY	COUNT_DOXY
	101	SBE43_IDO						**206 (7.2.1)**					
	102	SBE43F_IDO							**206 (7.2.2)**				
	103	SBE63_OPTODE								**307 (7.2.5)** 308 (7.2.6)	**301 (7.2.7)** 309 (7.2.8)		
	201	AANDERAA_OPTODE_3830	**301 (7.2.11)**	**202 (7.2.12)** **204 (7.2.13)** 302 (7.2.14) 304 (7.2.15)	**202 (7.2.16)** **204 (7.2.17)** 302 (7.2.18) 304 (7.2.19)								
	202	AANDERAA_OPTODE_4330 AANDERAA_OPTODE_4330F	**301 (7.2.22)**			202 (7.2.23) 203 (7.2.24) 204 (7.2.25) 205 (7.2.26) 302 (7.2.27) 303 (7.2.28) **304 (7.2.29)** **305 (7.2.30)**	202 (7.2.31) 203 (7.2.32) 204 (7.2.33) 205 (7.2.34) 302 (7.2.35) 303 (7.2.36) **304 (7.2.37)** **305 (7.2.38)**						
	301	ARO_FT										**401 (7.2.40)**	

Table 5: Configurations for the calculation of DOXY as function of the sensor model and input parameter. The recommended configurations are highlighted in bold.

Why Intermediate parameters are essential

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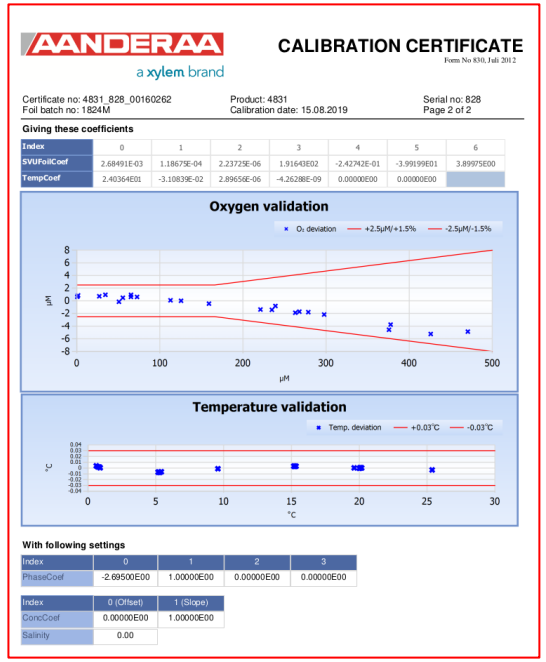
Table 5: Configurations for the calculation of DOXY as function of the sensor model and input parameter. The recommended configurations are highlighted in bold.

Sensor model : Aanderaa_optode 4330

Intermediate parameters : TPHASE_DOXY
Sensor serial number : 828

Set of calibration coefficients :


AANDERAA
a xylem brand

CALIBRATION CERTIFICATE

Form No 830, Juli 2012

Certificate no: 4831_828_00160262
Foil batch no: 1824M

Product: 4831
Calibration date: 15.08.2019

Serial no: 828
Page 2 of 2

Giving these coefficients

Index	0	1	2	3	4	5	6
SVUFoilCoef	2.68491E-03	1.18675E-04	2.23725E-06	1.91643E02	-2.42742E-01	-3.99199E01	3.89975E00
TempCoef	2.40364E01	-3.10839E-02	2.89656E-06	-4.26288E-09	0.00000E00	0.00000E00	

Oxygen validation

O₂ deviation +2.5µM/+1.5% -2.5µM/-1.5%

µM

µM

Temperature validation

Temp. deviation +0.03°C -0.03°C

°C

°C

With following settings

Index	0	1	2	3
PhaseCoef	-2.69500E00	1.00000E00	0.00000E00	0.00000E00

Index	0 (Offset)	1 (Slope)
ConcCoef	0.00000E00	1.00000E00
Salinity	0.00	

Why Intermediate parameters are essential

Argo cookbook : https://archimer.ifremer.fr/doc/00287/39795/94062.pdf

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		AANDERAA_OPTODE_4330F											
	301	ARO_FT											

DOXY2

DOXY

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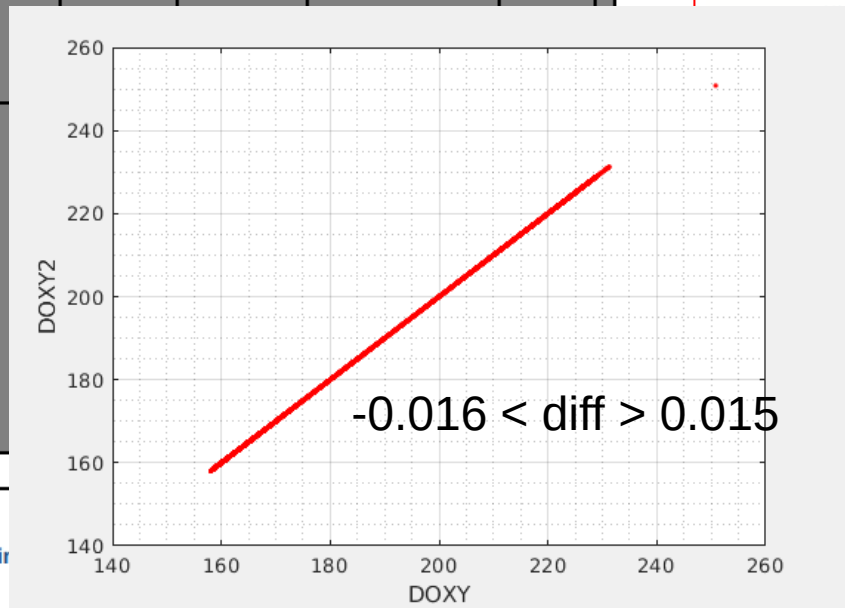
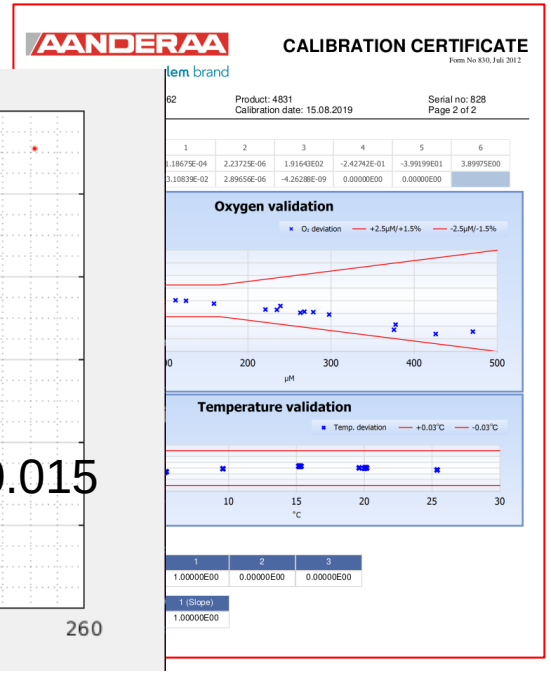


Sensor model : Aanderaa_optode 4330

Intermediate parameters : TPHASE_DOXY
Sensor serial number : 828

Set of calibration coefficients :



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DOXY2

DOXY

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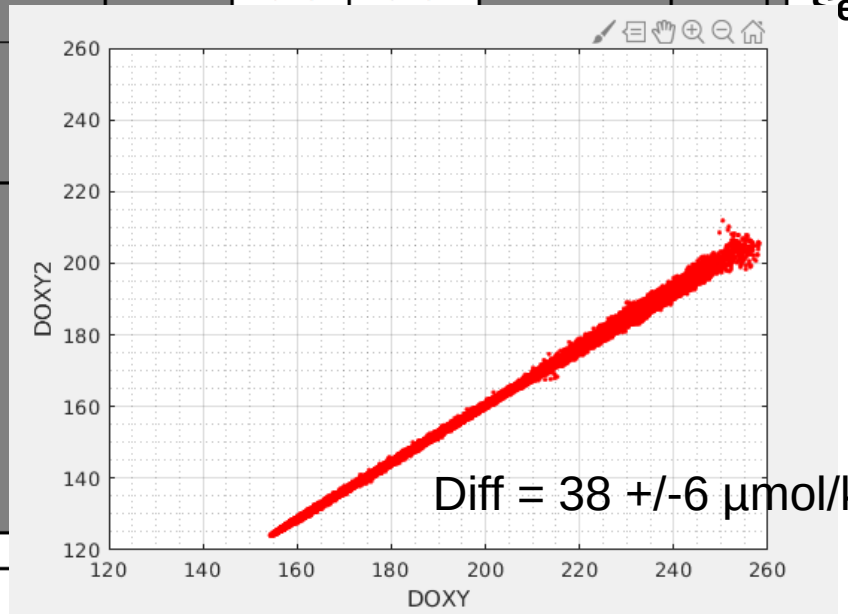


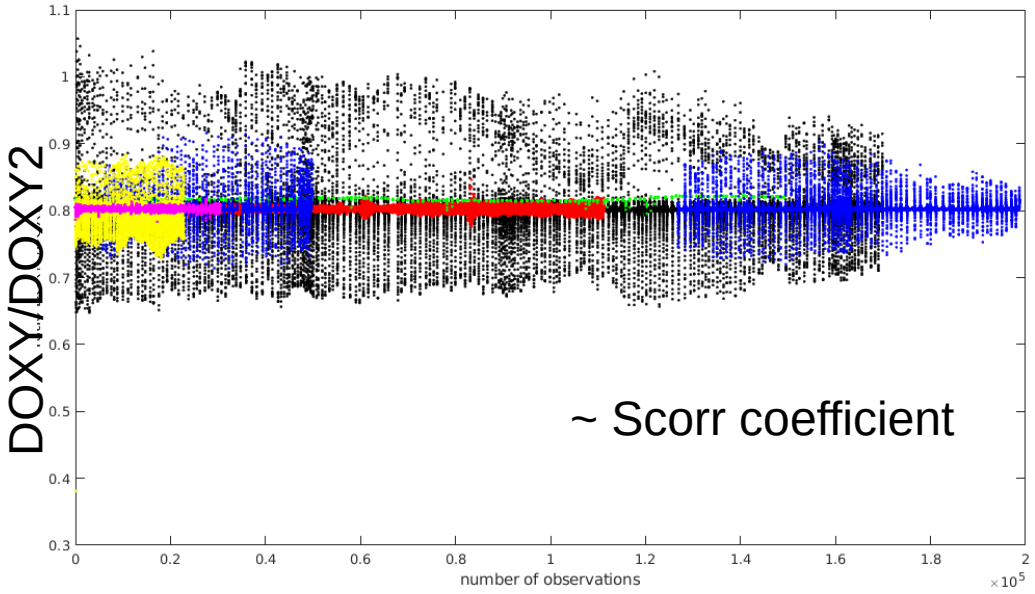
Sensor model : Aanderaa_optode 5013

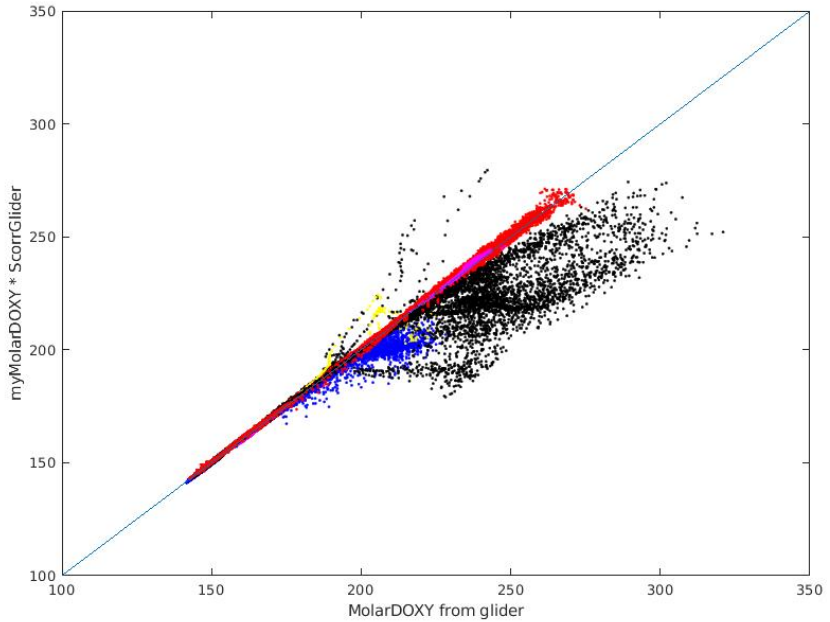
Intermediate parameters : BPHASE

Sensor serial number : 901

Set of calibration coefficients :

Pending case of uncompensated salinity





MOLAR_DOXY from the glider is rawData.vars_sci_time.sci_oxy3835_wphase_oxygen

Our interpretation > MOLAR_DOXY * Scorr * Pcorr = DOXY

Is it the true ??

Real time QC

https://oceangliderscommunity.github.io/Oxygen_SOP/sections/oxygen_rtqc.html#rtqc-check-doxy

Argo (or copernicus) contribution

- Initial QC
  - DOXY_QC = 3 (Several oxygen sensors suffer from predeployment storage drift that can reduce accuracy by up to 20% or more (Bittig et al., 2019)
- Global range QC [-5 600]µmol/kg
- Outlier and spike QC
- Stuck value test
- Bad P/T/S QC spreading
- Effect of biofouling

Real time adjustment in Argo

e.g. automatic procedure for coriolis https://archimer.ifremer.fr/doc/00655/76709/84784.pdf

DOXY_ADJUSTED = DOXY .* G

G (gain factor) = median(gi)

with gi = (PPOX_woa/PPOX_DOXY_float)cycle i

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

PPOX_float{DOXY_float,TEMP_float,PSAL_float,Patm = 1atm}

From the 5 first cycles (upper 10dbar)
Climatology = oxygen saturation from WOA18 (monthly resolution, first level - 0m)
Gain automatical application (Go/NoGO) = Compared adjusted value with GLODAP climatology

Adjusted error =

PPOX_DOXY_ADJUSTED_ERROR = elast + 1 mbar year-1*(T – Tlast)

DOXY_ADJUSTED_ERROR =f(PPOX_DOXY_ADJUSTED_ERROR)

Is it relevant for GLIDER-O2 ?

Should we add a simplfied estimate of time response correction ?

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- www.groom-h2020.eu

Thanks for your attention