

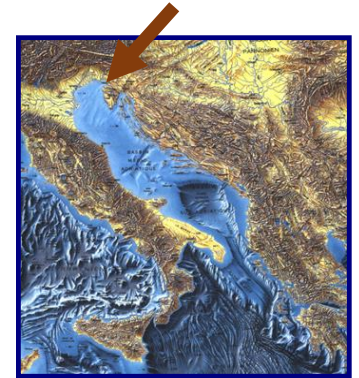
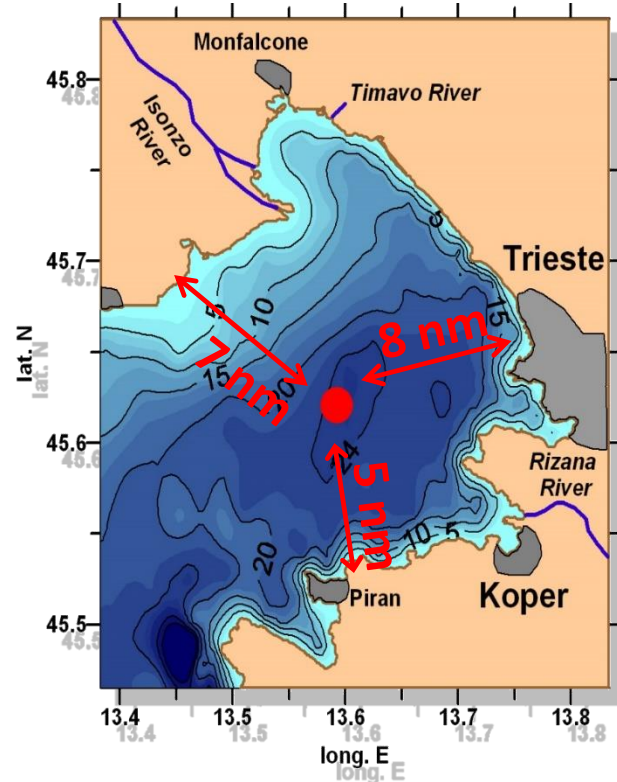
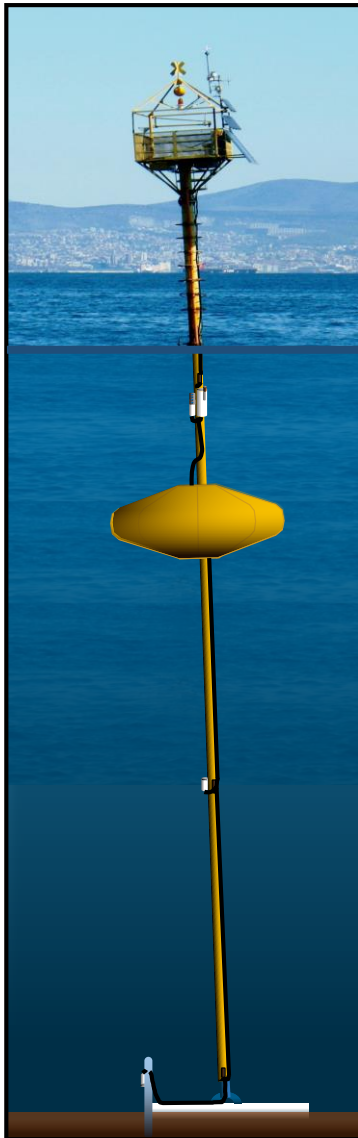
P.A.L.O.M.A.

Piattaforma Avanzata Laboratorio Oceanografico Mare Adriatico
Advanced Oceanographic Laboratory Platform for the Adriatic Sea

Position: $45^{\circ}37.097'N$ $13^{\circ}33.913'E$

Bottom depth: 25 m 8 nautic miles from coast

Elastic beacon



P.I. Anna Luchetta
O.M. Carolina Cantoni

Monthly sampling since 2008

Physical parameters - profiles

- Temperature, salinity, fluorescence, DO (profiles)

Biogeochemical parameters at 4 depths

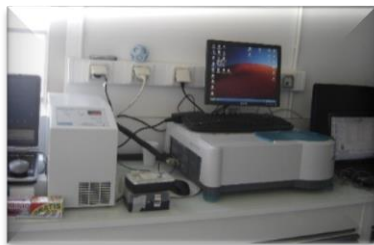
- Dissolve Oxygen (DO), Winkler method
- Nutrients: NO_3 , NH_4 , NO_2 , PO_4 , SiO_2
- Total Organic Carbon

Inorganic carbon chemistry at 4 depths

- pH_T** (on "total scale"): spectrophotometric det. ± 0.003
- Alkalinity**: potentiometric titration $\pm 3 \mu\text{mol}/\text{kg}_{\text{SW}}$
- pH_T in situ, $p\text{CO}_2$, Ω_{Ar} other parameters: calculated with "CO₂sys" program . Use of "Dickson's CRM" for carbonate chem.

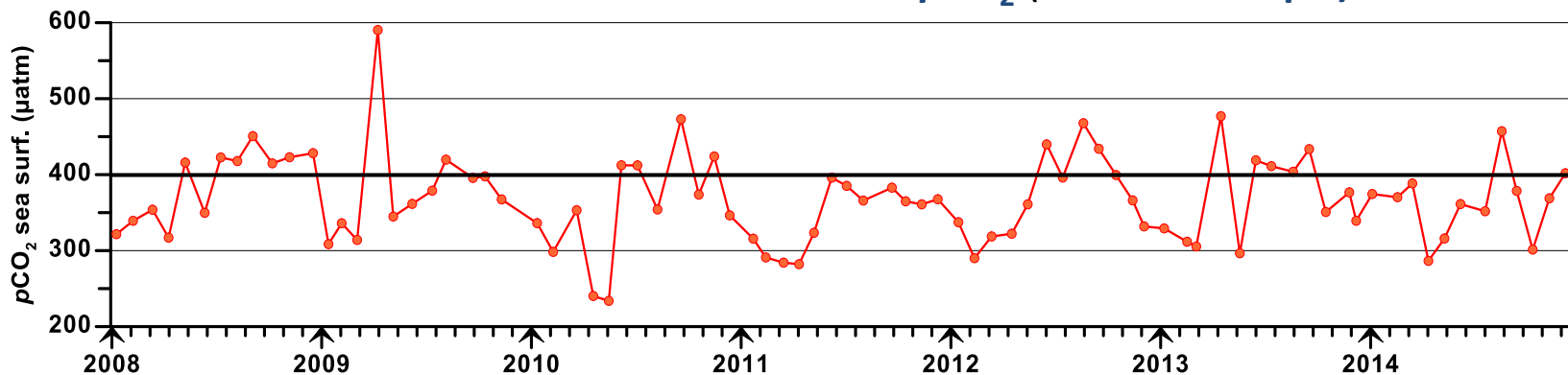
Biological parameters for selected periods

- Chlorophyll (ARPA – Regional Environ. Prot. Agency)
- Phytoplankton Abundance and composition (ISMAR – Venice)
- Zooplankton abundance and composition (OGS)



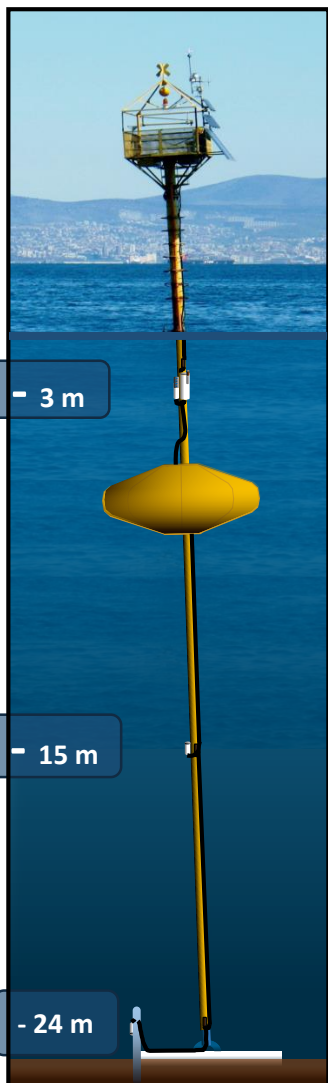
Sea surface $p\text{CO}_2$ variability 2008 - 2015

Sea surface $p\text{CO}_2$ (from TA and pH)



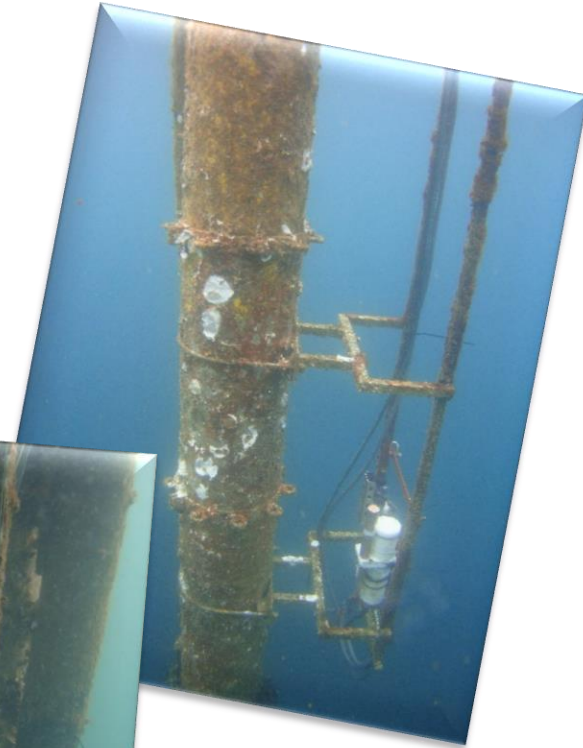
290 < $p\text{CO}_2$ (μatm) < 450

Param.	Min	Max
T ($^{\circ}\text{C}$)	5.82	27.11
S	26.41	38.42
DO ($\mu\text{mol/L}$)	205	321
DO (% sat)	91	131
pH_T (25°C)	7.857	8.198
TA ($\mu\text{mol/kg}$)	2458	2859
$p\text{CO}_2$ (μatm)	234	590



	Instrumentation & parameters	Data acquisition	Height/ Depth Resp. Avg SL	N. R.T
ATMOSPHERE	Siap-Micros meteorological station*: air temperature, relative humidity, air pressure, solar radiation, precipitation, wind velocity and direction	continuous	+ 8 m	Y
	LI840-Licor: Atmospheric CO₂ concentration	2h	+ 6 m	Y
WATER COLUMN	SBE37-SMP-ODO, MicroCAT - Seabird: SW temperature ($\pm 0,002$ °C), Conductivity /salinity Pressure /depth Dissolved oxygen (optode)	15 min	- 3 m	Y
	Hydro CO₂ II - Contros: Seawater CO ₂ concentration ($p\text{CO}_2$)	6h	-3 m	N
	SBE 39 - Seabird	15 min	-15 m	Y
	SBE 39 - Seabird	15 min	-24,5 m	Y

Installation



Licor LI-840 air XCO₂



Contros Hydro CO₂ II
Seawater pCO₂

SBE37-ODO
T, S, DO, pressure

Biofouling inside the Hydro CO2 II

Heavy fouling problems on the sensor membrane in 2012

- Data reliability
- Fast membrane degradation



We suggested Contros to put copper



Better...



Much better !!

Data acquisition

4 measurements/day: 00 – 6 - 12 – 18 h

Cycle: 15 min warmup, 2 min zeroing,
10 min flush, 20 min measure

Monthly data download



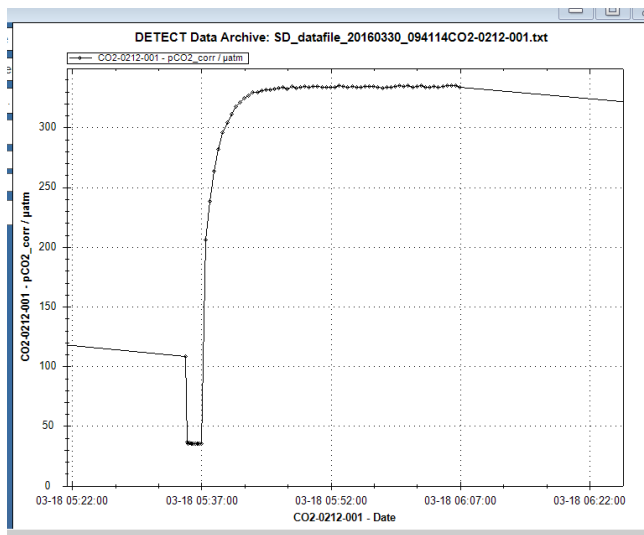
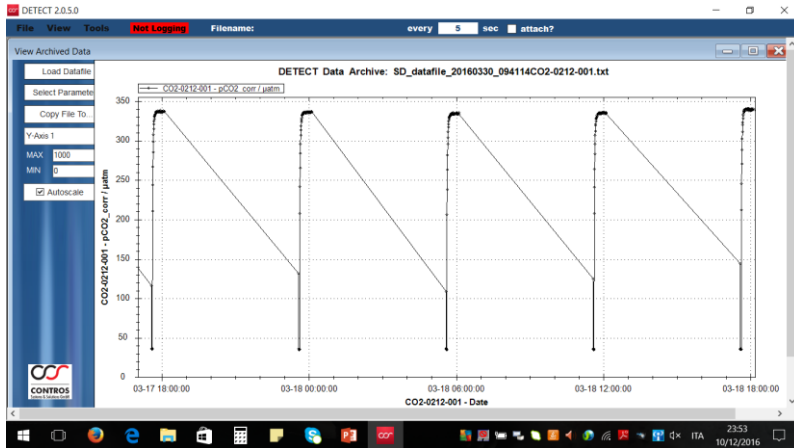
Checking the proper functioning of the
sensor



Data delivered
to ICOS

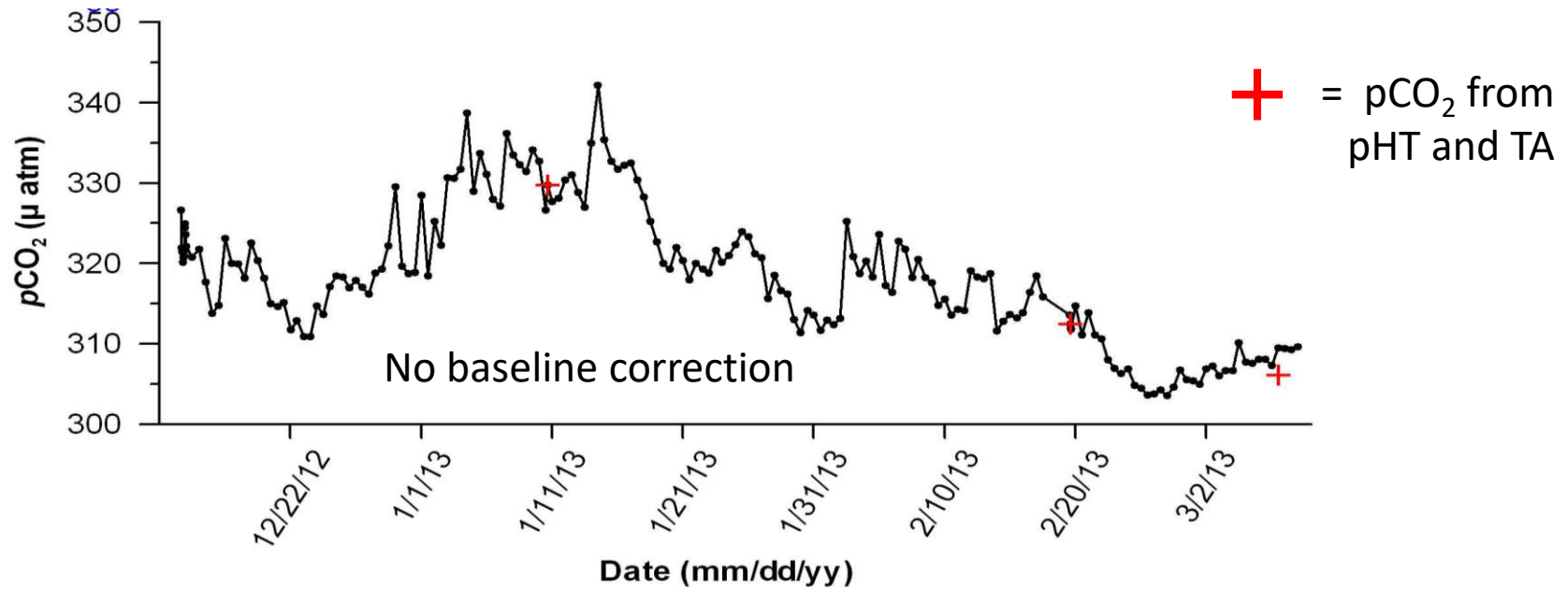


Manual correction for
baseline drift for every
measurement, according to
data processing procedure
provided by Kongsberg



Comparison with discrete samples

December 2012 – March 2013 $p\text{CO}_2$ (μatm)

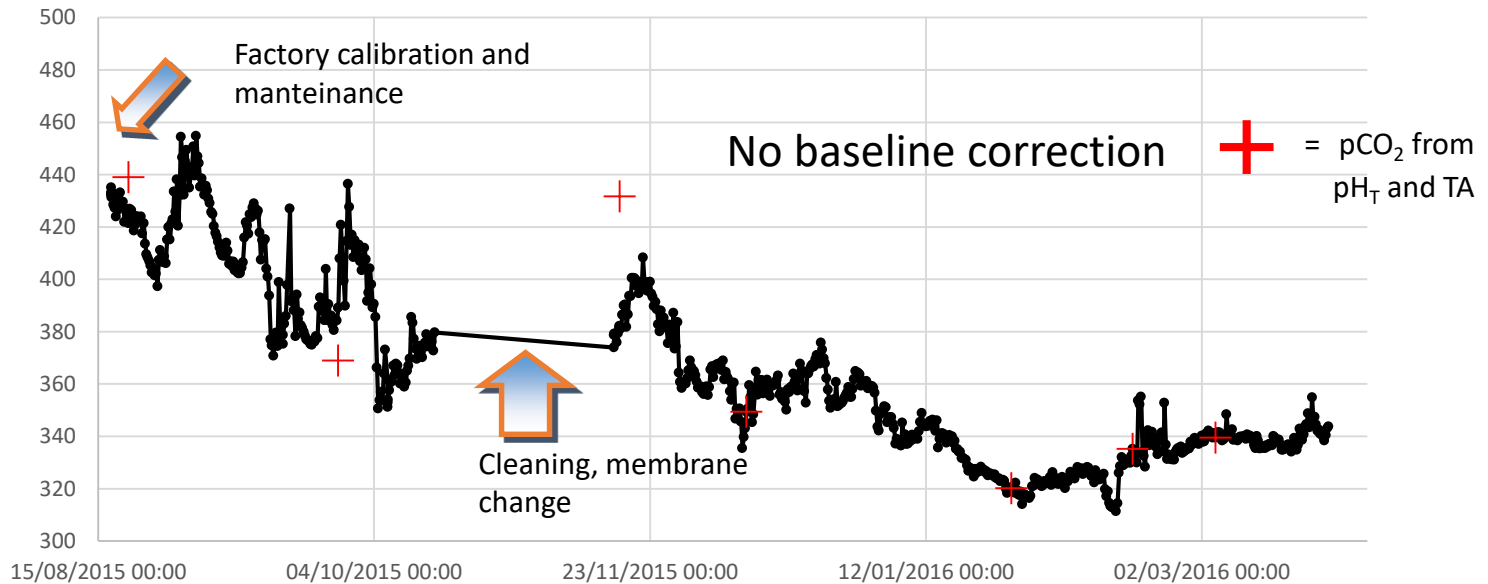


Date	Sample	Sensor	Sampl. - Sensor
01/2013	329.2	329.8	-0.5
02/2013	311.7	312.5	-0.8
03/2013	305.4	309.4	-4.1

- Water sampling at ≈ 3 m, near the sensors
- New sensor, first successful deployment
- Factory calibration

Comparison with discrete samples

August 2015 – March 2016 $p\text{CO}_2$ (μatm)



Date	Sample	Sensor	Sampl. - Sensor
08/2015	439.1	421.4	17.7
09/2015	368.9	389.1	-20.2
11/2015	431.7	381.9	49.8
12/2015	357.4	349.4	8.0
01/2016	318.3	320.1	-1.8
02/2016	349.4	335.3	14.1
03/2016	339.5	339.5	0.0

400.2 31,5
359,3 1,9

With baseline correction

Intercomparison is critical
under stratified conditions, as
11/2015 (river plume)