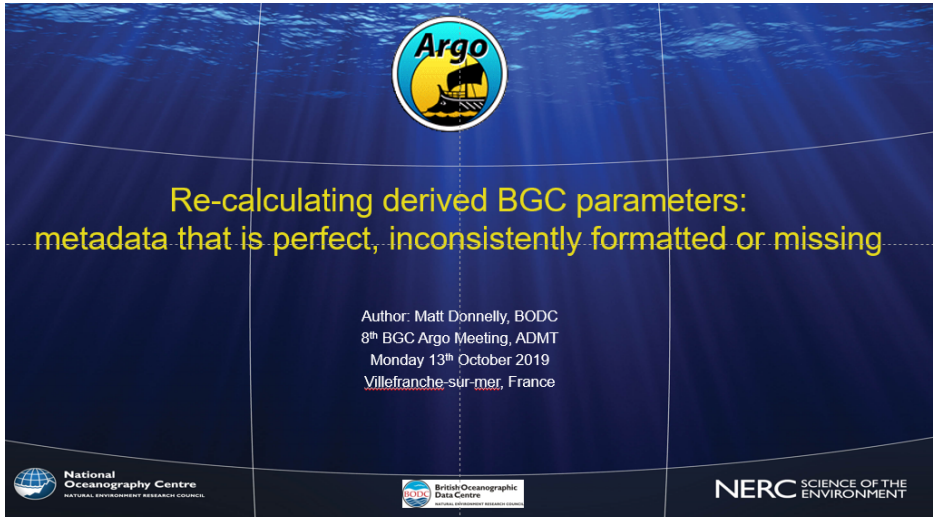
An extension of the Argo program to include biogeochemical observations

Float metadata on DAC – GDAC

CATHERINE SCHMECHTIG

Tentative Conclusions (from M. Donnelly)



- Inconsistency in encoding BGC metadata in the Argo data system
- Effects a range of programmes
- Hindrance to software testing
- Future issue for recalculation/reconsideration of:
  - real-time mode data
  - adjusted-mode data
  - delayed-mode
- Barrier to effective reuse?
- Issue of accessibility and/or confidence for users?

Deployment Sheets for PROVOR CTS4, CTS5

ARGO PROJECT INFORMATION	1	PI_NAME	Fabrizio D'Ortenzio
ARGO PROJECT INFORMATION	1	PROJECT_NAME	NAOS
ARGO PROJECT INFORMATION	1	FLOAT_OWNER	NAOS
ARGO PROJECT INFORMATION	1	OPERATING_INSTITUTION	LOV-CNRS-UPMC

PLATFORM INFORMATION	1	PLATFORM_FAMILY	FLOAT
PLATFORM INFORMATION	1	PLATFORM_TYPE	PROVOR_III
PLATFORM INFORMATION	1	WMO_INST_TYPE	839
PLATFORM INFORMATION	1	PLATFORM_MAKER	NKE
PLATFORM INFORMATION	1	BATTERY_TYPE	Lithium
PLATFORM INFORMATION	1	BATTERY_PACKS	4DD LI
PLATFORM INFORMATION	1	FLOAT_SAIL_ID	
PLATFORM INFORMATION	1	FLOAT_SERIAL_NUMBER	OIN14SO-S4-08
PLATFORM INFORMATION	1	CONTROLLER_BOARD_TYPE_PRIMARY	I535
PLATFORM INFORMATION	1	CONTROLLER_BOARD_TYPE_SECONDARY	CAMAT256
PLATFORM INFORMATION	1	CONTROLLER_BOARD_SERIAL_NO_PRIMARY	C134239-0002
PLATFORM INFORMATION	1	CONTROLLER_BOARD_SERIAL_NO_SECONDARY	I1405015
PLATFORM INFORMATION	1	WMO_NUMBER	6902954
PLATFORM INFORMATION	1	LOGIN_NAME	lovbio091f
PLATFORM INFORMATION	1	SIM_NUMBER	8988169234000798736
PLATFORM INFORMATION	1	IMEI_NUMBER	300125010915300
PLATFORM INFORMATION	1	BLUETOOTH_NUMBER	2014-06-002
PLATFORM INFORMATION	1	FIRMWARE_VERSION	1.07
PLATFORM INFORMATION	1	STANDARD_FORMAT_ID	
PLATFORM INFORMATION	1	MANUAL_VERSION	
PLATFORM INFORMATION	1	FIRMWARE_CHECKSUM	
PLATFORM INFORMATION	1	CORIOLIS_DECODER_VERSION	5.9

SENSOR INFORMATION	1	SENSOR	CTD_PRES
SENSOR INFORMATION	1	SENSOR_MAKER	KISTLER
SENSOR INFORMATION	1	SENSOR_MODEL	KISTLER_2900PSIA
SENSOR INFORMATION	1	SENSOR_SERIAL_NUMBER	2148599
SENSOR INFORMATION	2	SENSOR	CTD_TEMP
SENSOR INFORMATION	2	SENSOR_MAKER	SBE
SENSOR INFORMATION	2	SENSOR_MODEL	SBE41CP
SENSOR INFORMATION	2	SENSOR_SERIAL_NUMBER	6025

SENSOR INFORMATION	12	SENSOR	SPECTROPHOTOMETER_NITRATE
SENSOR INFORMATION	12	SENSOR_MAKER	SATLANTIC
SENSOR INFORMATION	12	SENSOR_MODEL	SUNA_V2
SENSOR INFORMATION	12	SENSOR_SERIAL_NUMBER	488

PARAMETER INFORMATION	12	PARAMETER	NITRATE
PARAMETER INFORMATION	12	PARAMETER_SENSOR	SPECTROPHOTOMETER_NITRATE
PARAMETER INFORMATION	12	PARAMETER_UNITS	micromole/kg
PARAMETER INFORMATION	12	PARAMETER_ACCURACY	
PARAMETER INFORMATION	12	PARAMETER_RESOLUTION	
PARAMETER INFORMATION	12	PREDEPLOYMENT_CALIB_EQUATION	
PARAMETER INFORMATION	12	PREDEPLOYMENT_CALIB_COEFFICIENT	
PARAMETER INFORMATION	12	PREDEPLOYMENT_CALIB_COMMENT	

SENSOR WAVELENGTH	1	OCR_OPTICAL_WAVELENGTH (in nm)	380
SENSOR WAVELENGTH	2	OCR_OPTICAL_WAVELENGTH (in nm)	412
SENSOR WAVELENGTH	3	OCR_OPTICAL_WAVELENGTH (in nm)	490
SENSOR WAVELENGTH	1	ECO3_OPTICAL_WAVELENGTH (in nm)	700
SENSOR WAVELENGTH	2	ECO3_OPTICAL_WAVELENGTH (in nm)	
SENSOR WAVELENGTH	1	CROVER_OPTICAL_WAVELENGTH (in nm)	

SENSOR MOUNT INFORMATION	1	OPTODE: vertical pressure offset (in dbar)	-0.54
SENSOR MOUNT INFORMATION	1	OCR: vertical pressure offset (in dbar)	-0.08
SENSOR MOUNT INFORMATION	1	ECO: vertical pressure offset (in dbar)	0.1
SENSOR MOUNT INFORMATION	1	CROVER: vertical pressure offset (in dbar)	
SENSOR MOUNT INFORMATION	1	SUNA: vertical pressure offset (in dbar)	1.5
SENSOR MOUNT INFORMATION	1	OPTODE: measurements in air	yes

SENSOR DELAY INFORMATION	1	OPTODE: Time Pressure Offset (in seconds)	0

MISSION CONFIGURATION PARAMETERS	1	PREDEPLOY_CONFIG_FILE_NAME	DON'T FORGET TO PROVIDE THE FLOAT CONFIGURATION

SENSOR CALIBRATION INFORMATION	1	OPTODE_CALIBRATION_CERTIFICATE	DON'T FORGET TO PROVIDE THE OPTODE CALIBRATION SHEET
SENSOR CALIBRATION INFORMATION	1	PREDEPLOYMENT VALUES FOR DARK	no
SENSOR CALIBRATION INFORMATION	1	FLUOROMETER_CHLA	
SENSOR CALIBRATION INFORMATION	1	FLUOROMETER_CDOM	
SENSOR CALIBRATION INFORMATION	1	SCATTEROMETER_BBP	

DEPLOYMENT CHECKS	1	DEPLOY_VISUAL_CHECK	OK
DEPLOYMENT CHECKS	1	DEPLOY_BALLAST_CHECK	OK
DEPLOYMENT INFORMATION	1	DEPLOY_MISSION	MOOSE 2019
DEPLOYMENT INFORMATION	1	DEPLOY_SHIP	Thalassa
DEPLOYMENT INFORMATION	1	DEPLOY_OPERATOR_NAME	COPPOLA
DEPLOYMENT INFORMATION	1	DEPLOY_PROFILE_DONE	
DEPLOYMENT INFORMATION	1	DEPLOY_MAGNET_REMOVAL_TIME	12/06/2019 14:42:00
DEPLOYMENT INFORMATION	1	DEPLOY_FLOAT_INTERNAL_CHECK	
DEPLOYMENT INFORMATION	1	DEPLOY_TIME	12/06/2019 15:11:00
DEPLOYMENT INFORMATION	1	DEPLOY_LATITUDE	42° 53,351N
DEPLOYMENT INFORMATION	1	DEPLOY_LONGITUDE	7° 38,559 E
DEPLOYMENT INFORMATION	1	DEPLOY_BUOYANCY	
DEPLOYMENT INFORMATION	1	DEPLOY_METHOD	
DEPLOYMENT INFORMATION	1	DEPLOY_HEIGHT	3
DEPLOYMENT INFORMATION	1	DEPLOY_SHIP_SPEED	2
DEPLOYMENT INFORMATION	1	DEPLOY_WIND_SPEED	6
DEPLOYMENT INFORMATION	1	DEPLOY_SEA_STATE	rough
DEPLOYMENT INFORMATION	1	DEPLOY_BATHYMETRY	2666
DEPLOYMENT INFORMATION	1	DEPLOY_COMMENT	CTD nearby

VALIDATION

On the importance of metadata for BBP

ADMT 16 Bermuda / Nov. 2015

BBP700 =2*π*khi[(BETA_BACKSCATTERING700 – DARK_BACKSCATTERING700)* SCALE_BACKSCATTERING700 - BETASW700]

« khi » is the conversion factor

DARK_BACKSCATTERING700 are the dark counts

SCALE_BACKSCATTERING700 is the scaling factor

BETA_BACKSCATTERING700 are the raw counts output

BETASW700 is the contribution of the pure seawater

ADMT 17 Tianjin / Sep. 2016

khi values and sensors models updated

Wetlabs Sensor	Measurements angle	Full Width at Half Maximum (FWHM)	Bandwidth	χ
MCOMS and SeaOWL UV-A	149°	20°	20nm	1.142*
Single Channel Sensors	124°	20°	20nm	1.076**
Dual Channel Sensors (FLbb, FLNTU)	142°	30°	20nm	1.097*
Three Channel Sensors	124°	20°	20nm	1.076**
Combined Three Channel Sensors	124°	20°	20nm	1.076**

WET Labs backscatter Models	Examples	Centroid angle (°)	$\chi(\theta)$
ECO Single Channel	BB, NTU	124	1.076
ECO Dual Channel	FLBB, FLNTU, FLBBAP2, FLBB2K	142	1.097
ECO Three Channel	BB3, BBFL2, BB2FL, Triplet-w	124	1.076
ECO Combined Three Channel	FLBBCD, FLBBBB, FLBBCDREM, FLBBBBREM, FLBBCDAP2, FLBBBBAP2	124	1.076
MCOMS Combined Three Channel	MCOMS-FLBBCD	150	1.142

3 SENSOR_MODEL at 124° 142° and 150° measurements angle

ADMT 18 Hamburg / Nov. 2017

AGU PUBLICATIONS

Geophysical Research Letters

RESEARCH LETTER
10.1002/2017GL073949

Key Points:
- b_{bp} (700) values at 900-950 m are nearly constant in most areas of the oceans
- Seasonality is observed at high latitudes, and higher values are observed in association with

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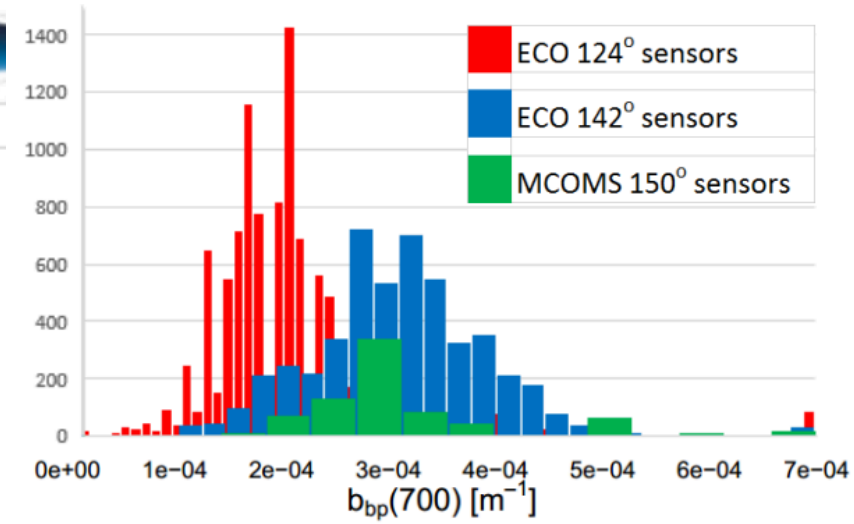
Antoine Poteau[1], Emmanuel Boss[2], and Hervé Claustre[1]



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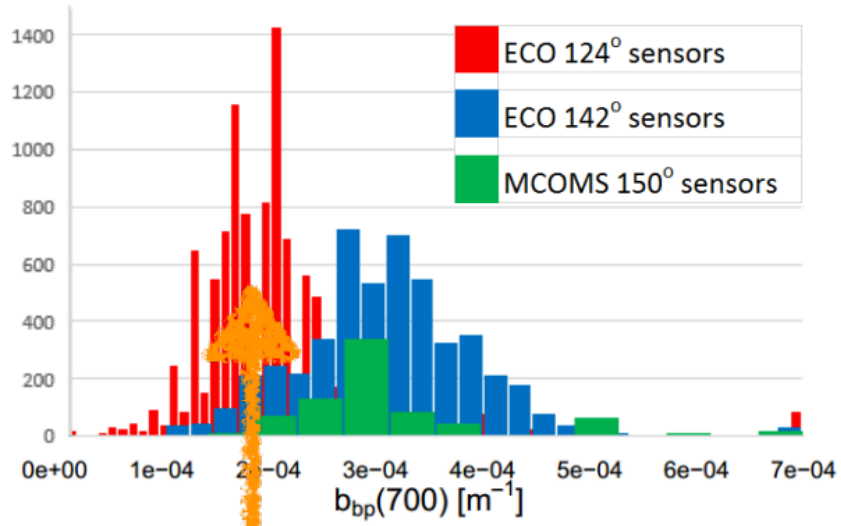
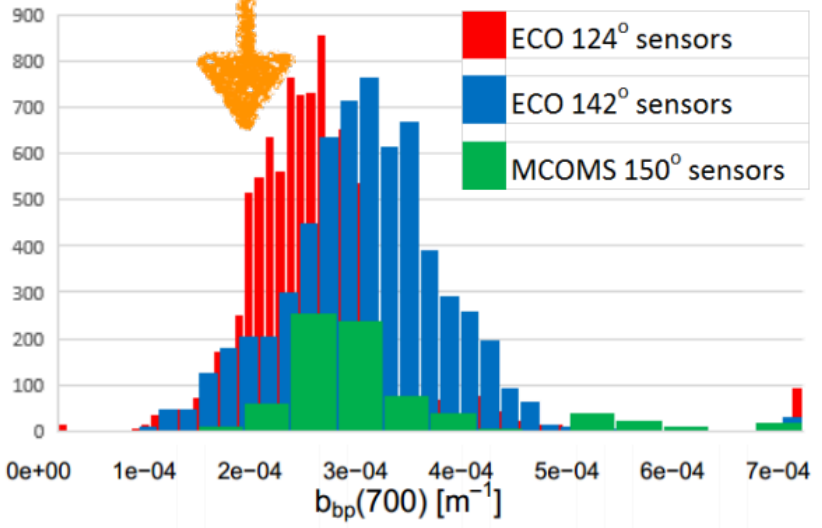


Explanation from Andrew Bernard (Wetlabs/SeaBird)

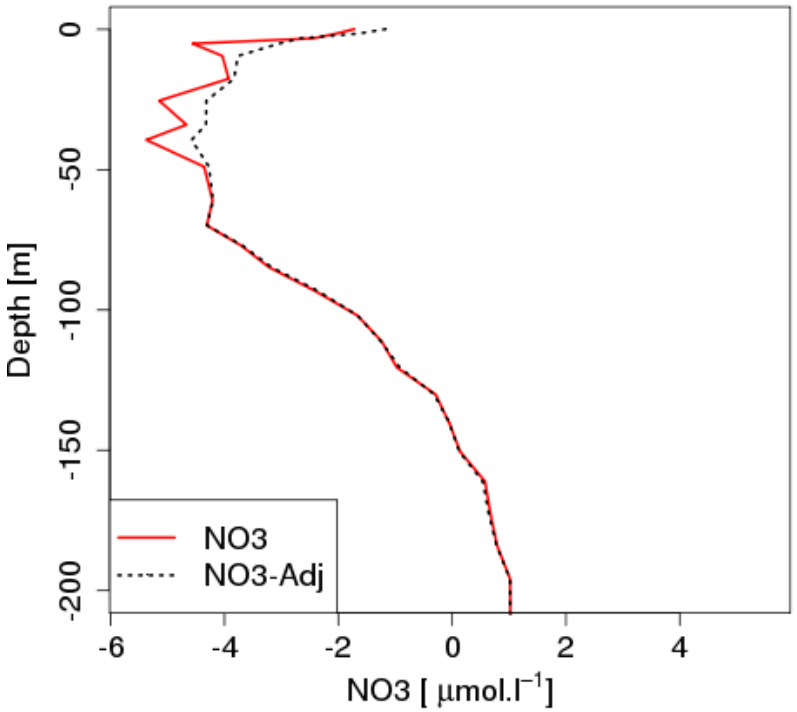
BBP700 =2*π*khi[(BETA_BACKSCATTERING700 – DARK_BACKSCATTERING700)* SCALE_BACKSCATTERING700 - BETASW700]

scale factor

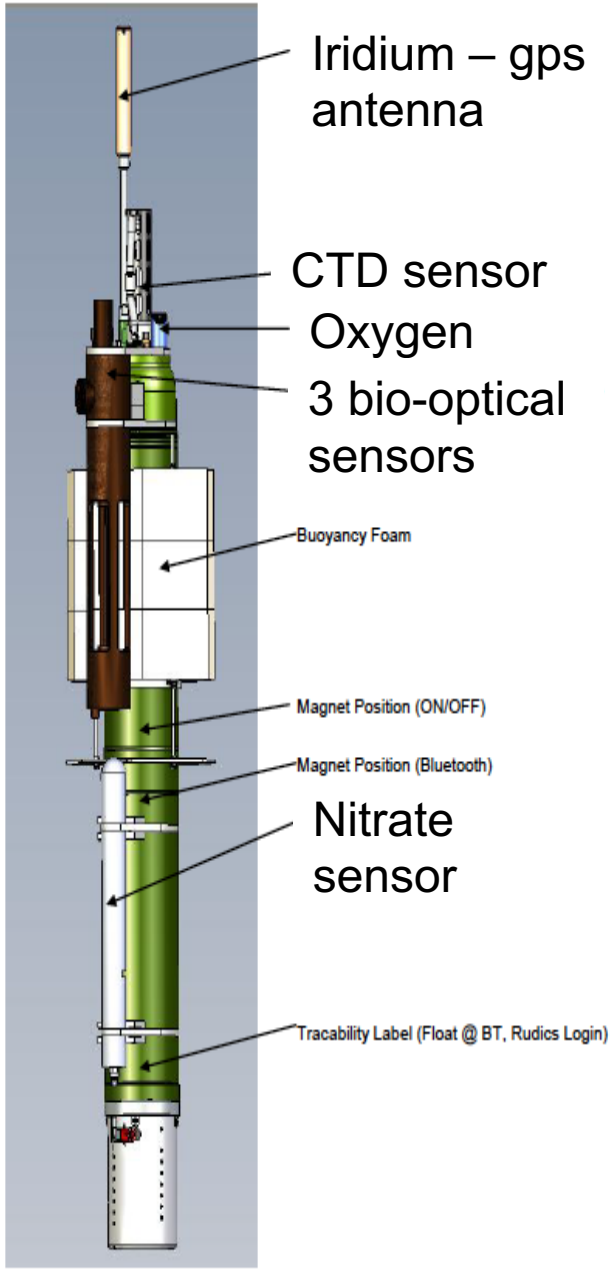


Vertical pressure offset

Float 6901490, in Tyrrhenian sea



1.5m



METADATA

6901032_meta.nc

- Everything about the sensor
  - SENSOR — ex : **OPTODE_DOXY**
  - SENSOR_MAKER — ex : **AANDERAA**
  - SENSOR_MODEL — ex : **AANDERAA_OPTODE_4330**
  - SENSOR_SERIAL_NO — ex: **585**

  ALSO stored in the metadata file the LAUNCH_CONFIG , the value CONFIG_OptodeVerticalPressureOffset_dbar for in-Air measurements

- Parameter Characteristics
  - PARAMETER — ex: **C1PHASE_DOXY, C2PHASE_DOXY,TEMP_DOXY DOXY**
  - PARAMETER_SENSOR — ex: **OPTODE_DOXY**
  - PARAMETER_UNITS — ex: **umol/kg**

- Calibration equation before the deployment (factory calibration)
  - PREDEPLOYMENT_CALIB_EQUATION
  - PREDEPLOYMENT_CALIB_COMMENT
  - PREDEPLOYMENT_CALIB_COEFFICIENT

PREDEPLOYMENT_CALIB_EQUATION=«

TPHASE_DOXY=C1PHASE_DOXY-C2PHASE_DOXY;
Phase_Pcorr=TPHASE_DOXY+Pcoef1*PRES/1000;
CalPhase=PhaseCoef0+PhaseCoef1*Phase_Pcorr+PhaseCoef2*Phase_Pcorr^2+PhaseCoef3*Phase_Pcorr^3;
deltaP=c0*TEMP_DOXY^m0*CalPhase^n0+c1*TEMP_DOXY^m1*CalPhase^n1+..+c27*TEMP_DOXY^m27*CalPhase^n27;
AirSat=deltaP*100/[(1013.25-exp[52.57-6690.9/(TEMP_DOXY+273.15)-4.681*ln(TEMP_DOXY+273.15)])*0.20946];
MOLAR_DOXY=Cstar*44.614*AirSat/100; ln(Cstar)=A0+A1*Ts1+A2*Ts1^2+A3*Ts1
^3+A4*Ts1^4+A5*Ts1^5; Ts1=ln[(298.15-TEMP_DOXY)/(273.15+TEMP_DOXY)];
O2=MOLAR_DOXY*Scorr*Pcorr; Scorr=A*exp[PSAL*(B0+B1*Ts2+B2*Ts2^2+B3*Ts2^3)+C0*PSAL^2];
A=[(1013.25-pH2O(TEMP,Spreset))/(1013.25-pH2O(TEMP,PSAL))];
pH2O(TEMP,S)=1013.25*exp[D0+D1*(100/(TEMP+273.15))+D2*ln((TEMP+273.15)/100)+D3*S];
Ts2=ln[(298.15-TEMP)/(273.15+TEMP)];
Pcorr=1+((Pcoef2*TEMP+Pcoef3)*PRES)/1000;
DOXY=O2/rho, where rho is the potential density [kg/L] calculated from CTD data

»

PREDEPLOYMENT_CALIB_COMMENT=«

see TD269 Operating manual oxygen optode 4330, 4835, 4831; see Processing Argo OXYGEN data at the DAC level, Version 2.2 (DOI: http://dx.doi.org/10.13155/39795)

»

PREDEPLOYMENT_CALIB_COEFFICIENT=«

Spreset=0; Pcoef1=0.1, Pcoef2=0.00022, Pcoef3=0.0419; B0=-0.00624523, B1=-0.00737614, B2=-0.010341, B3=-0.00817083; C0=-4.88682e-07; PhaseCoef0=-1.
51271, PhaseCoef1=1.02076, PhaseCoef2=0, PhaseCoef3=0; c0=-3.60479e-06, c1=-6.84366e-06, c2=0.0018392, c3=-0.198444, c4=0.000812123, c5=-1.22073e-06,
c6=10.8689, c7=-0.0709398, c8=0.000281047, c9=-1.32885e-06, c10=-309.375, c11=2.92369, c12=-0.0222201, c13=0.000214634, c14=-7.93483e-07, c15=3792.41,
c16=-49.3514, c17=0.633521, c18=-0.0108549, c19=0.000121895, c20=-7.34497e-07, c21=0, c22=0, c23=0, c24=0, c25=0, c26=0, c27=0; m0=1, m1=0, m2=0, m3=
0, m4=1, m5=2, m6=0, m7=1, m8=2, m9=3, m10=0, m11=1, m12=2, m13=3, m14=4, m15=0, m16=1, m17=2, m18=3, m19=4, m20=5, m21=0, m22=0, m23=0, m24=0, m25=0,
m26=0, m27=0; n0=4, n1=5, n2=4, n3=3, n4=3, n5=3, n6=2, n7=2, n8=2, n9=2, n10=1, n11=1, n12=1, n13=1, n14=1, n15=0, n16=0, n17=0, n18=0, n19=0, n20=0
, n21=0, n22=0, n23=0, n24=0, n25=0, n26=0, n27=0; A0=2.00856, A1=3.224, A2=3.99063, A3=4.80299, A4=0.978188, A5=1.71069; D0=24.4543, D1=-67.4509, D2=
-4.8489, D3=-0.000544

»

What for ?

- REUSABLE
- REPRODUCIBLE
- Users trust the data management
- Easy to correct

Don’t hesitate to ask question !!!