Determination of nutrients in seawater via NuLab Nutrient Analyser

April – June 2018

Helmholtz-Zentrum Geesthacht
Institute for Coastal Research

The Green Eyes NuLAB

Measurements Principles

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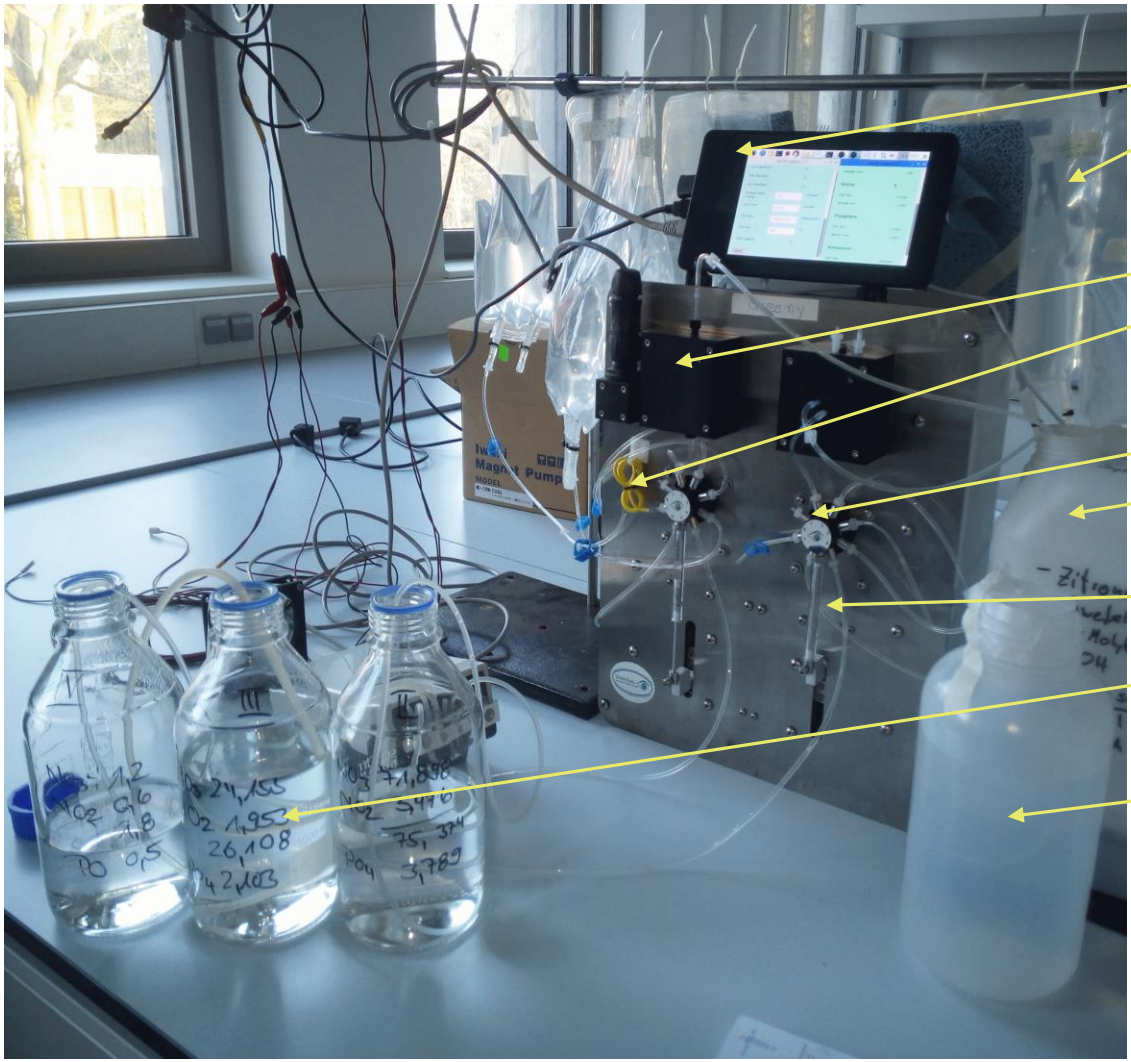
Centre for Materials and Coastal Research



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Conducted Test

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Conducted Test – Laboratory Tests

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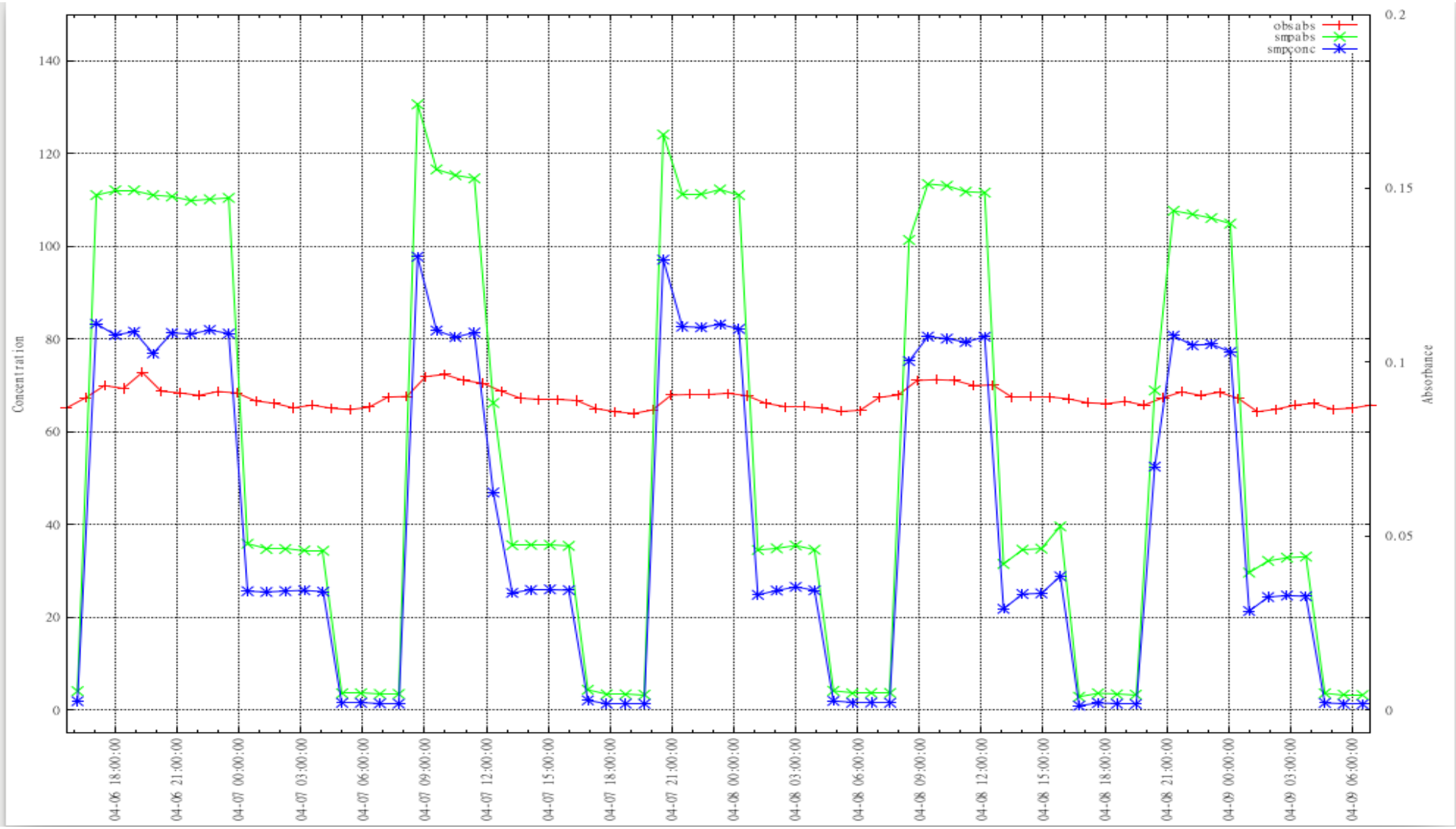

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Results of Lab-Tests

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	I	III	IV
Target value	100.24	26.11	1.80
Measured Mean	92.81	24.80	1.74
Deviation [µmol/l]	2.36	0.97	0.35
Deviation Error [%]	2.55	3.92	20.25
Error of Target [µmol/l]	7.43	1.31	0.06
Error of Target [%]	7.41	5.02	3.53

NOx Errors

	I	III	IV
Target value	5.21	2.[illegible]	0.6[illegible]
Measured Mean	4.80	1.60	0.[illegible]4
Deviation	0.24	[illegible]	[illegible]
Deviation Error [%]	4.94	7.[illegible]9	5.[illegible]0
Error of Target [µmol/l]	0.41	[illegible]58	0[illegible]31
Error of Target [%]	7.94	[illegible].62	[illegible].32

NO2 Errors

	I	III	IV
Target value	5.04	2.10	0.5[illegible]
Measured Mean	5.09	1.84	3.[illegible]6
Deviation [µmol/l]	0.03	0.073	1.[illegible]
Deviation Error [%]	5.94	3.98	49.[illegible]2
Error of Target [µmol/l]	0.05	0.27	3.[illegible]6
Error of Target [%]	0.92	12.71	6[illegible].02

PO4 Errors

Parameter	Low Limit [µmol/l]	High Limit [µmol/l]
NO_X	0.8	200
NO_2	0.6	150
PO_4	0.2	25

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Conducted Test – Field Station Cuxhaven

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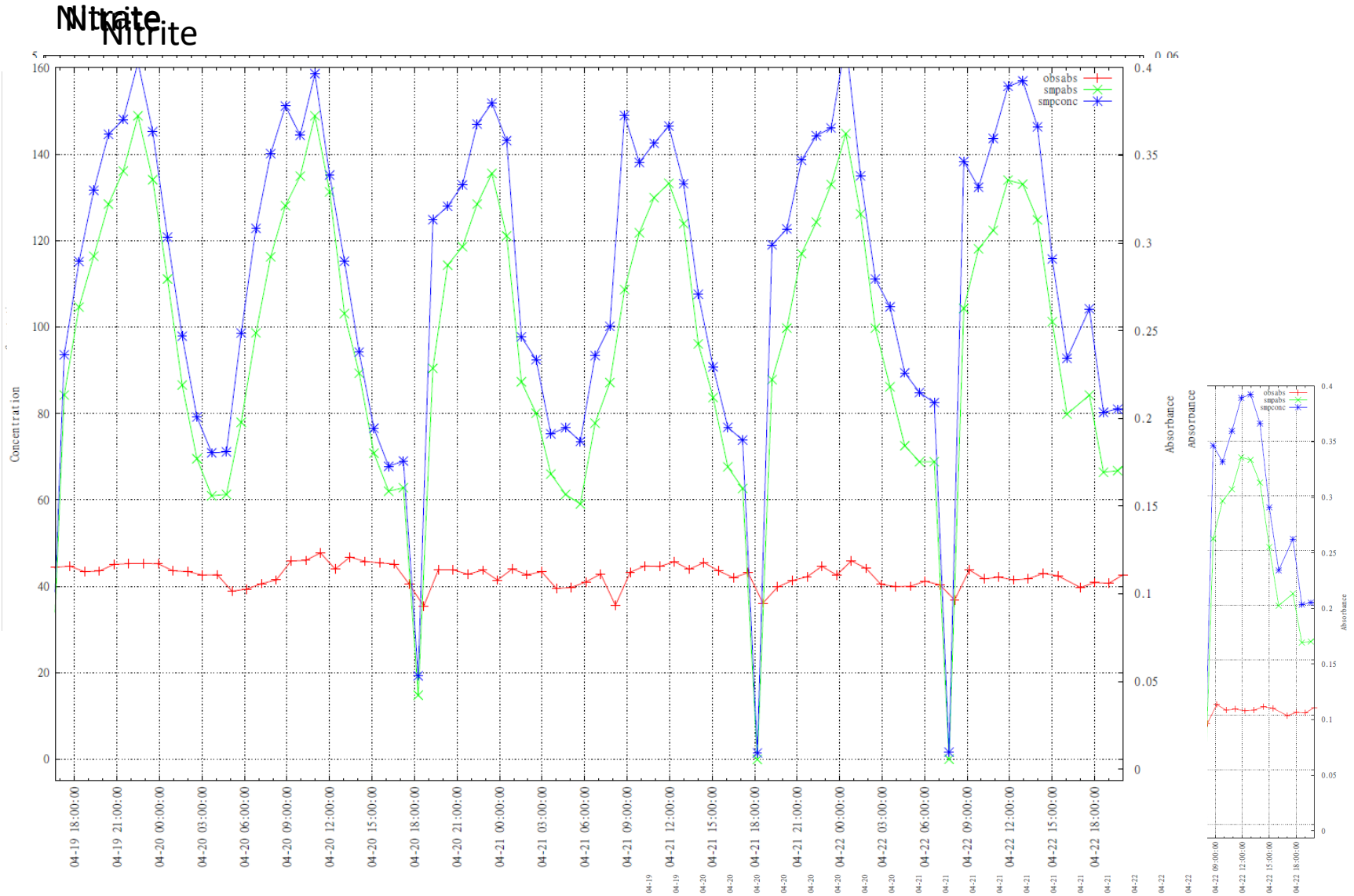

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Conducted Test – back in laboratory

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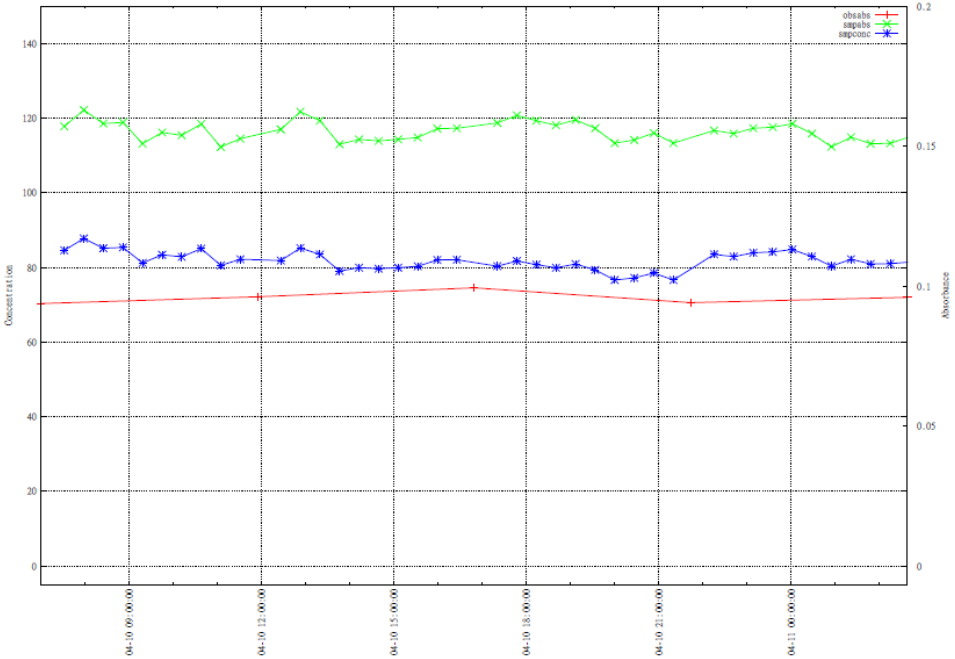
Stability Test:



NO_X stability

1 calibration, 10 measurements

	NO_2	NO_X	PO_4
Target value	3.48	75.38	3.79
Mean	3.46	81.77	3.37
Deviation	0.09	2.45	0.19
% Error	2.67	3.00	5.53
Error of Target	0.02	-6.39	0.42
Error of Target %	0.71	-8.48	11.03

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Conducted Test – back in laboratory

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Overview 1 calibration, 1 measurement

	I	III	IV
Target value	100.24	26.11	1.80
Measured Mean	92.81	24.80	1.74
Deviation [µmol/l]	2.36	0.97	0.35
Deviation Error [%]	2.55	3.92	20.25
Error of Target [µmol/l]	7.43	1.31	0.06
Error of Target [%]	7.41	5.02	3.53

NOx Errors

	I	III	IV
Target value	5.21	2.18	0.65
Measured Mean	4.80	1.60	0.34
Deviation	0.24	0.12	0.02
Deviation Error [%]	4.94	7.59	5.30
Error of Target [µmol/l]	0.41	0.58	0.31
Error of Target [%]	7.94	26.62	47.32

NO2 Errors

	I	III	IV
Target value	5.04	2.10	0.50
Measured Mean	5.09	1.84	3.56
Deviation [µmol/l]	0.03	0.073	1.76
Deviation Error [%]	5.94	3.98	49.52
Error of Target [µmol/l]	0.05	0.27	3.06
Error of Target [%]	0.92	12.71	612.02

PO4 Errors

Overview 1 calibration, 10 measurements

	NO_2	NO_X	PO_4
Target value	3.48	75.38	3.79
Mean	3.46	81.77	3.37
Deviation	0.09	2.45	0.19
% Error	2.67	3.00	5.53
Error of Target	0.02	-6.39	0.42
Error of Target %	0.71	-8.48	11.03

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Conclusion

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- ✓ Good Precision
- ✓ Stable and reproducible
- ✓ Measurements
- ✓ Compact size (7 kg)
- ✓ Low Weight
- ✓ Separated Channels
- ✓ Macros can be adapted to needs and preferences
- ✓ Low Power Consumption
- ✓ Deployment and calibration remotely possible

- × Carry-Over-Effect between sample and OBS
- × No temperature normalisation on the NOx Channel
- × A separated enclosure is necessary
- × No washing cycle
- × NOx reduction via Cadmium pipe
- × Measurements could be faster
- × Measuring the OBS without calibrating is missing as an option

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Thank you for your attention!