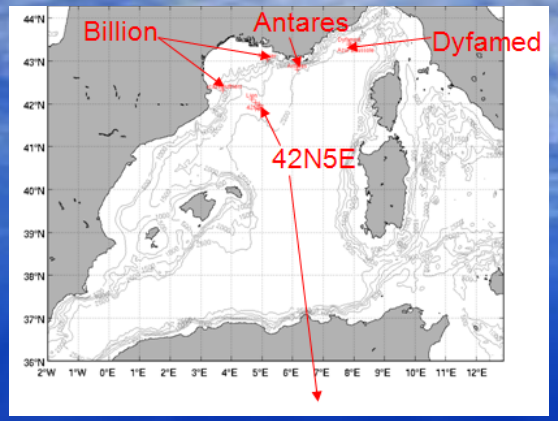
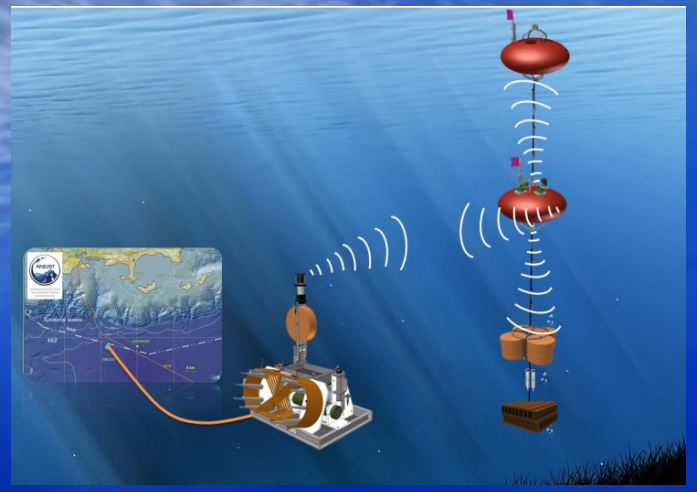
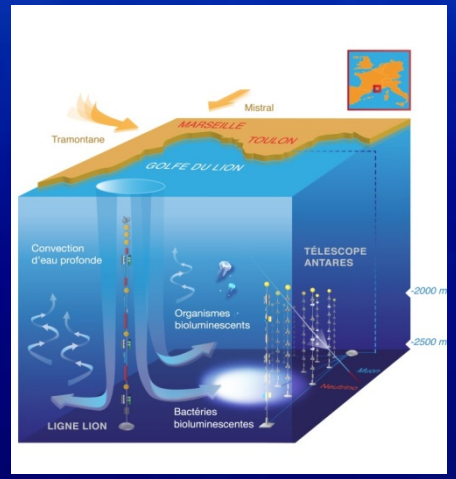
The Observing Long Term Strategy
MOOSE & EMSO





P, Theta, Salinity, O_2
High frequency, real time
500-2400 m



P, Theta, Salinity, O2, BGC variables
Monthly, Water column

How to Validate this time series ?

Time series

Monthly Profile

Predeployment
Sensors mounted on CTD
1D Profile with steps
30 points required encompassing depth of time series

- Requires that each sensor is calibrated

- Requires that each sensor is calibrated
- Requires discrete sampling

For each depth
Var=f(t)

For each month
Var=f(Z)

Postdeployment
Sensors mounted on CTD
1D Profile with steps
30 points required encompassing depth of time series

Profiling. → Sampling → Analysing → Qualifying

[O2]=f(Z) @ 12 Z each month

[O2] = f(volt, SOC, offset, pCorr)
24 hz averaged @ 1m resolution
With adjusted parameters

Procedure based on application note
Murphy et al.
64, 64-1, 64-2 64-3

O2=f(Z) @ 1 m resolution

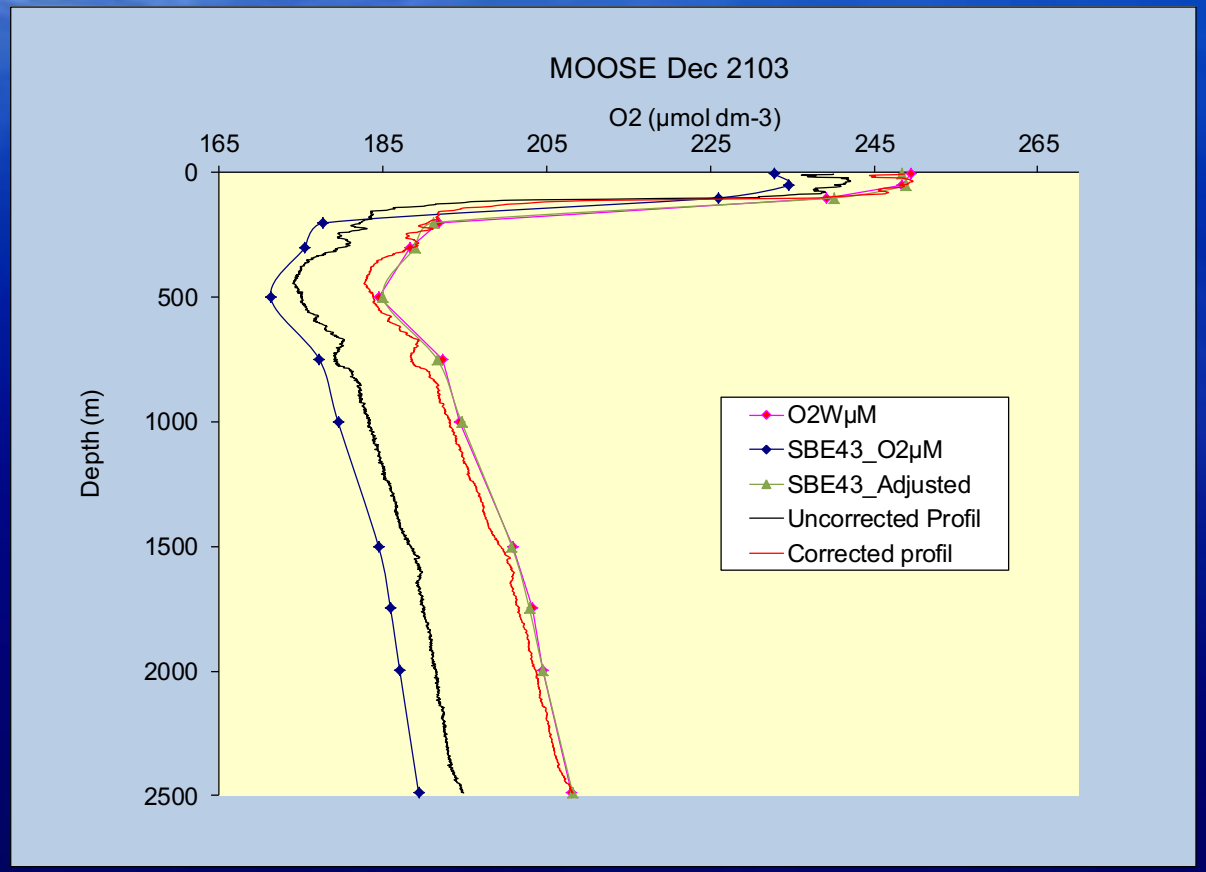
http://www.seabird.com/application-notes

- CTD Dyfamed Moose GE
- 3 palliers : 1000 ; 350 et 5 m
- ODO

- CTD LION Moose GE
- 3 palliers : 1000 ; 350 et 5 m
- CTD peacetime
- CTD ALBATROSS 2014 ; 2015 ; 2016 ; 2017

Procédure pré déploiement – post déploiement
Comparaison in situ

Calibration avec l'échantillon Winkler:
Propagation au profil descendant (propagation d'erreur: +/- 2µM)



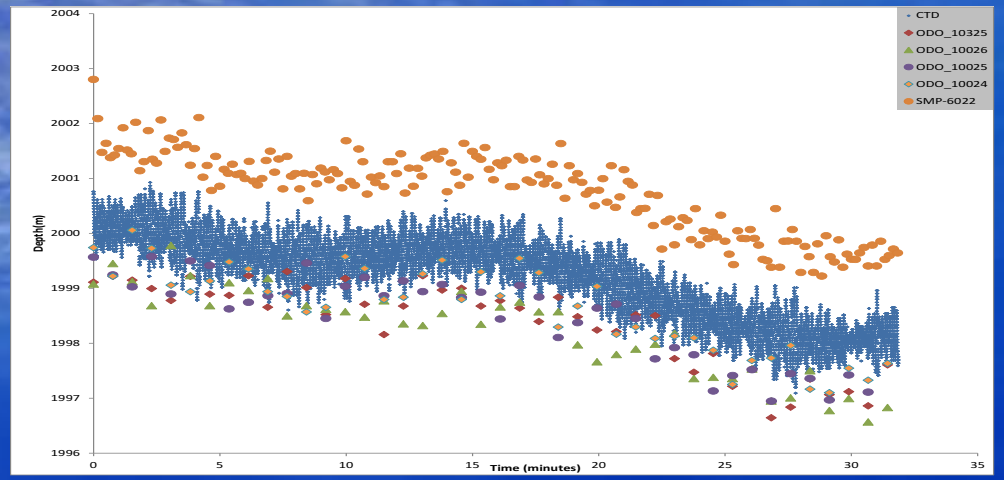
- CTD Rosette data @ 24Hz
  - Extract each steps

- Microcat ODO @ 1/60 Hz
  - Extract each steps

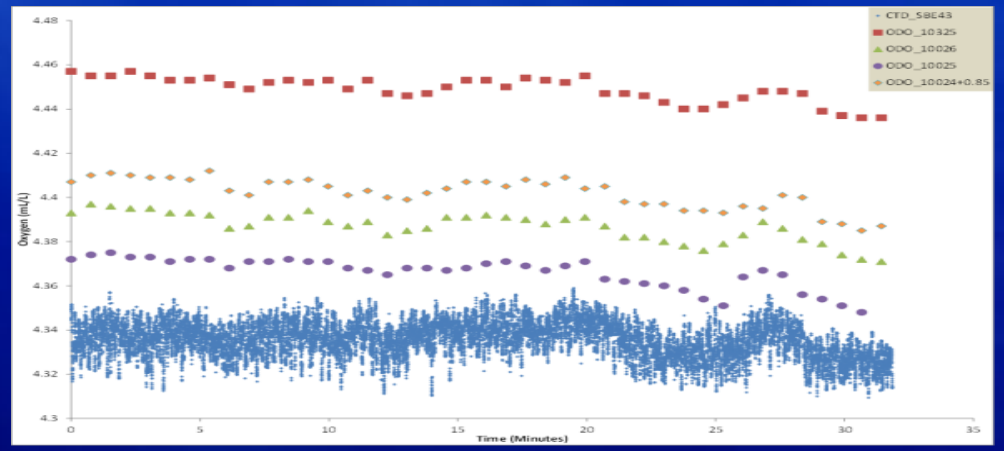
- CTD SBE43 is validated against Winkler samples
- Merge data
- Fit trendline in each time series of 30 mins
- Sample both time series with same time stamp
- Compute offset averages

Data acquisition CTD
Sensors @ 2 depths (5 and 2000 m)
30-45 mins

Time series of available parameters



Microcat mounted on CTD caroussel

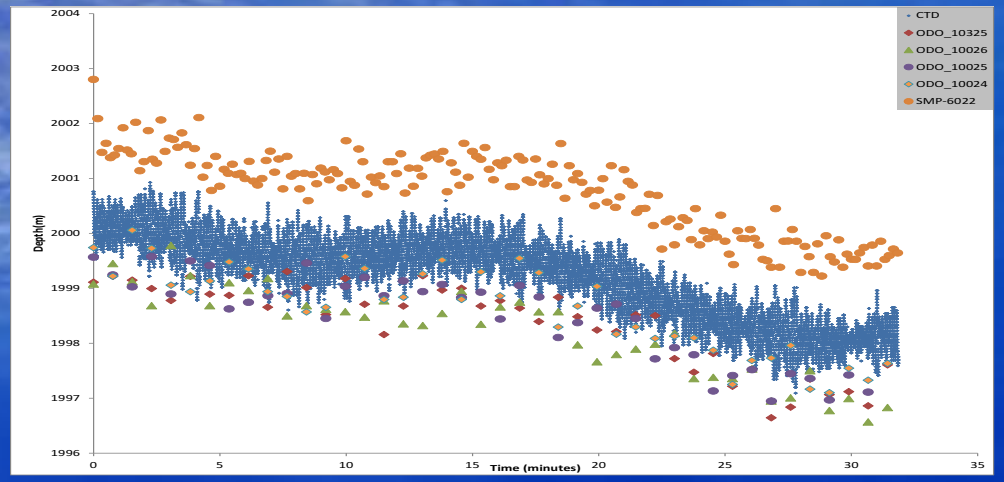


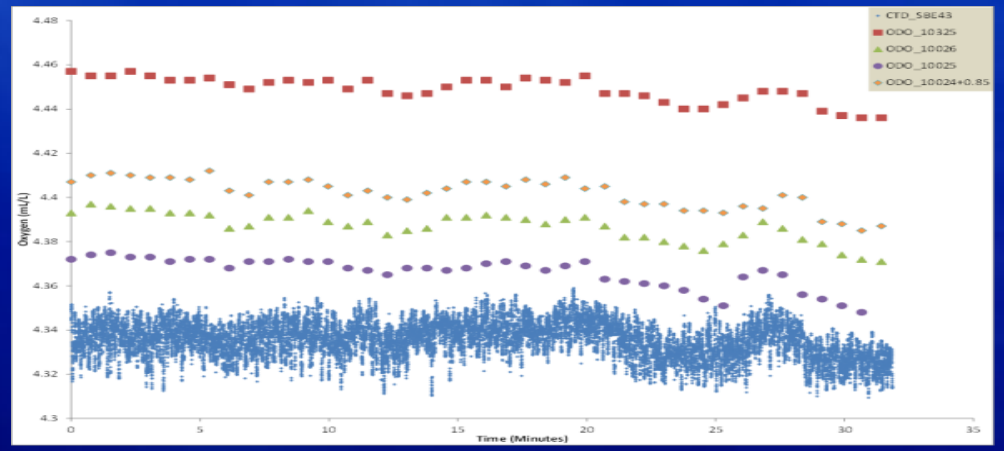
Co variability, offset → correction pre-deployment
→ correction post-deployment
and then drift correction to apply on acquired data =set

Data acquisition CTD
Sensors @ 2 depths (5 and 2000 m)
30-45 mins

Microcat mounted on CTD caroussel

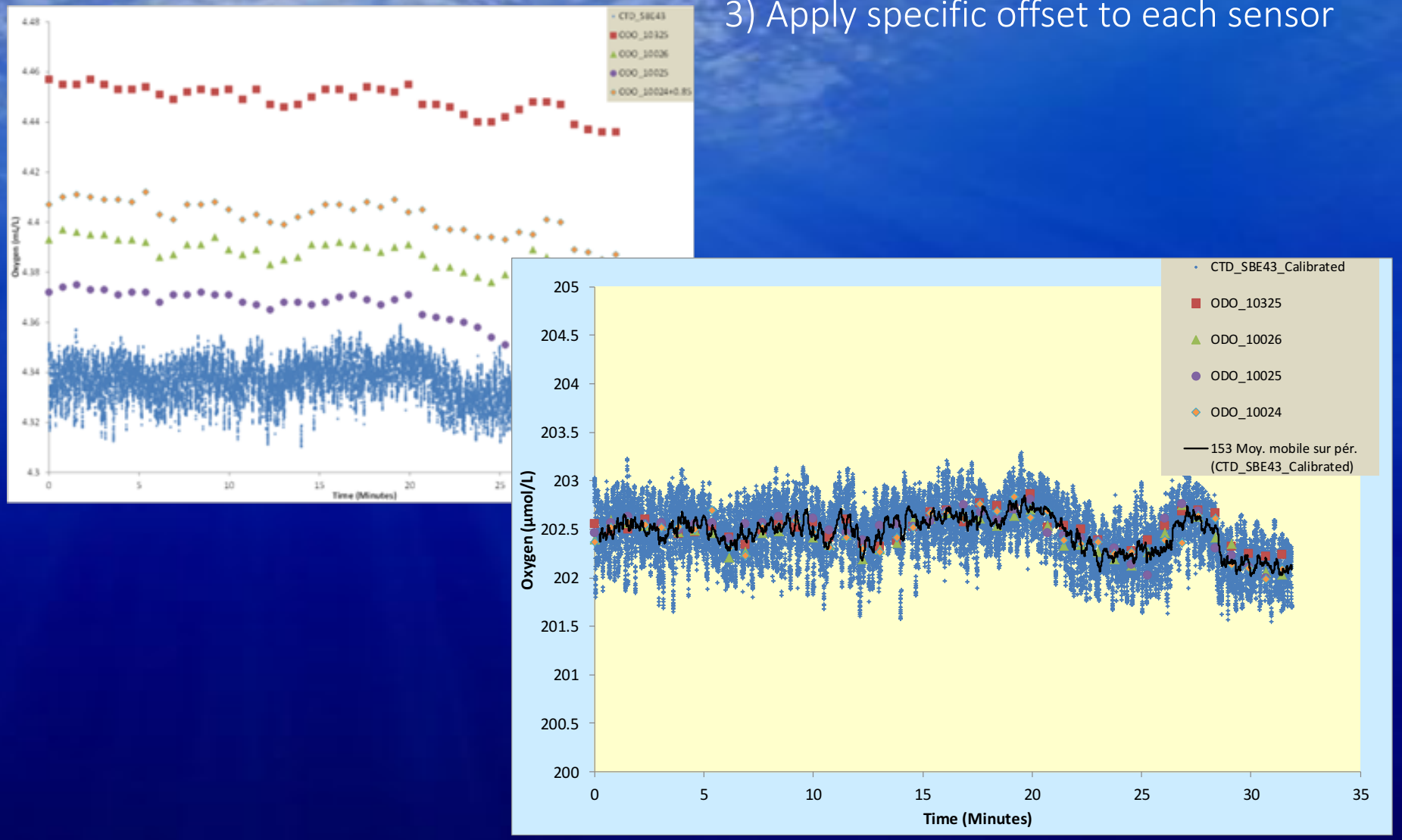
Time series of available parameters (Pressure ; Conductivity)



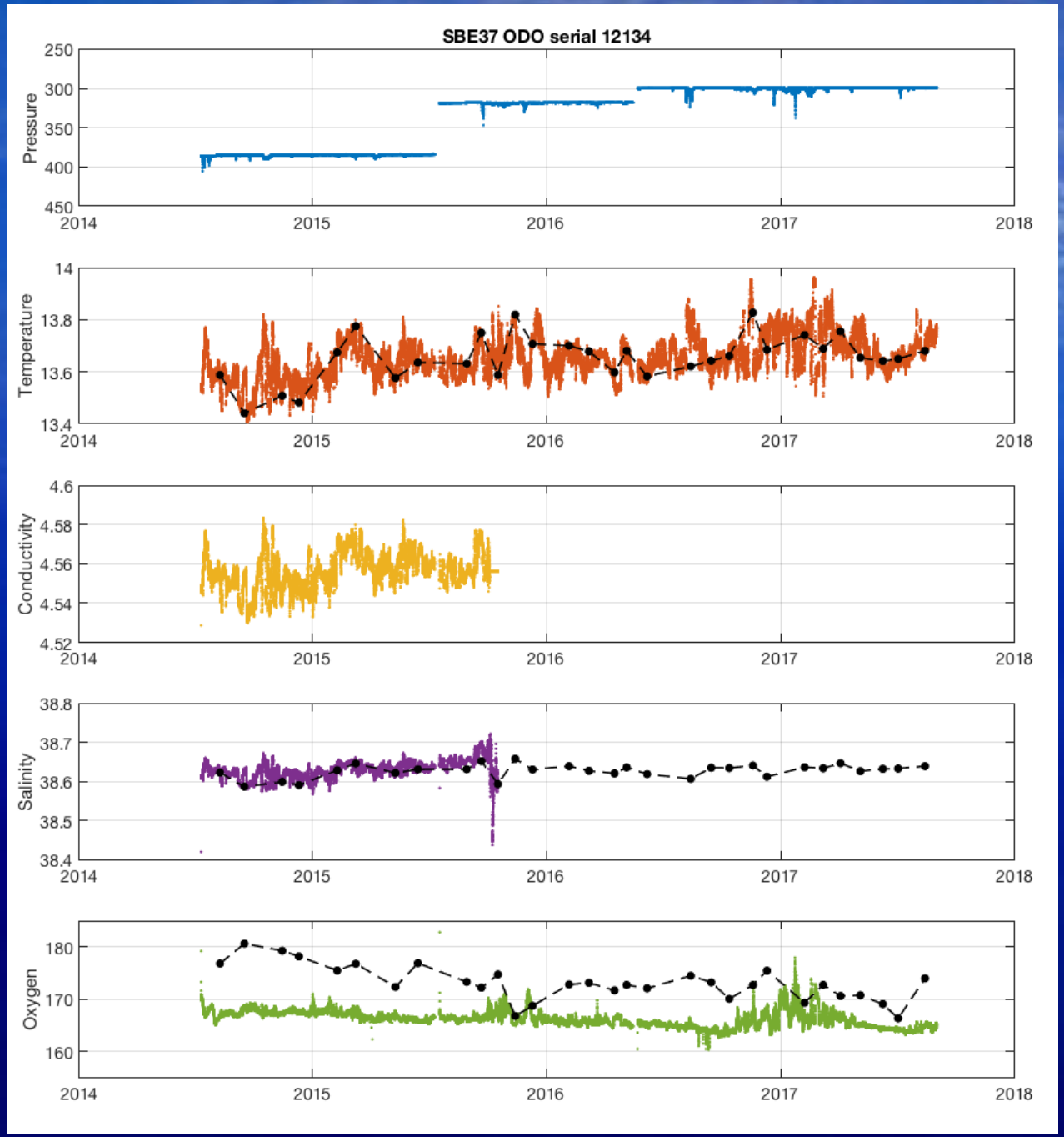


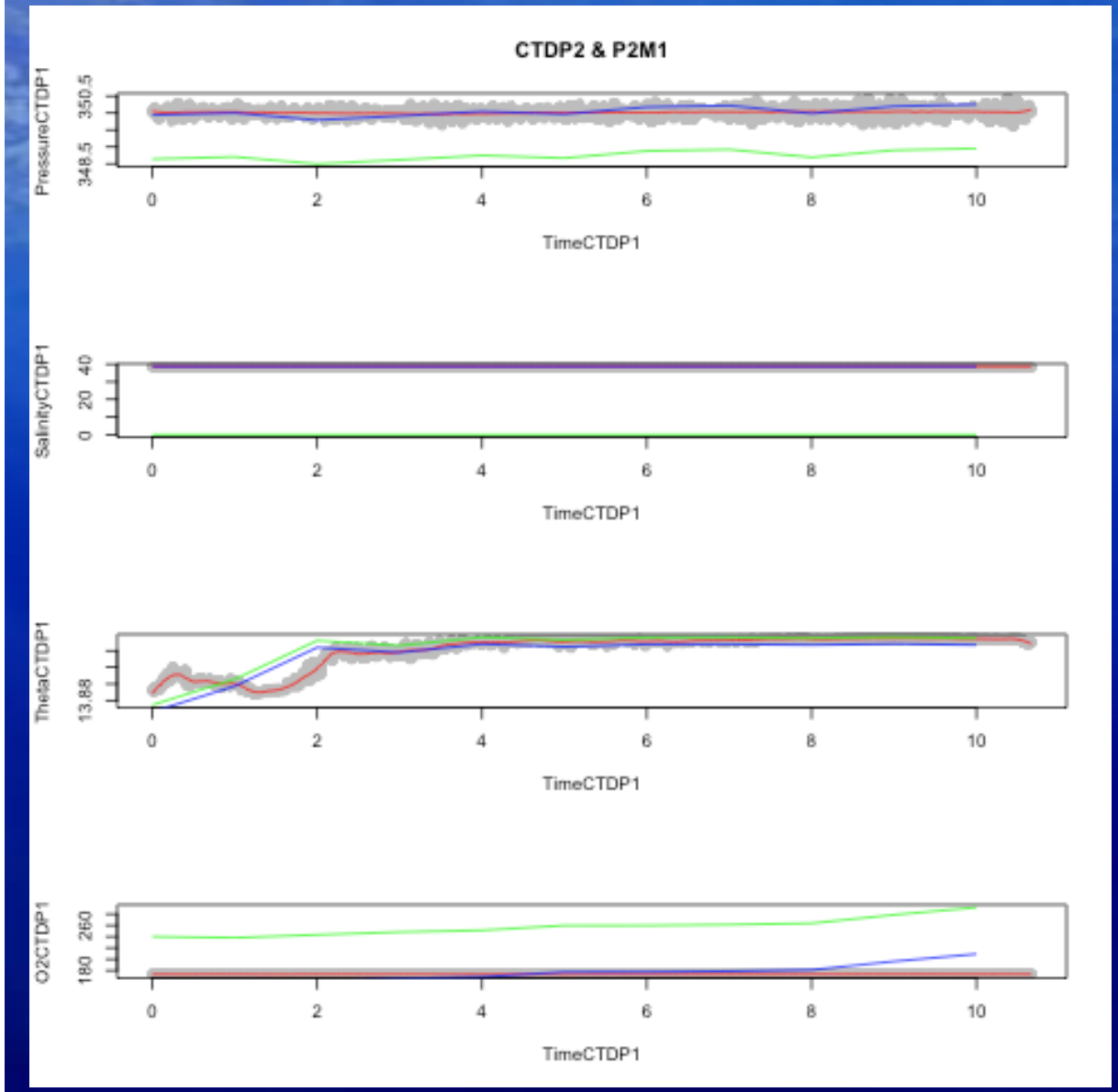
Co variability, offset → correction pre-deployment
→ correction post-deployment
and then drift correction to apply on acquired data =set

1) Fit a LOESS function for each time series
2) Compute offset from average distance during the «standby » @ lower acquisition frequency
3) Apply specific offset to each sensor

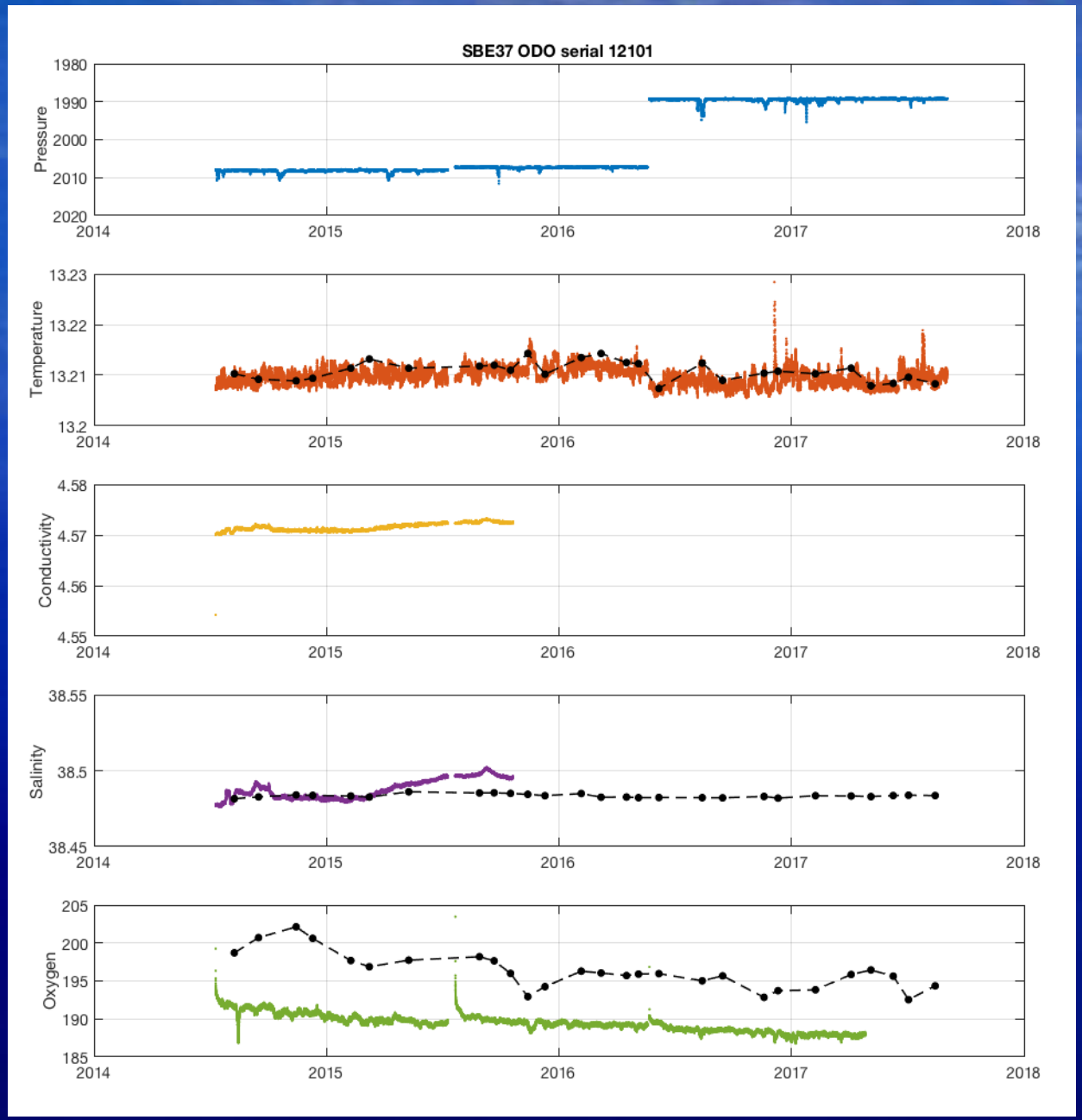


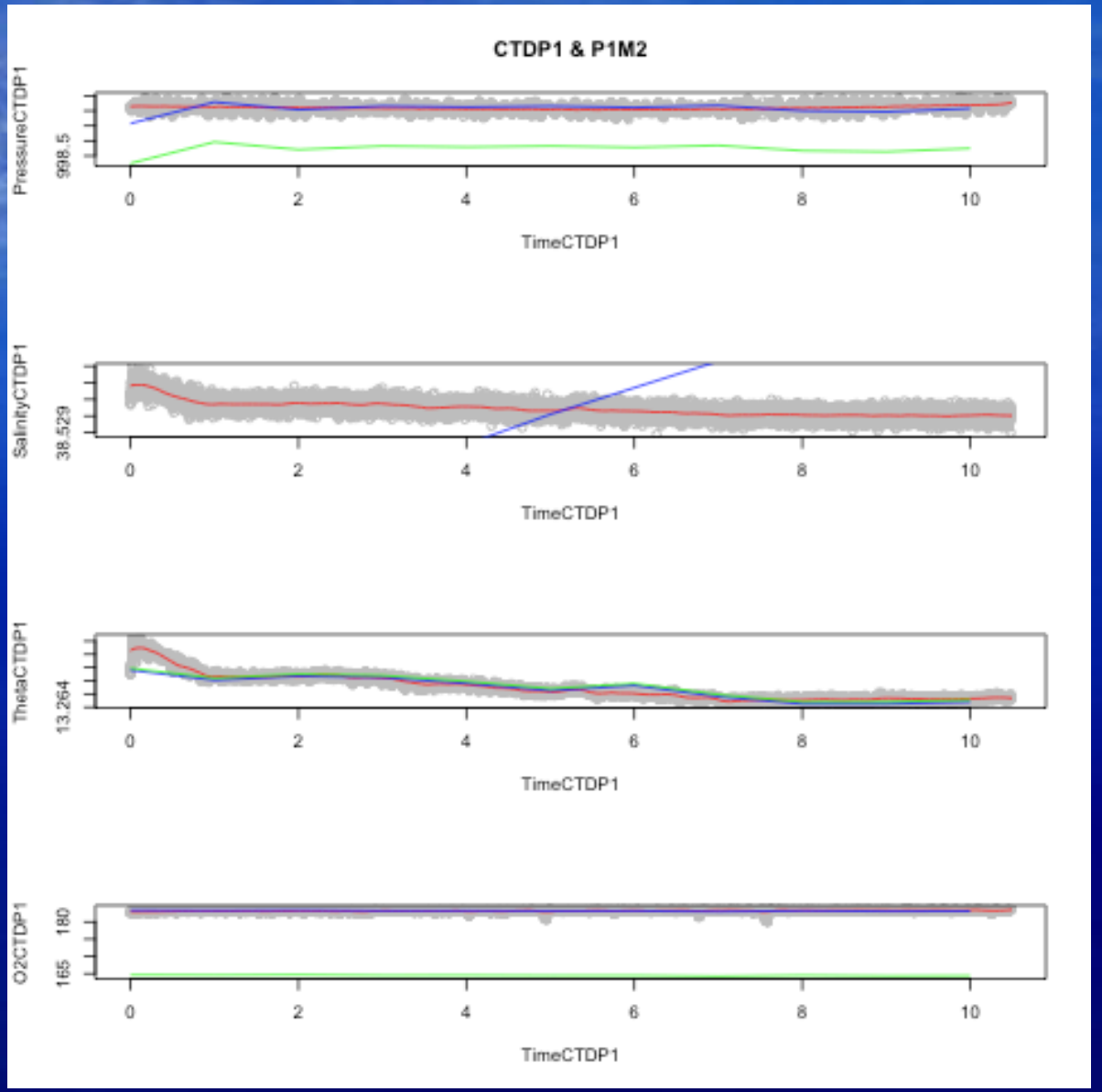
DYFAMED 2016-2017 – 350 m





DYFAMED 2016-2017 – 2000 m





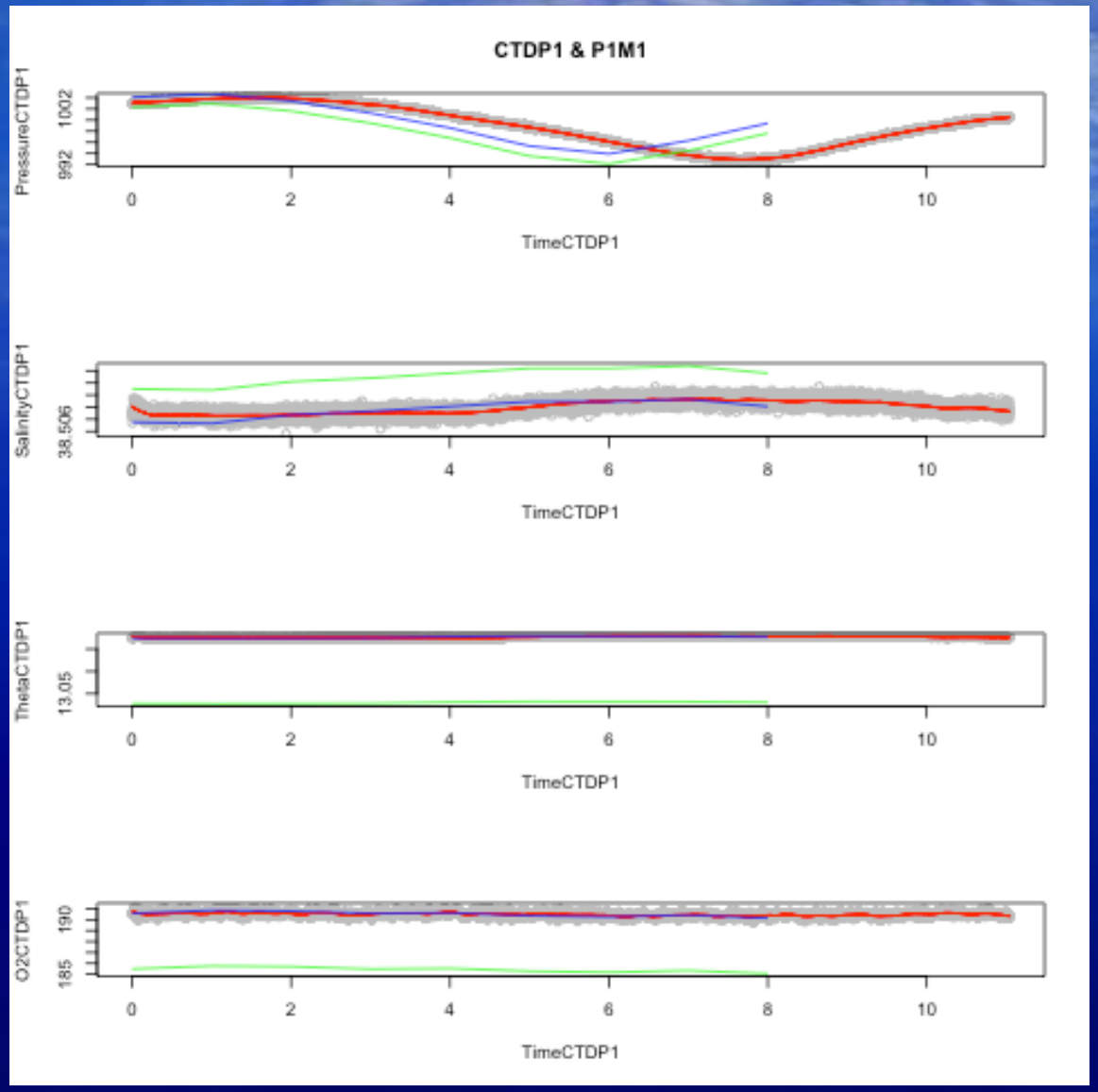
DYFAMED 2016 2017 – 350 m

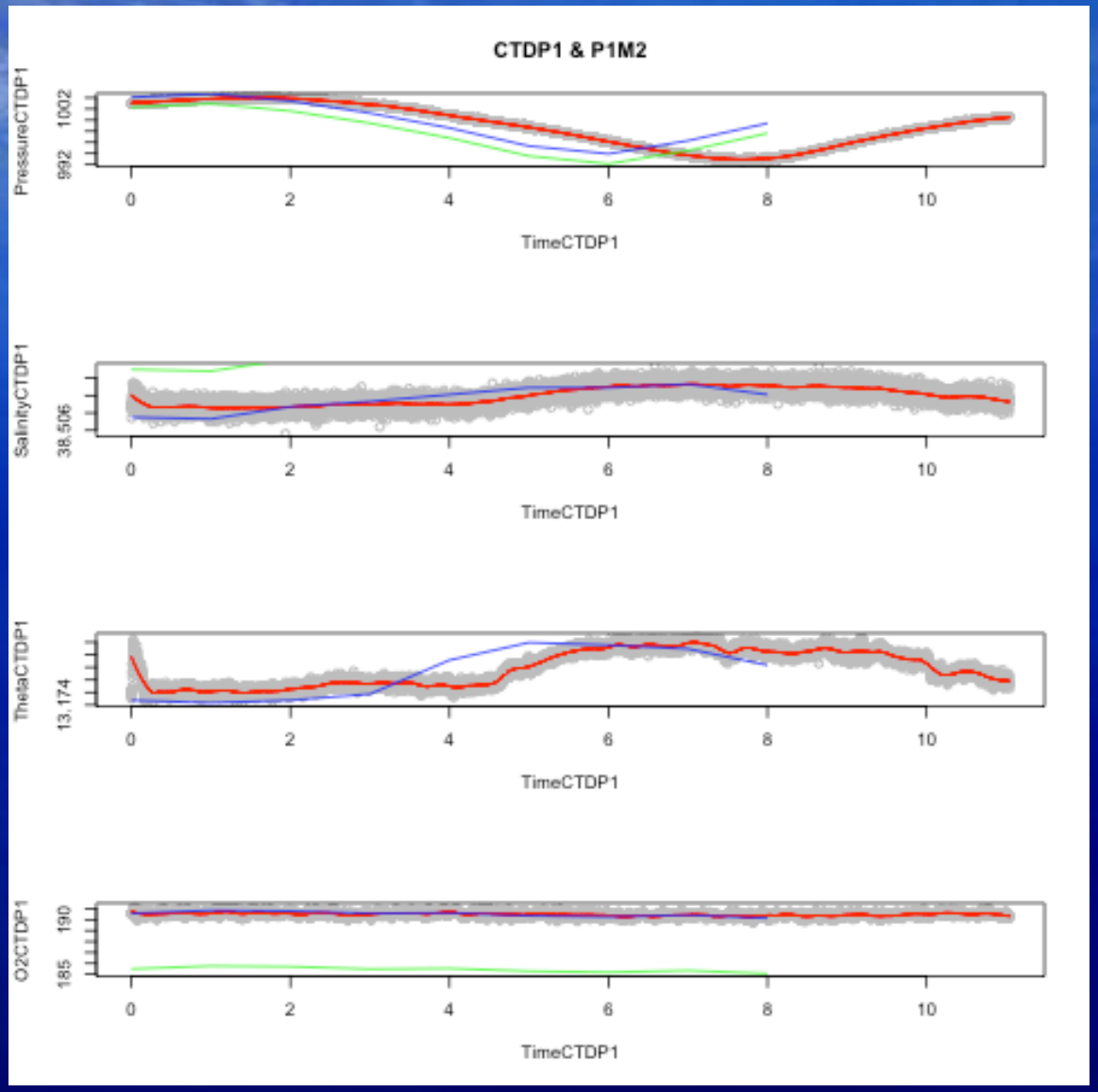
	DeltaOx	DeltaSalinity	DeltaTheta	DeltaPressure
ODO 12134	82.66	-38.62	0.004	-1.30
ODO 12101	-19.03	11.59	0.004	-0.96

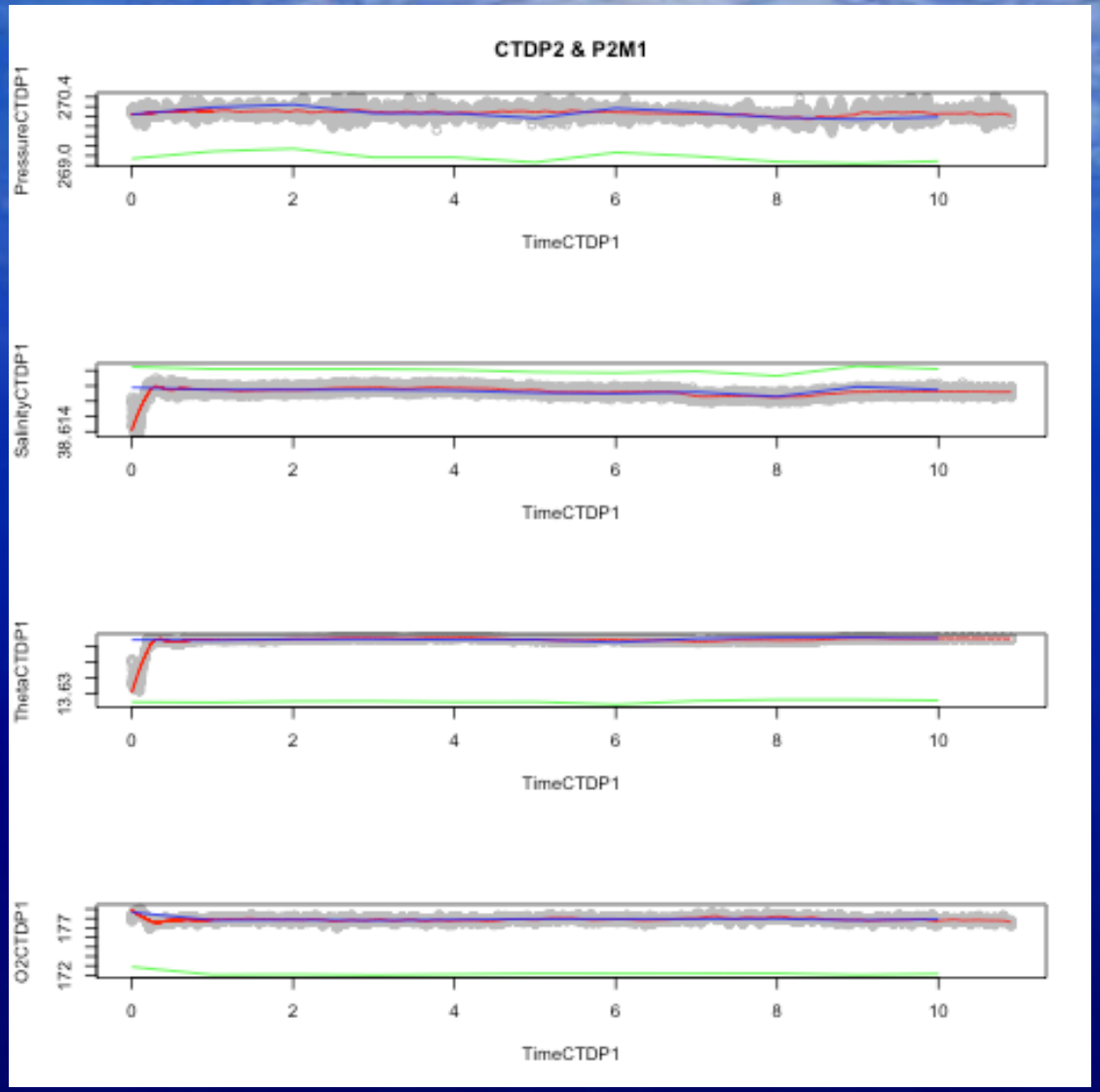
DYFAMED 2016 2017 – 1000 m

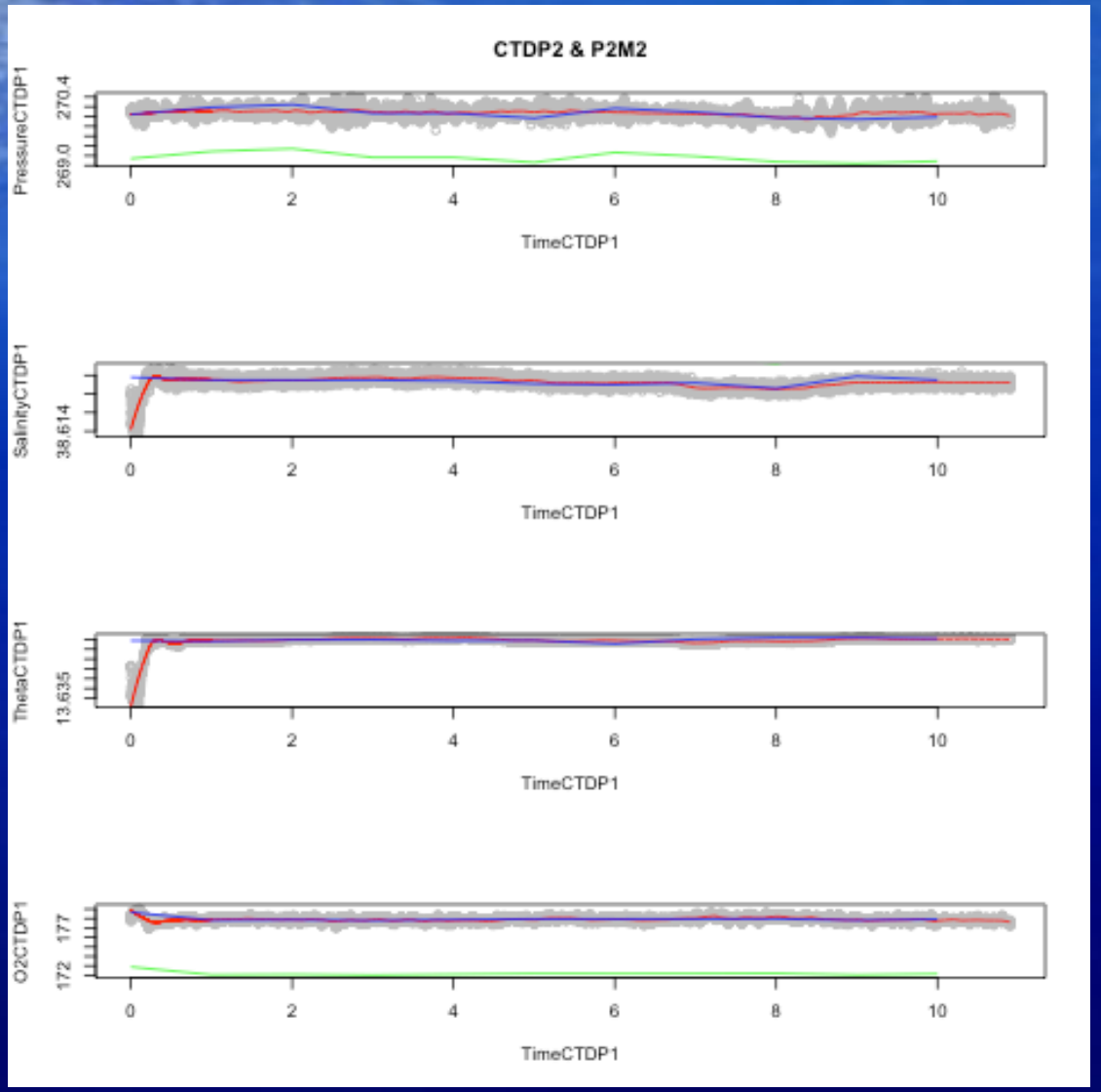
	DeltaOx	DeltaSalinity	DeltaTheta	DeltaPressure
ODO 12134	82.66	-38.62	0.004	-1.30
ODO 12101	-19.03	11.59	0.004	-0.96

LION. 2016 2017 – 1000 m






CTDP2 & P2M1
PressureCTDP1
269.0
270.4
TimeCTDP1
SalinityCTDP1
38.614
TimeCTDP1
ThetaCTDP1
13.63
TimeCTDP1
O2CTDP1
172
177
TimeCTDP1
0
2
4
6
8
10


CTDP2 & P2M2
PressureCTDP1
269.0
270.4
TimeCTDP1
SalinityCTDP1
38.614
TimeCTDP1
ThetaCTDP1
13.635
TimeCTDP1
O2CTDP1
172
177
TimeCTDP1
0
2
4
6
8
10

LION 2016 2017 – 5 m

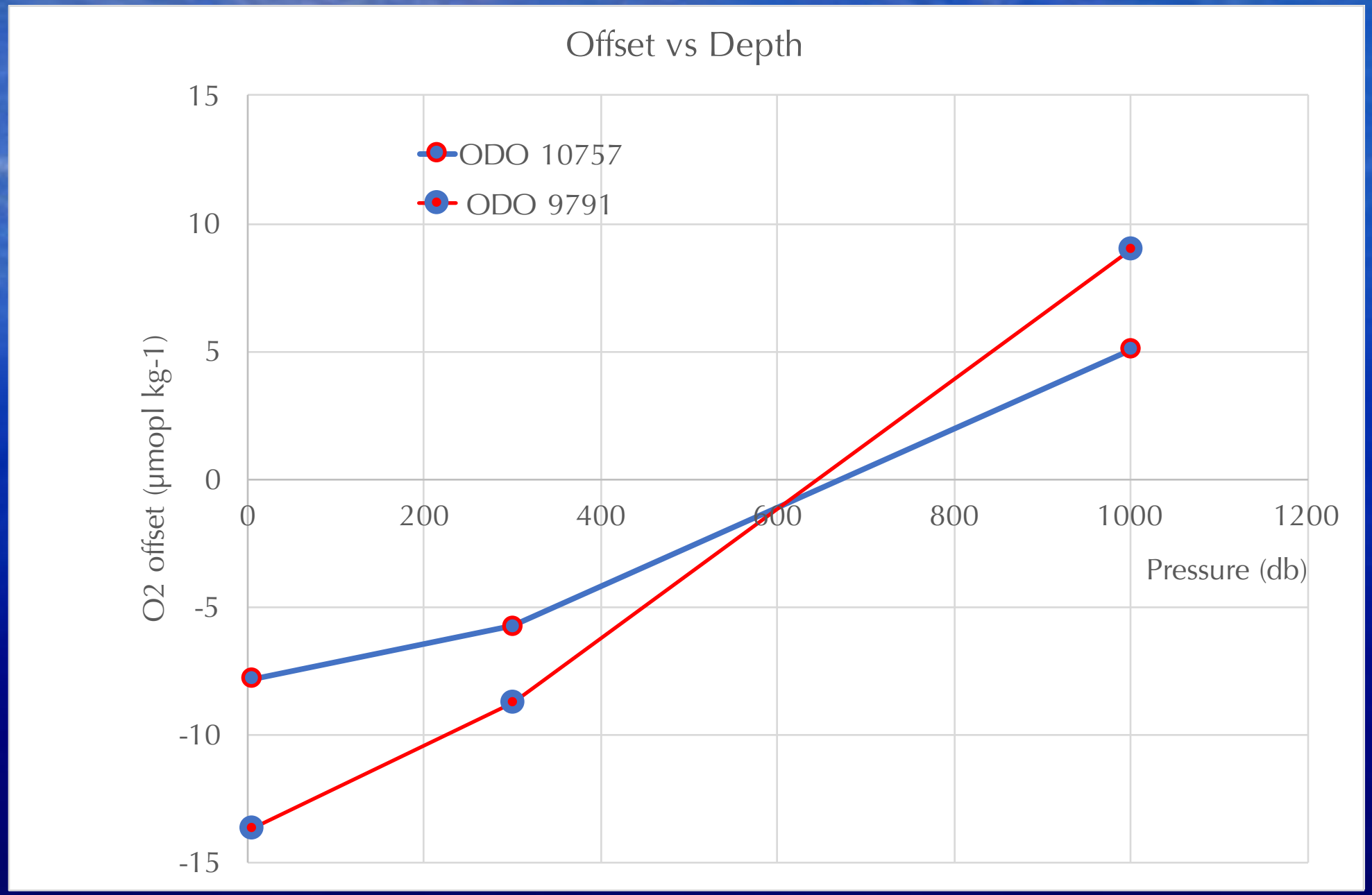
	DeltaOx	DeltaSalinity	DeltaTheta	DeltaPressure
ODO 9791	-7.810	0.004	-0.003	-0.304
ODO 10757	-13.645	-0.004	-0.006	-0.856

LION 2016 2017 – 300 m

	DeltaOx	DeltaSalinity	DeltaTheta	DeltaPressure
ODO 9791	-5.774	0.003	-0.040	-0.901
ODO 10757	-8.719	-0.006	-0.067	-0.866

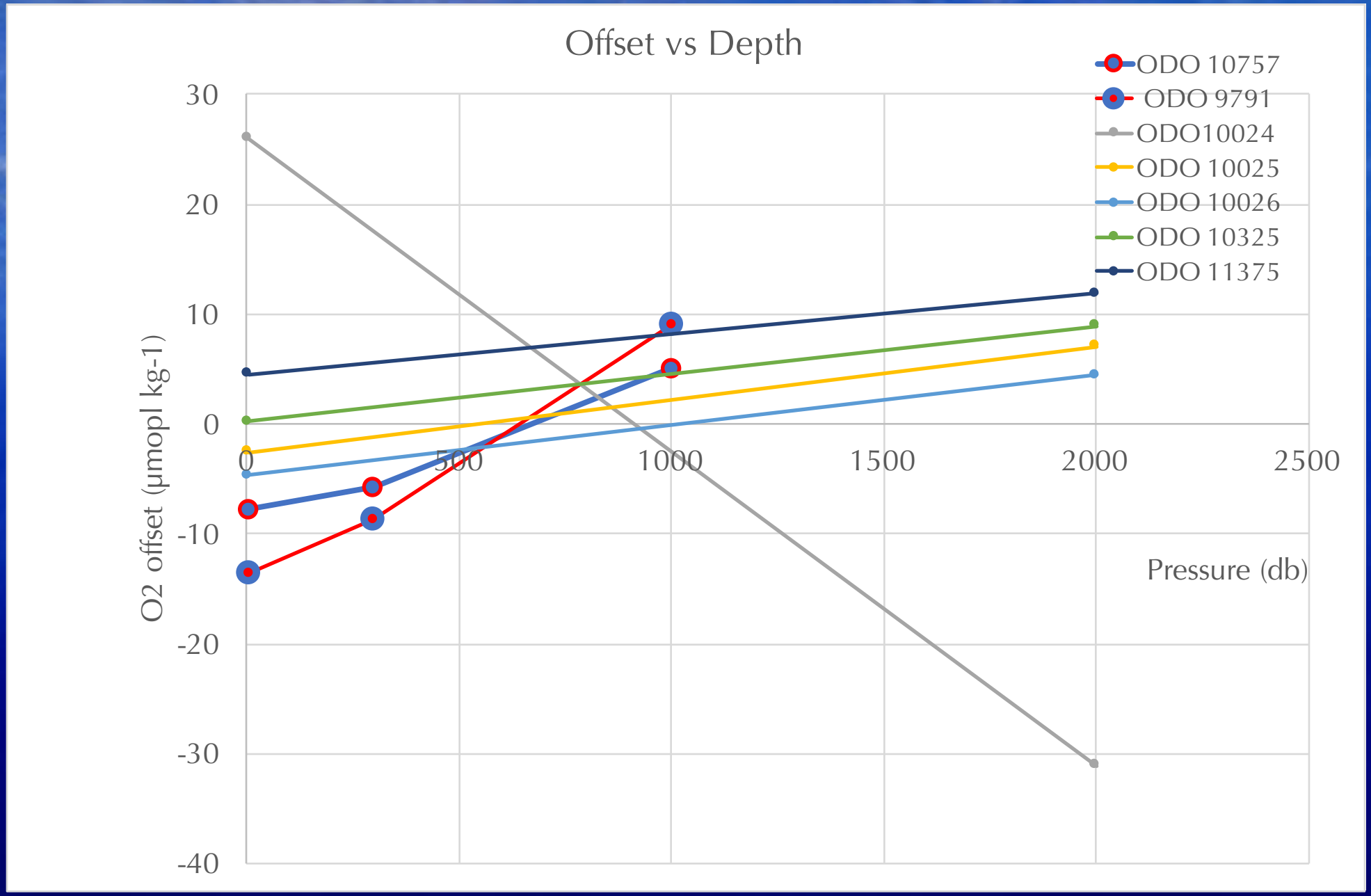
LION 2016 2017 – 1000 m

	DeltaOx	DeltaSalinity	DeltaTheta	DeltaPressure
ODO 9791	5.057	-0.003	0.147	1.125
ODO 10757	9.005	0.007	0.147	0.900


Offset vs Depth
ODO 10757
ODO 9791
O2 offset (µmopl kg-1)
Pressure (db)
15
10
5
0
-5
-10
-15
0
200
400
600
800
1000
1200

Pressure Offset

	DeltaOx10024	DeltaOx10025	DeltaOx10026	DeltaOx10325	DeltaOx11375
Pallier_2000	-31.102	7.025	4.480	8.919	11.886
Pallier_5	26.012	-2.559	-4.668	0.212	4.552


Offset vs Depth
ODO 10757
ODO 9791
ODO10024
ODO 10025
ODO 10026
ODO 10325
ODO 11375
30
20
10
0
-10
-20
-30
-40
0
500
1000
1500
2000
2500
O2 offset (µmopl kg-1)
Pressure (db)

Offset time evolution

	DeltaO210024	DeltaO210025	DeltaO210325	DeltaO210325
Predeployment	34.99	1.35	2.28	5.05
Postdeployment	**35.44**	**3.49**	**0.16**	**4.52**
Daily drift (300 days) µmol O2 kg-1 d-1	0.0015	0.0071	-0.0071	-0.0018

Apply a drift over time of deployment

Offset evolution (µmol O2 kg-1)

Sensor #	**9794**	**15637**	**15638**	**15639**
5m	8.16	11.84	12.98	12.12
	-1.45	7.96	8.20	8.68
daily drift µmol O2 kg-1 d-1 26 days	**-0.37**	**-0.15**	**-0.18**	**-0.13**
1000m	8.94	14.83	15.95	15.85
	0.97	11.77	11.89	12.60
daily drift µmol O2 kg-1 d-1 26 days	**-0.31**	**-0.12**	**-0.16**	**-0.13**

Conclusion

- If pre & post deployment
  - Apparent Sensor Drift can be assessed

- Steps @ various depth
  - Offset evolution is not understood
    - IDEAS ?