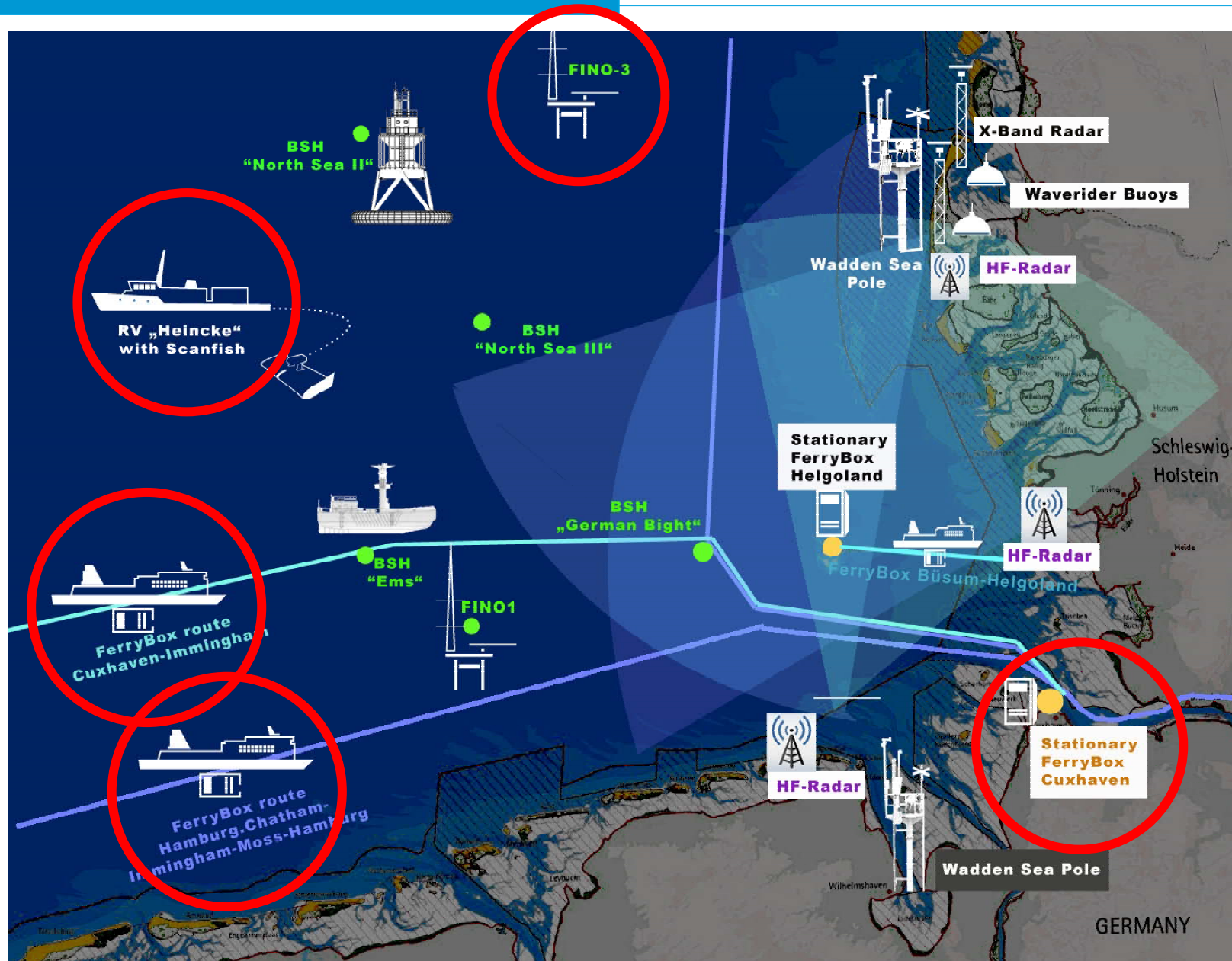


Operation of chemical nutrient analyzers

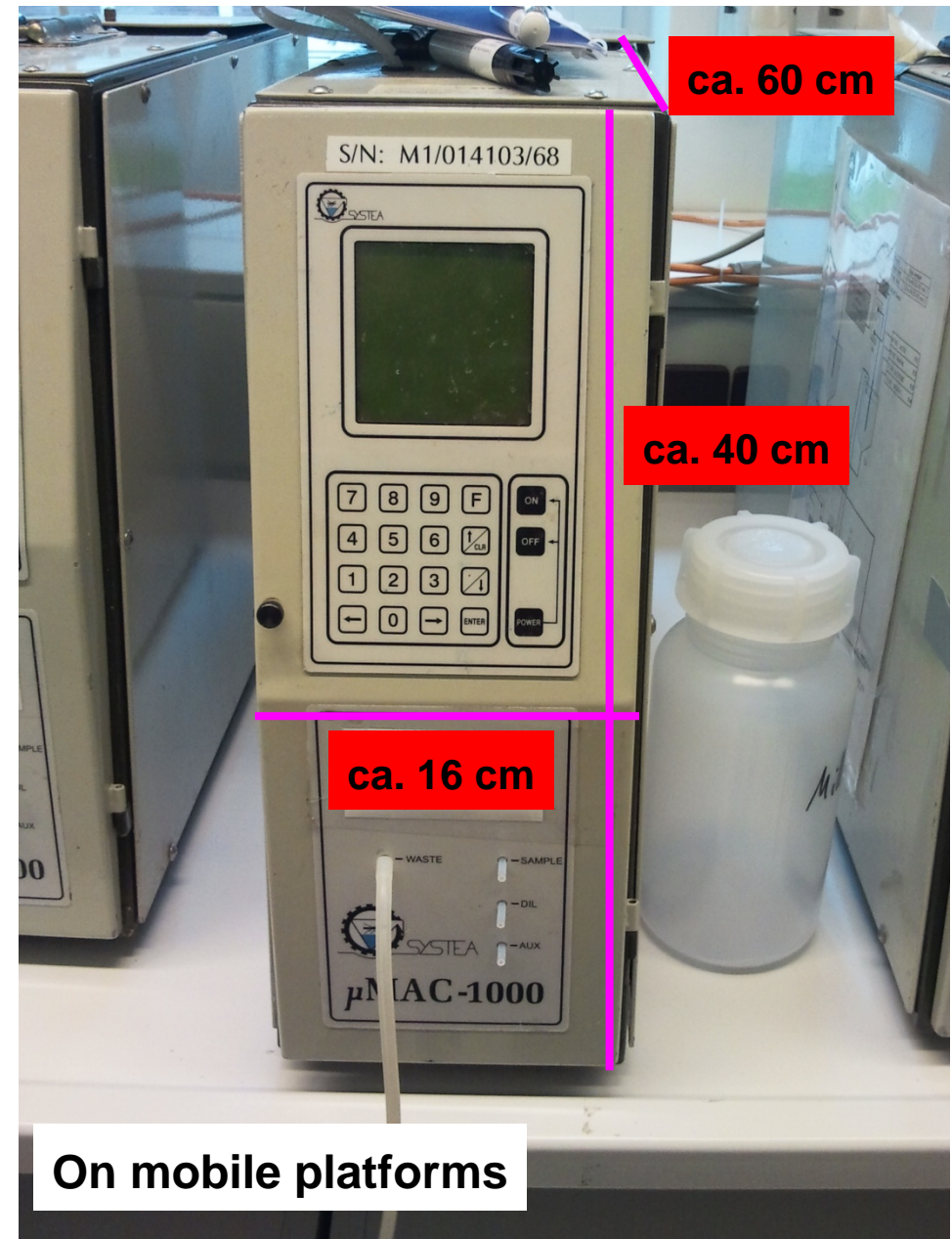
Maik Grunwald, Wilhelm Petersen

October 10, 2012 / Brest (France)

Nutrient measurements at HZG



Two different types of analyzers (Systea™)



Advantages vs. disadvantages



Advantages vs. disadvantages



Cuxhaven Station

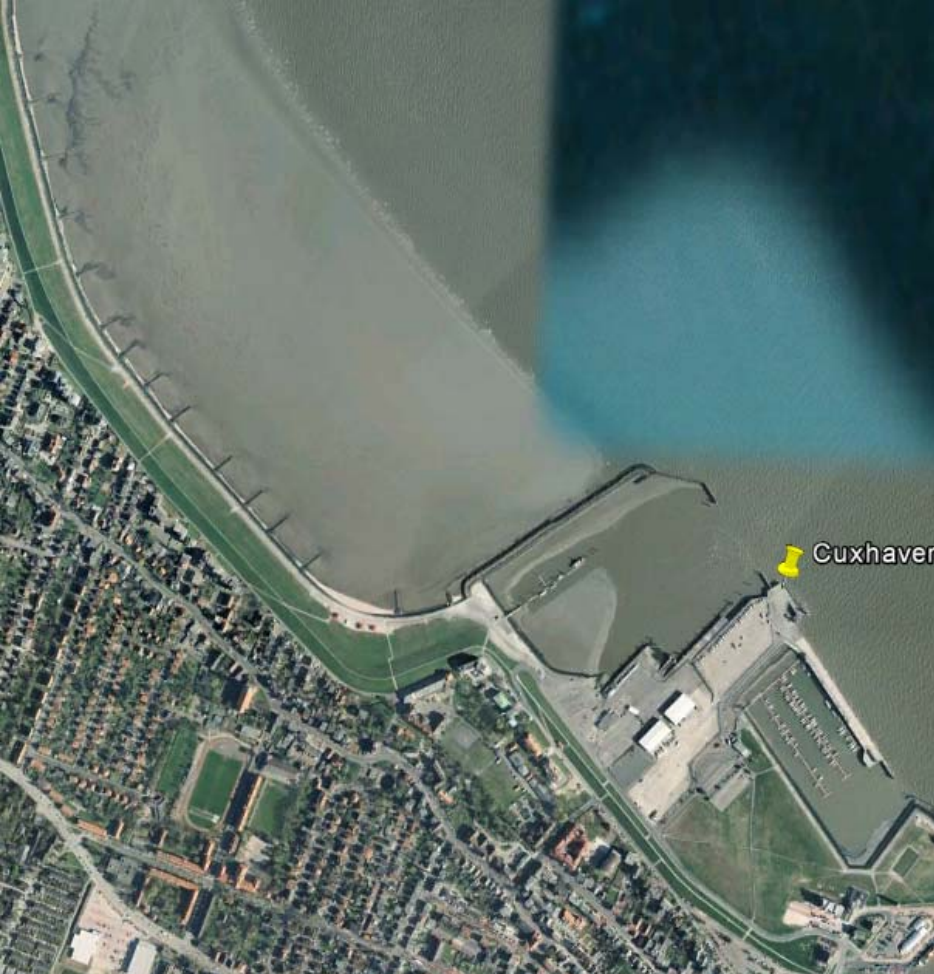
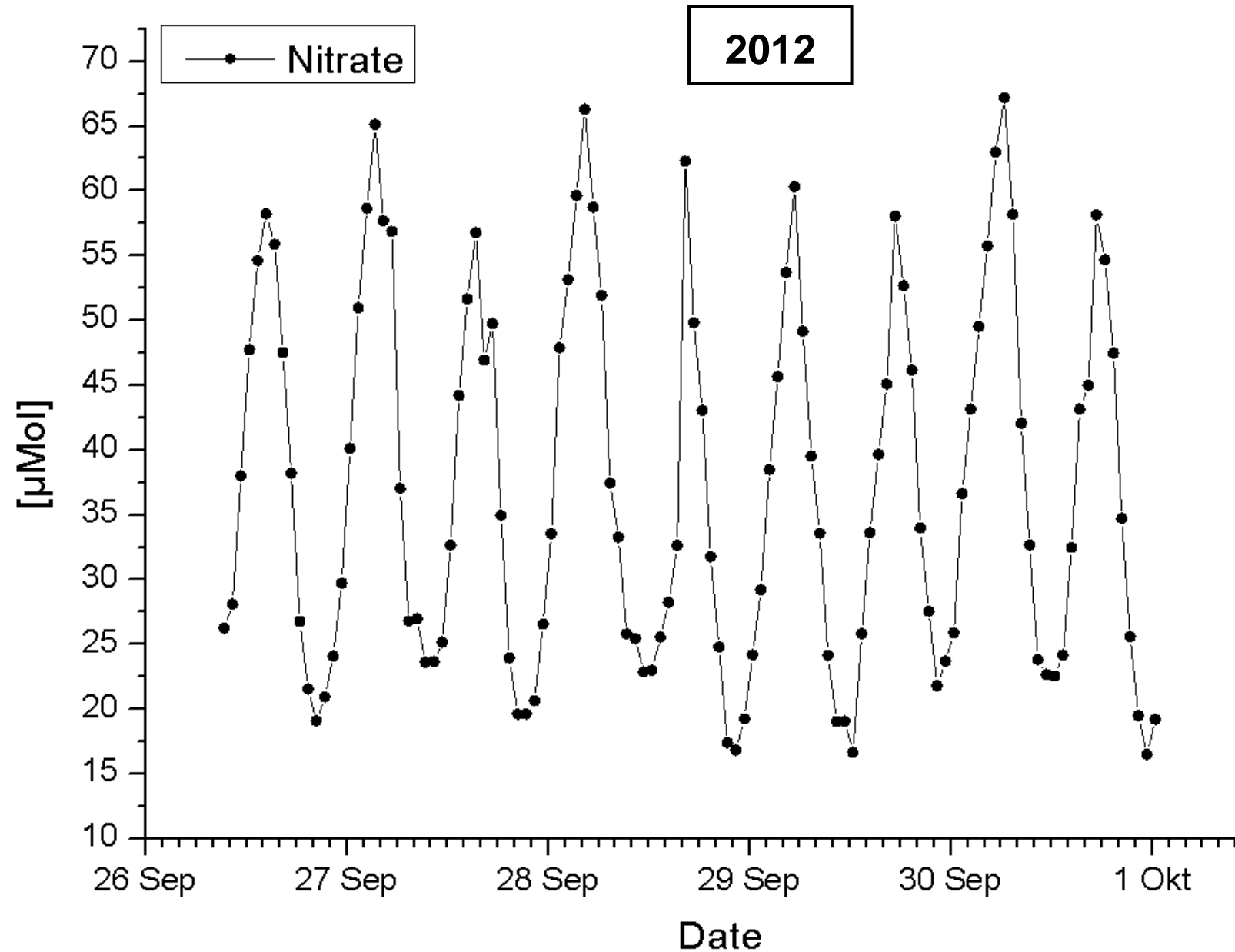
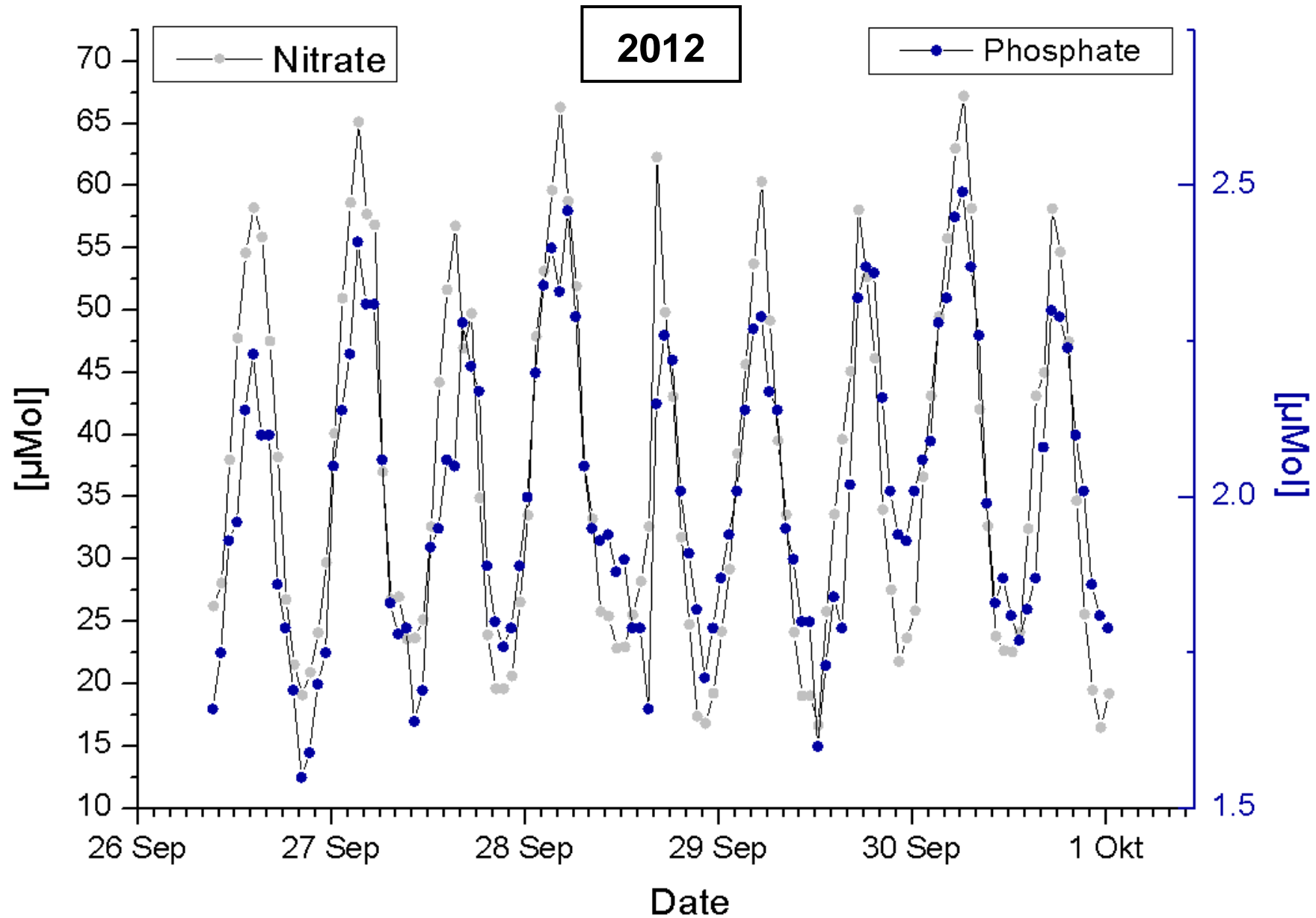


Image © 2012 TerraMetrics

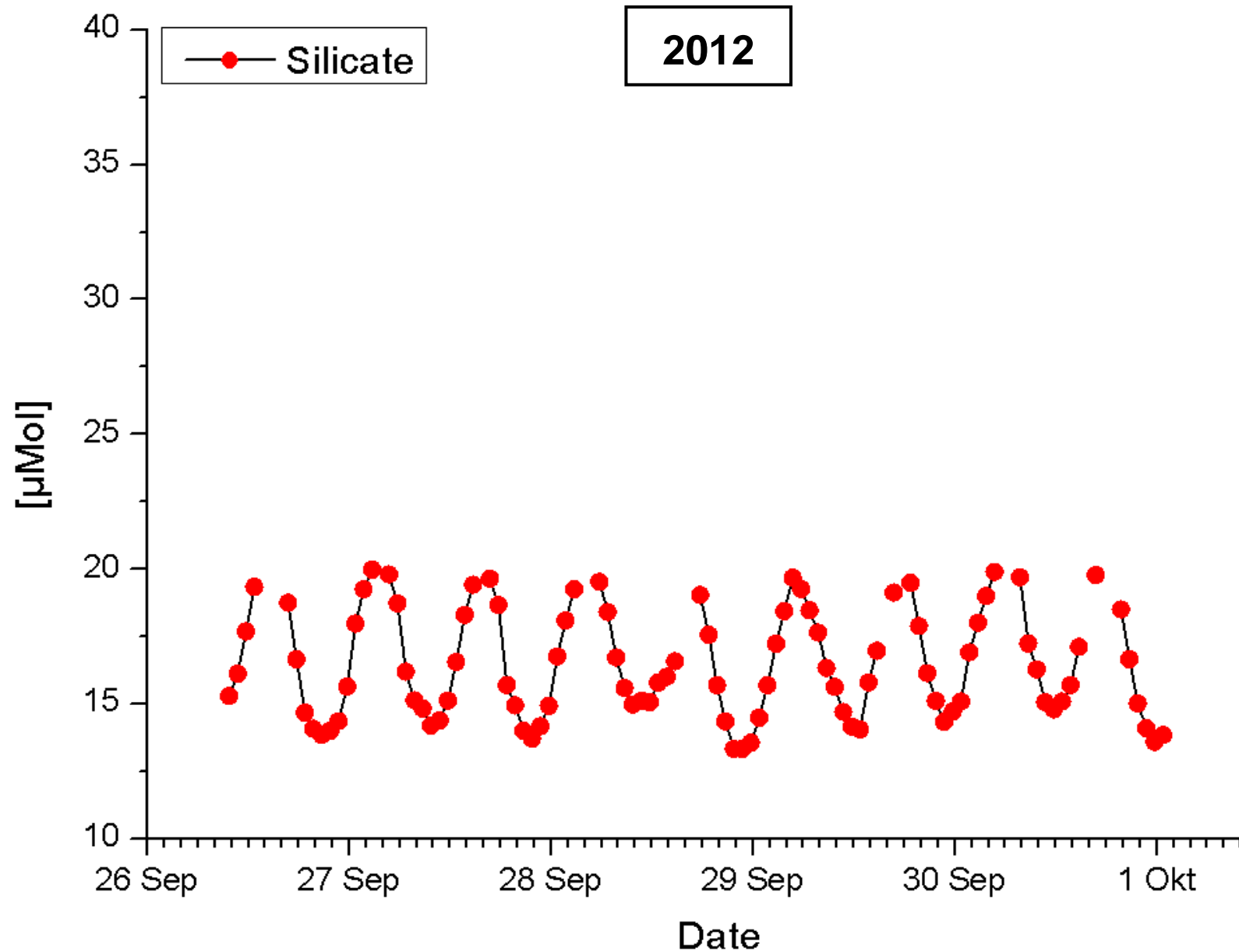
Recent data from Cuxhaven Station



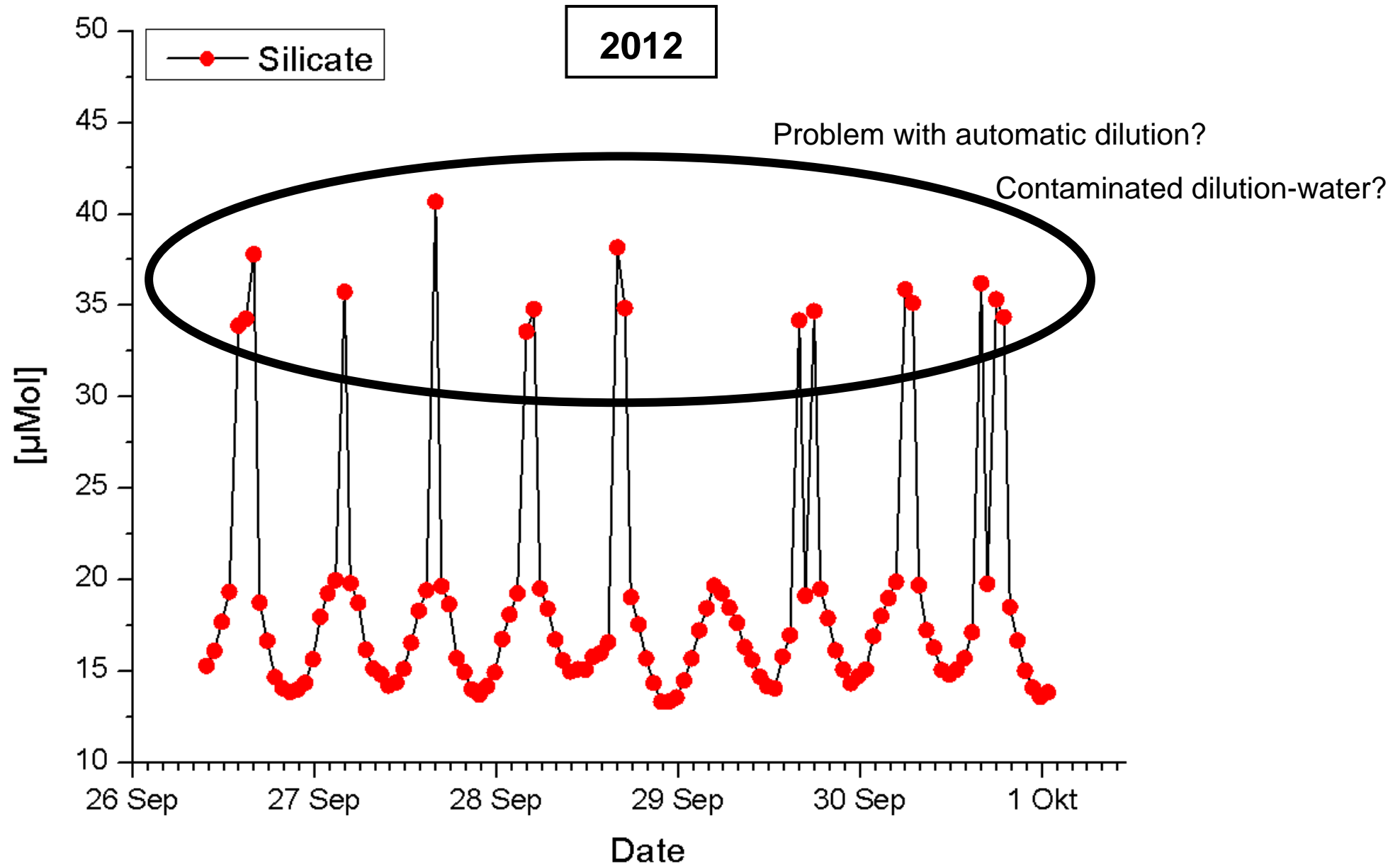
Recent data from Cuxhaven Station



Recent data from Cuxhaven Station



Recent data from Cuxhaven Station



Stability of measurements

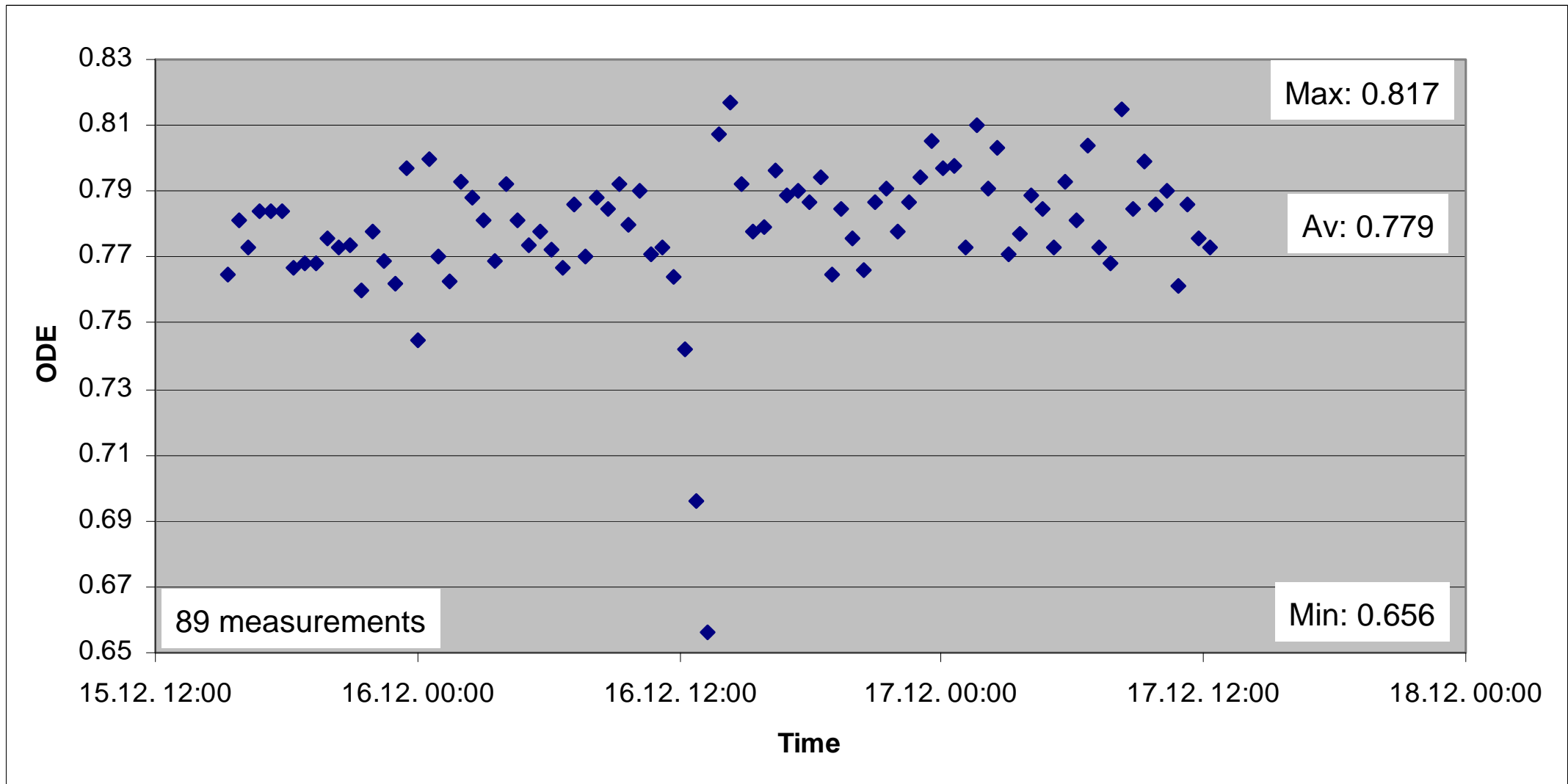
Stability of measurements – Lab (μ Mac)

Spiked seawater sample, ~21 μ Mol NO_3

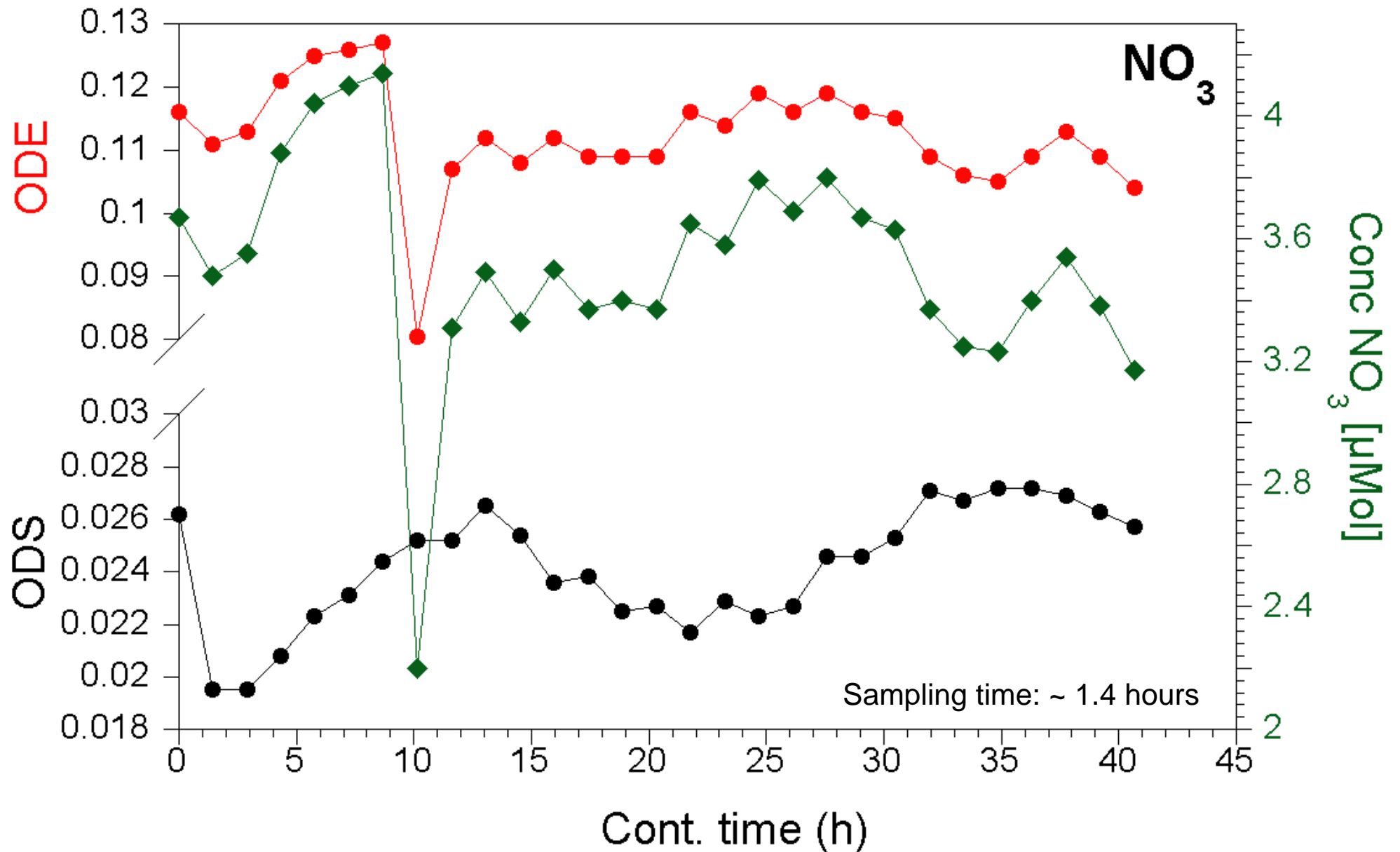
Frequency of measurements: every 30 mins

Skalar™ Cd reductor

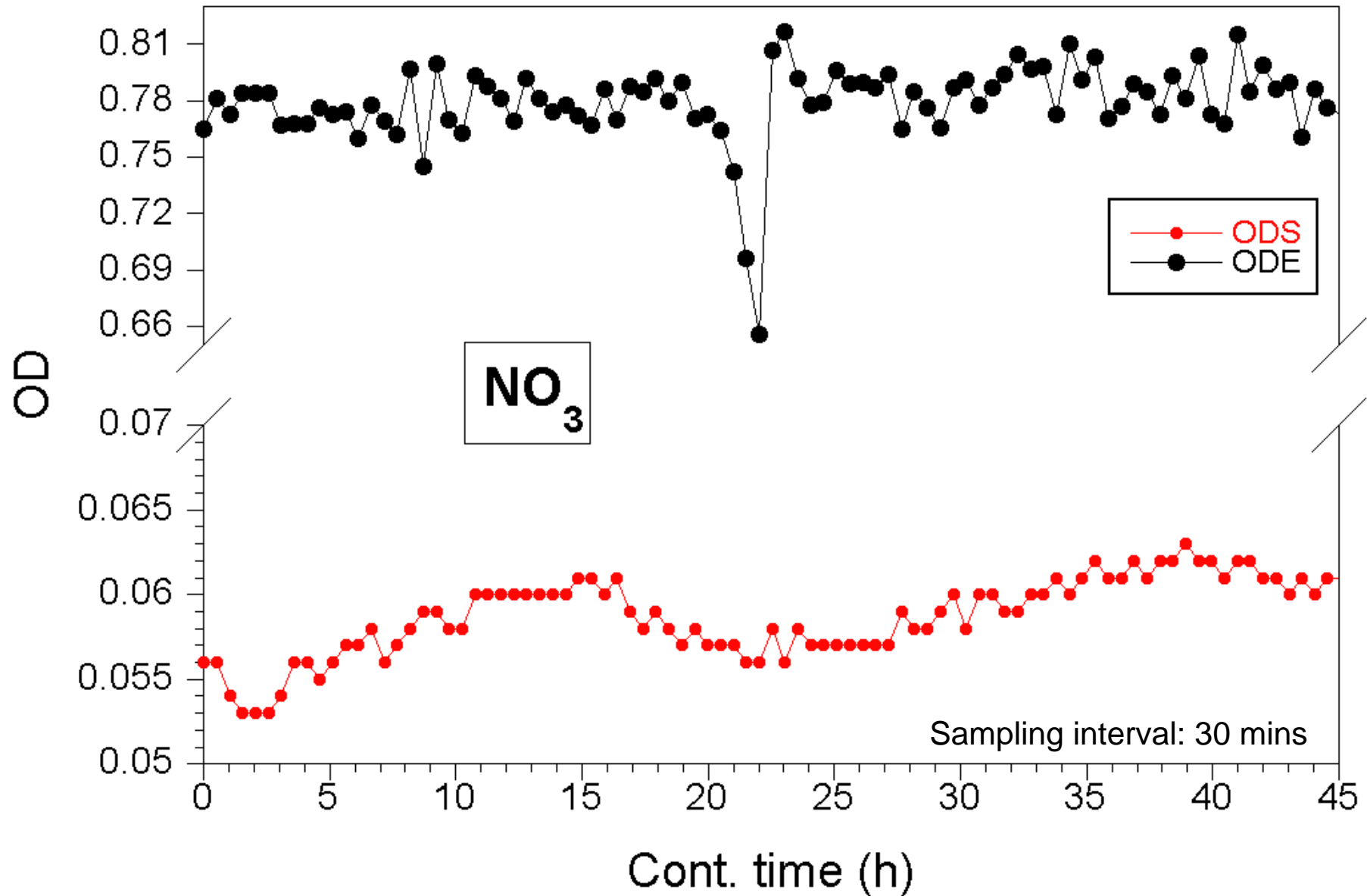
NH_4Cl buffer



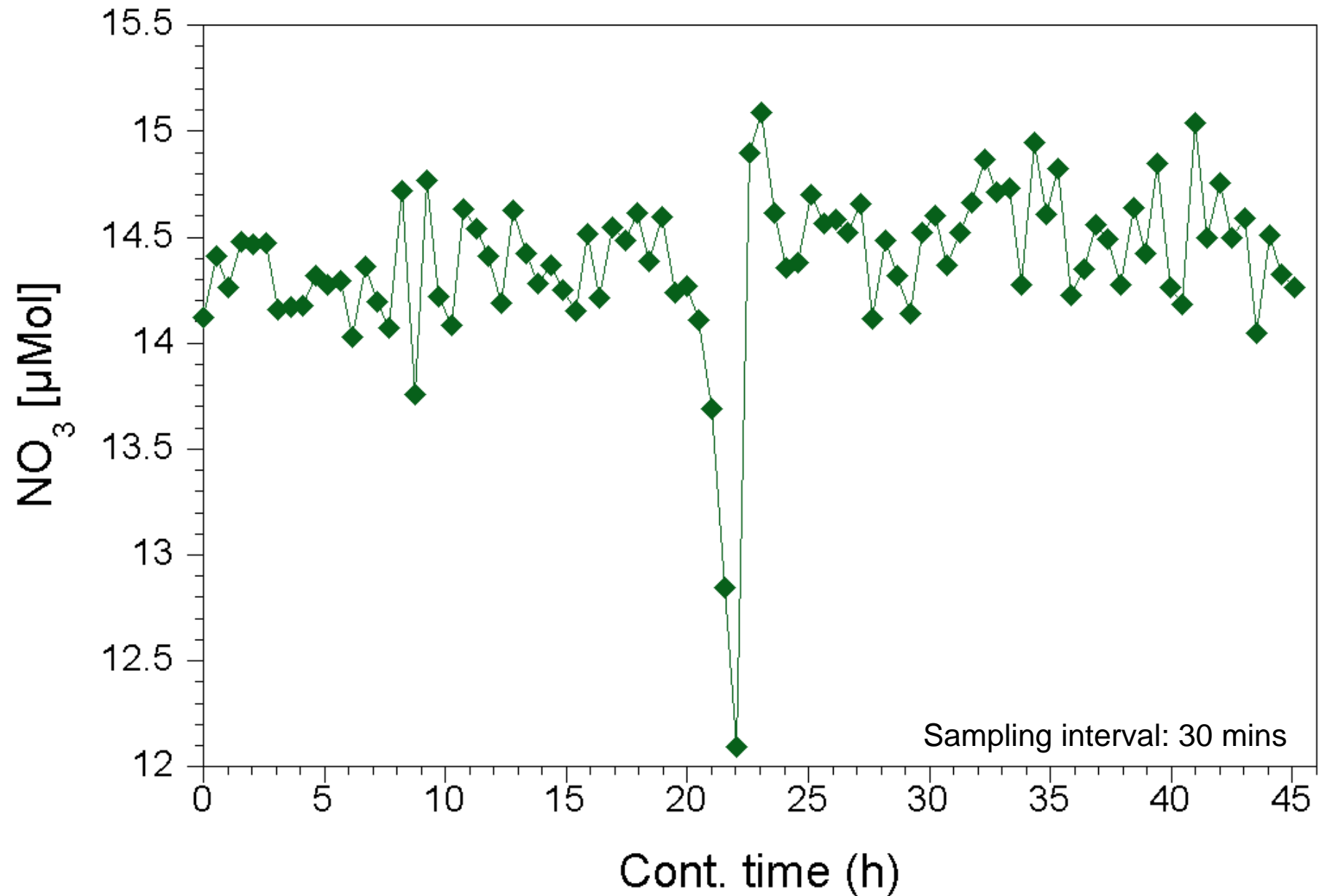
Stability of measurements – Lab (WIZ)



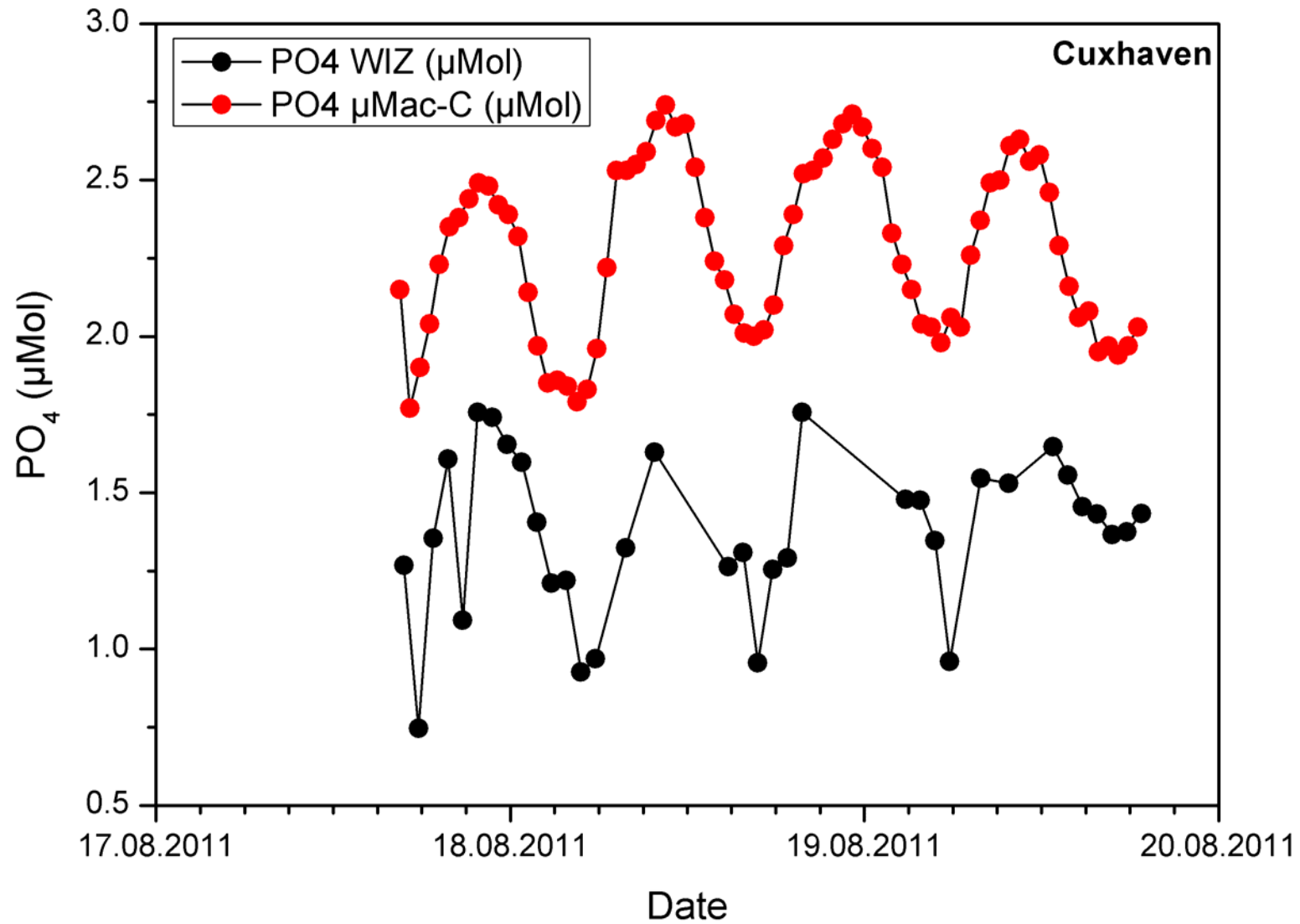
Stability of measurements – Lab (μ Mac1000)



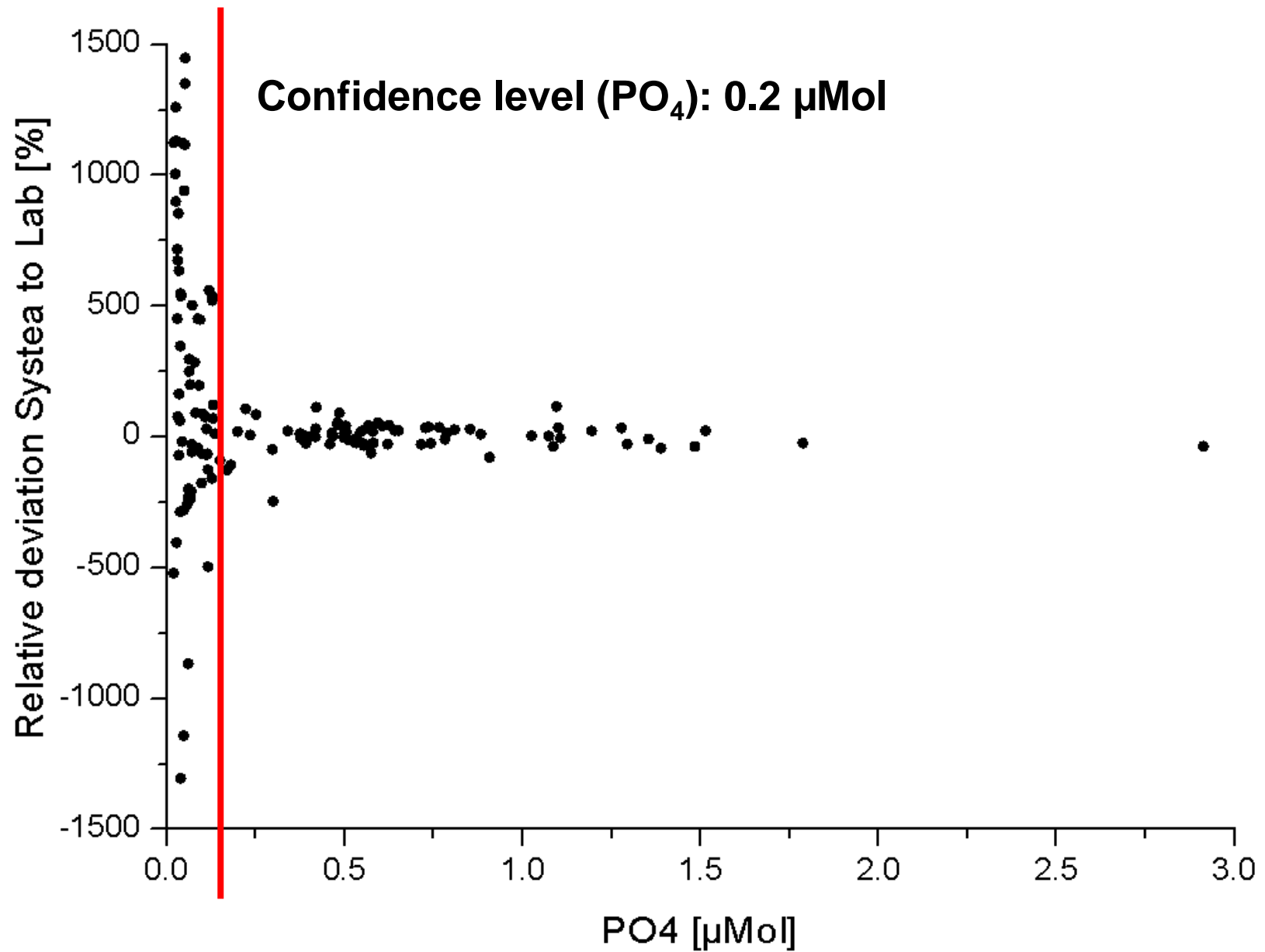
Stability of measurements – Lab (μ Mac1000)



Cuxhaven Station: Comparison μ Mac vs. WIZ



Results of lab check -- $\mu\text{Mac1000}$



Issues (...and how to overcome?)

µMac

- Disconnection of tubes inside the instrument
 - Problem occurred if analyze cycles were not finished completely (abort by user, power breakdown)
 - In this case, valves are not resetted completely → internal pressure build-up
 - Solution: Commands are inserted to reset valves before starting analyze cycle
- Instability of measurements, even within a shortish time span



WIZ

- No visual indicator for on/off, standby, or measurement outside the instrument
- Clogging of reagent tubes (crystallisation) → too less dimensioned tube diameter?
- Sometimes, if operated autonomously over night in Lab, the software freezes
- The entire system is very small dimensioned: Good for in situ operation, derogatory to autonomously long-term operation and maintenance aboard



Conclusions

- Automated systems are an essential tool for environmental process studies
- Operation of chemical nutrient analysers requires well trained and experienced operators (not a plug & play instrument)
- Re-calibration in the field are time consuming and result in higher errors
 - Re-calibration from bottle samples (lab analysis) are recommended
 - More bottle samples during analyzers running well
 - and/or*
 - Device-specific lab calibration based on OD values? → delayed calculation of concentration
- Commercially available instruments do not feature long-term stability for unattended operation
- There is still a demand on more robust and reliable instruments with high sensitivity

Thanks for your attention!