JERICO Workshop FCT @SeaTech Week

Oxygen – Measurements and validation/calibration

Maik Grunwald, Michael Haller

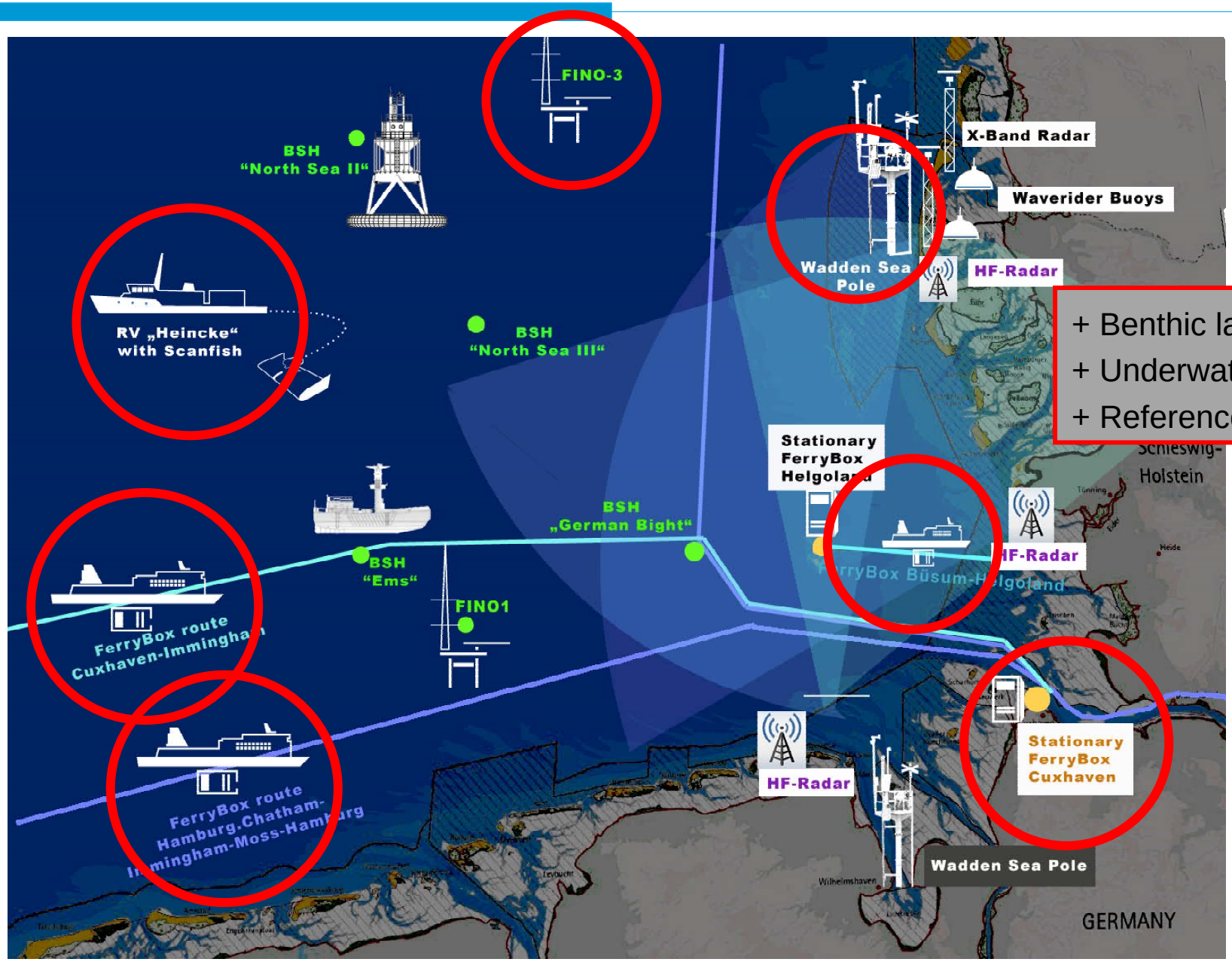
October 10, 2012 / Brest (France)

maik.grunwald@hzg.de

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

Platforms

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research



+ Benthic lander systems
+ Underwater nodes
+ Reference probe (CTD)

Sensor types in use

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

Sensor	Principle	Used at
AMT Sensor	Amperometric	ScanFish™
JFE Rinko Optode	Optical	Benthic Landers, Reference probe, ScanFish™ (future)
AANDERAA Optode	Optical	FerryBox, Wadden Sea Poles, Benthic Landers

AMT

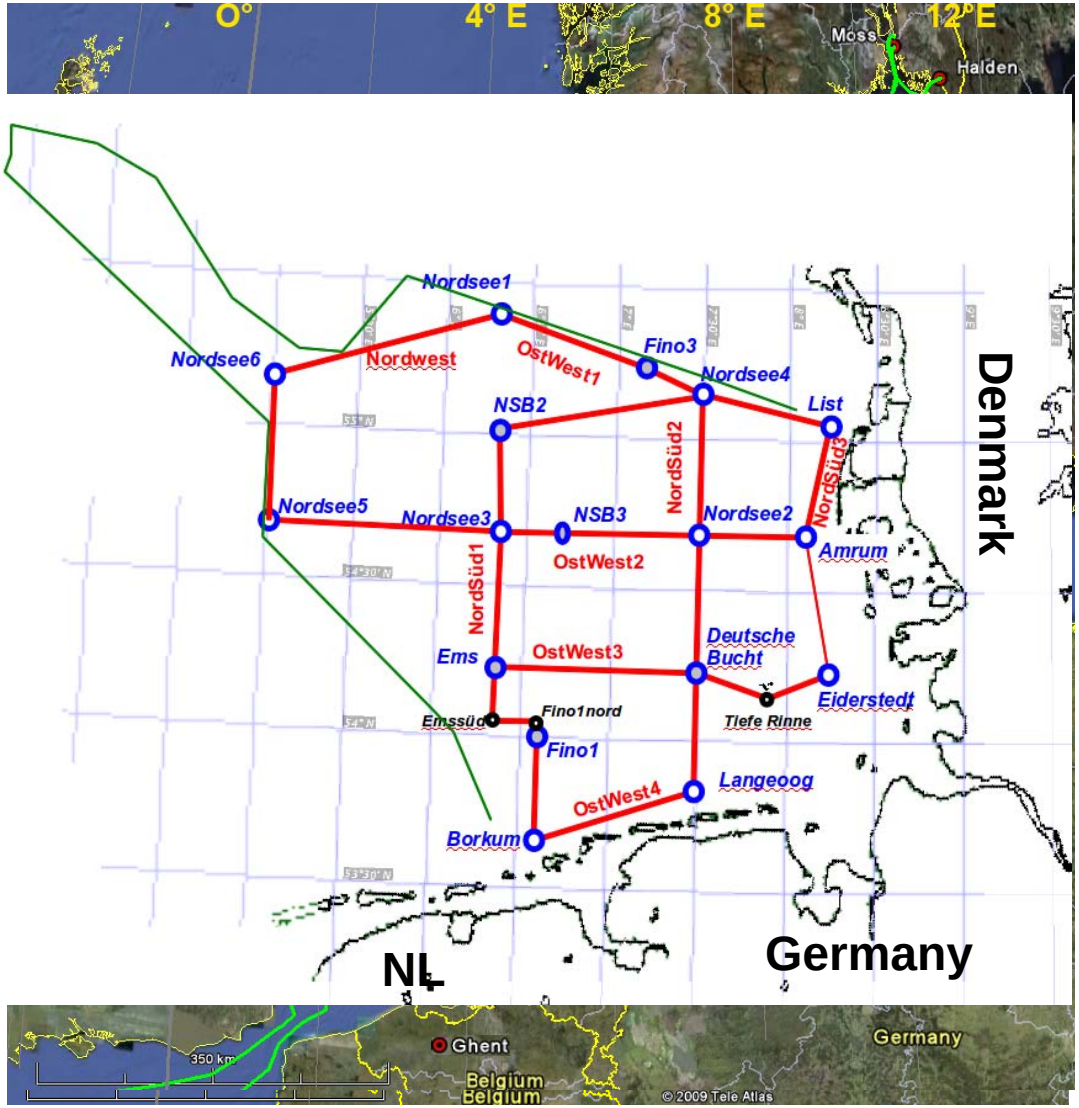
JFE Rinko

AANDERAA Optode

Platforms (selection)

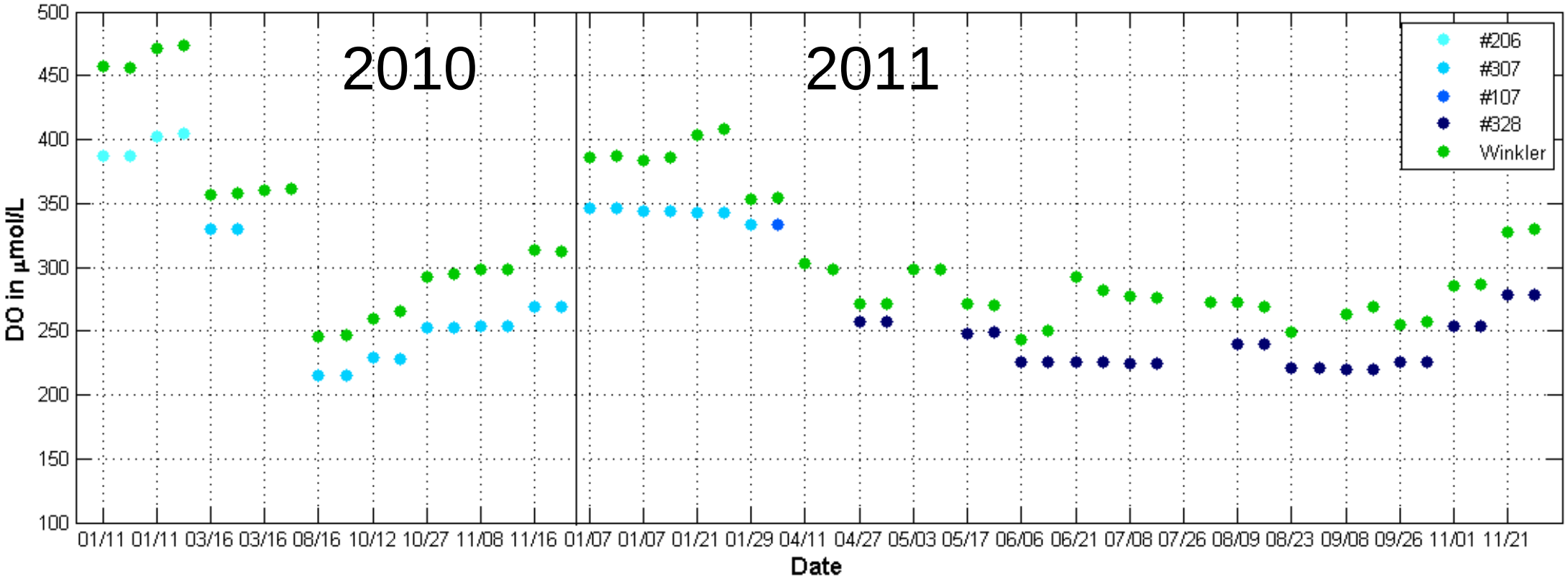
Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

- **TorDania**
  - Route between Germany and England
  - Ferrybox maintenance in Cuxhaven
- **LysBris**
  - Route between Germany (now Belgium), England, Spain, Norway
  - Ferrybox maintenance in Hamburg (now Zeebrugge and/or Ghent, Belgium)
- **R/V Heincke**
  - Research cruises in the German Bight
  - All maintenance aboard
  - Winkler measurements aboard



In situ vs. lab comparison (Tor Dania)

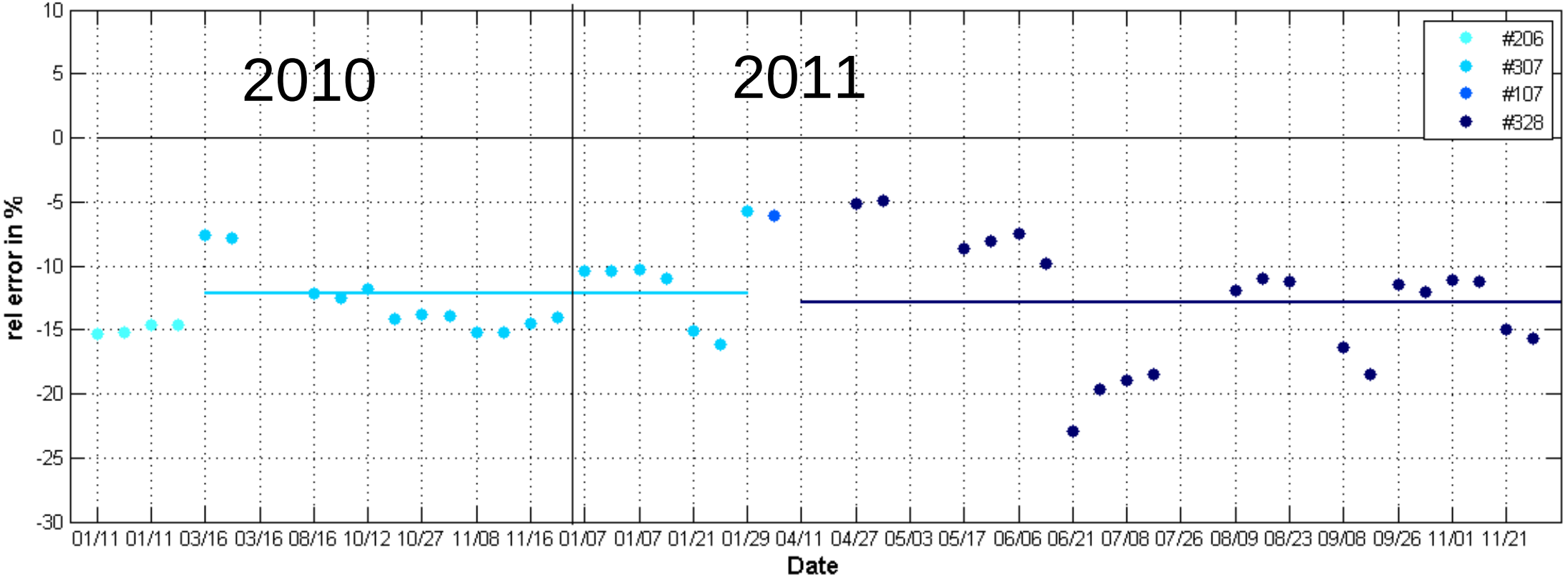
Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research



Four different optodes in two years

Tor Dania 2010-2011 relative error

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

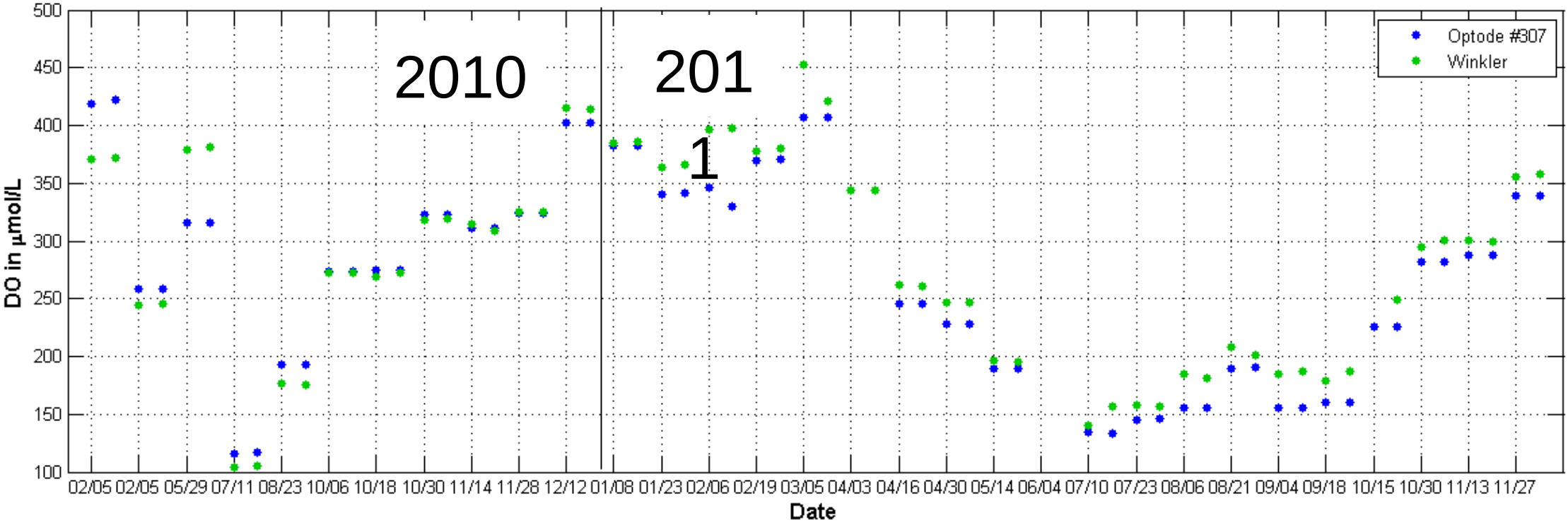


Relative error and mean values for each optode (minus 10-15%)

→ No general difference between optodes

In situ vs. lab comparison (Lysbris)

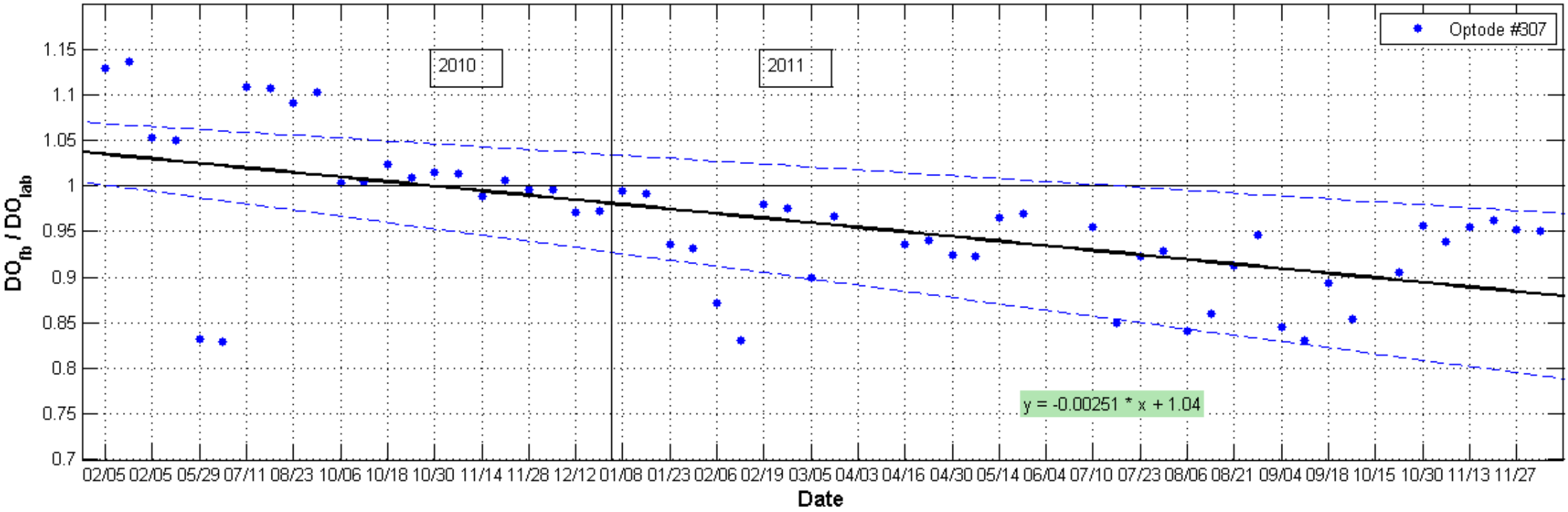
Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research



- Measurements taken in Hamburg harbour → low DO values in summer!
- Broad spread of optode and Winkler measurement differences → Reasons?
  - Problems due to manual water sampling?
  - Inprecise optode measurements at higher values?

Ratio of DO in situ vs. lab (Lysbris)

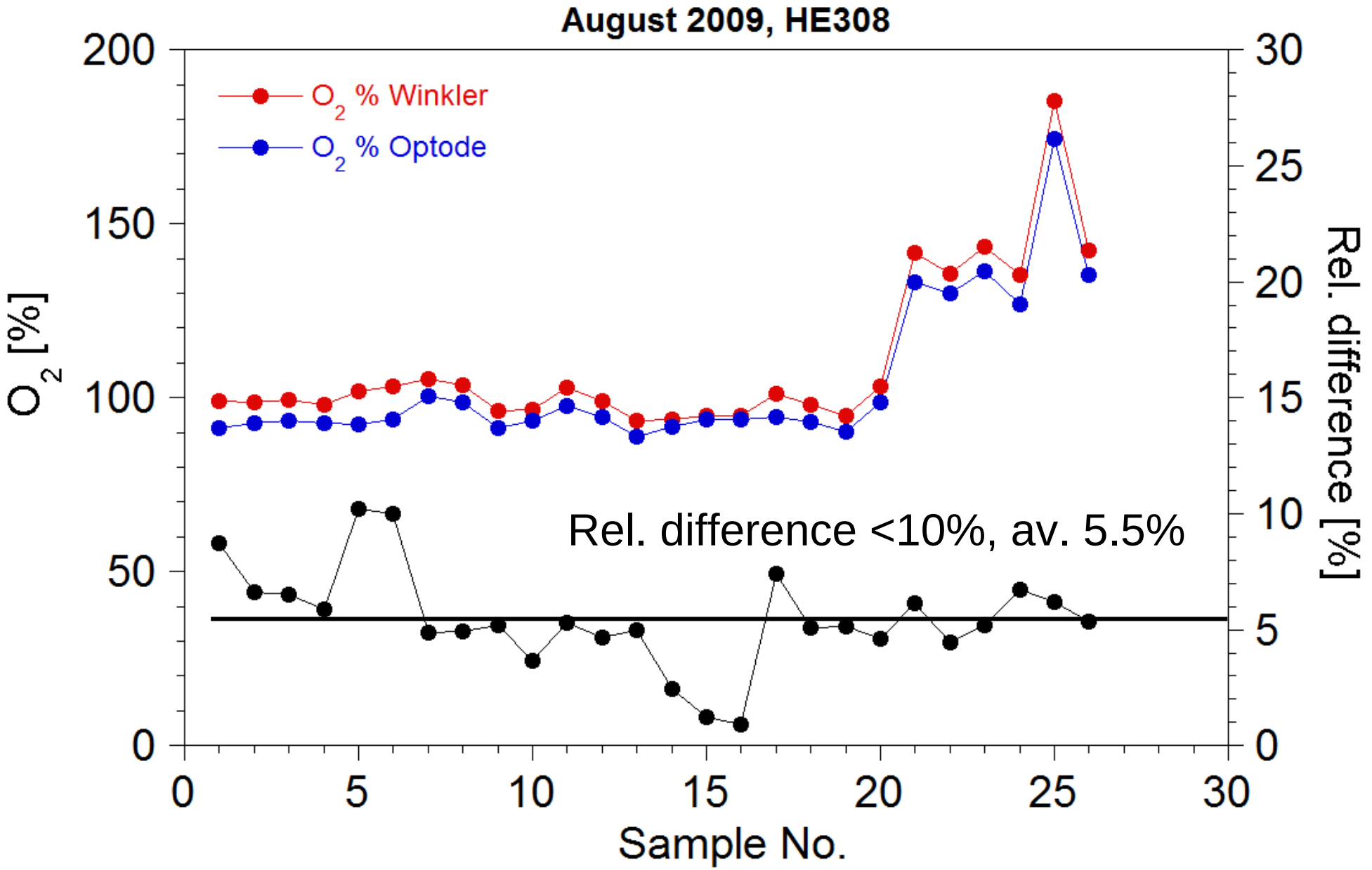
Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research



Drifting optode, starting with overestimation in 2010

In situ vs. aboard lab comparison (R/V Heincke)

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research



Issues and demand

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

Issues

- Manual aboard sampling for Winkler titration during FerryBox maintenance
  - Differences in handling amongst maintenance staff
  - Unswayable oxygen concentration due to given sorrounding water

➢ Lab check of optodes before and after installation reasonable
  - Long-term drift of sensors can be corrected (?!)

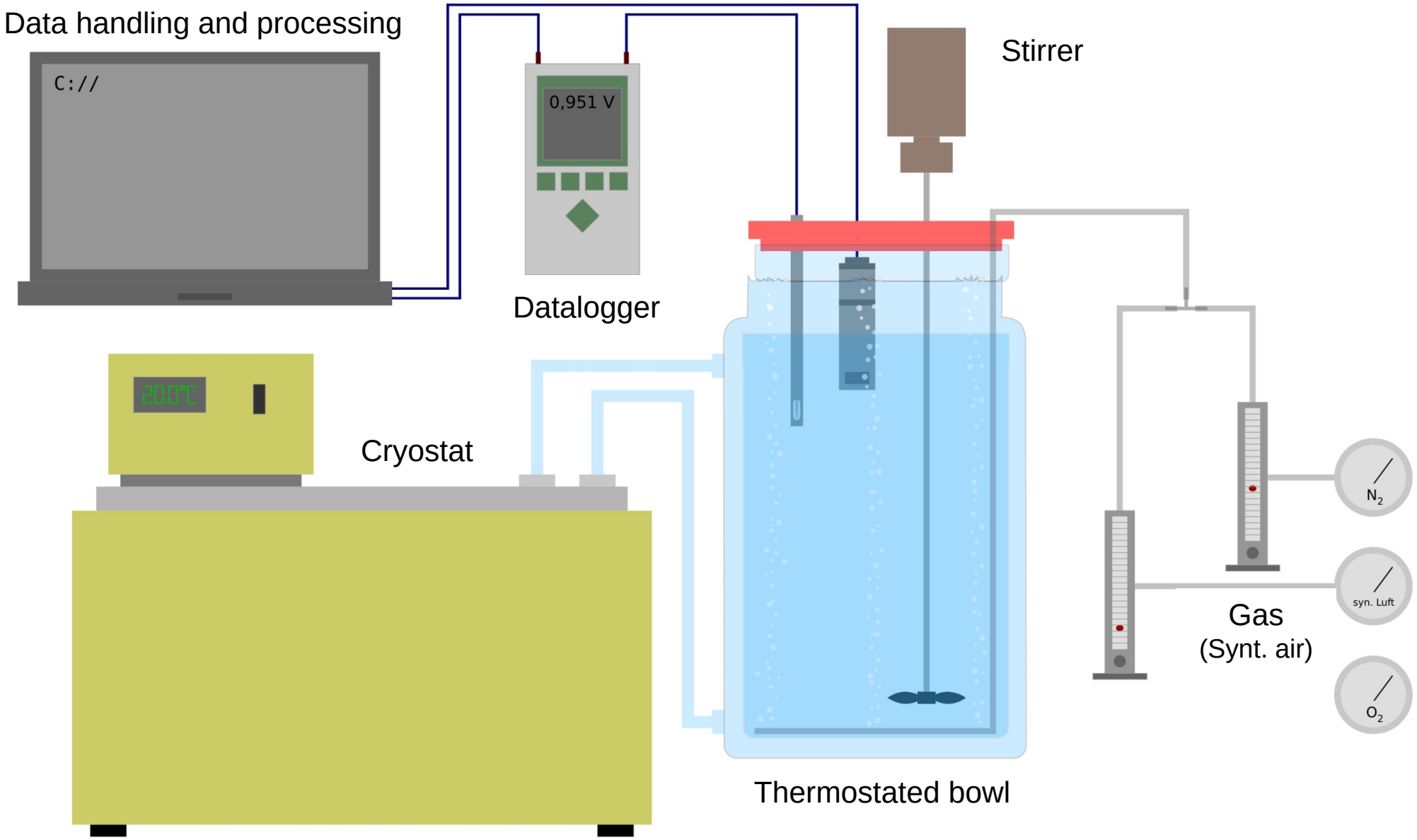
➢ Selection of wide range of oxygen concentration desirable

➢ Setup for different types of optodes is needed

➢ Synchronous check of several (and differend kinds of) optodes

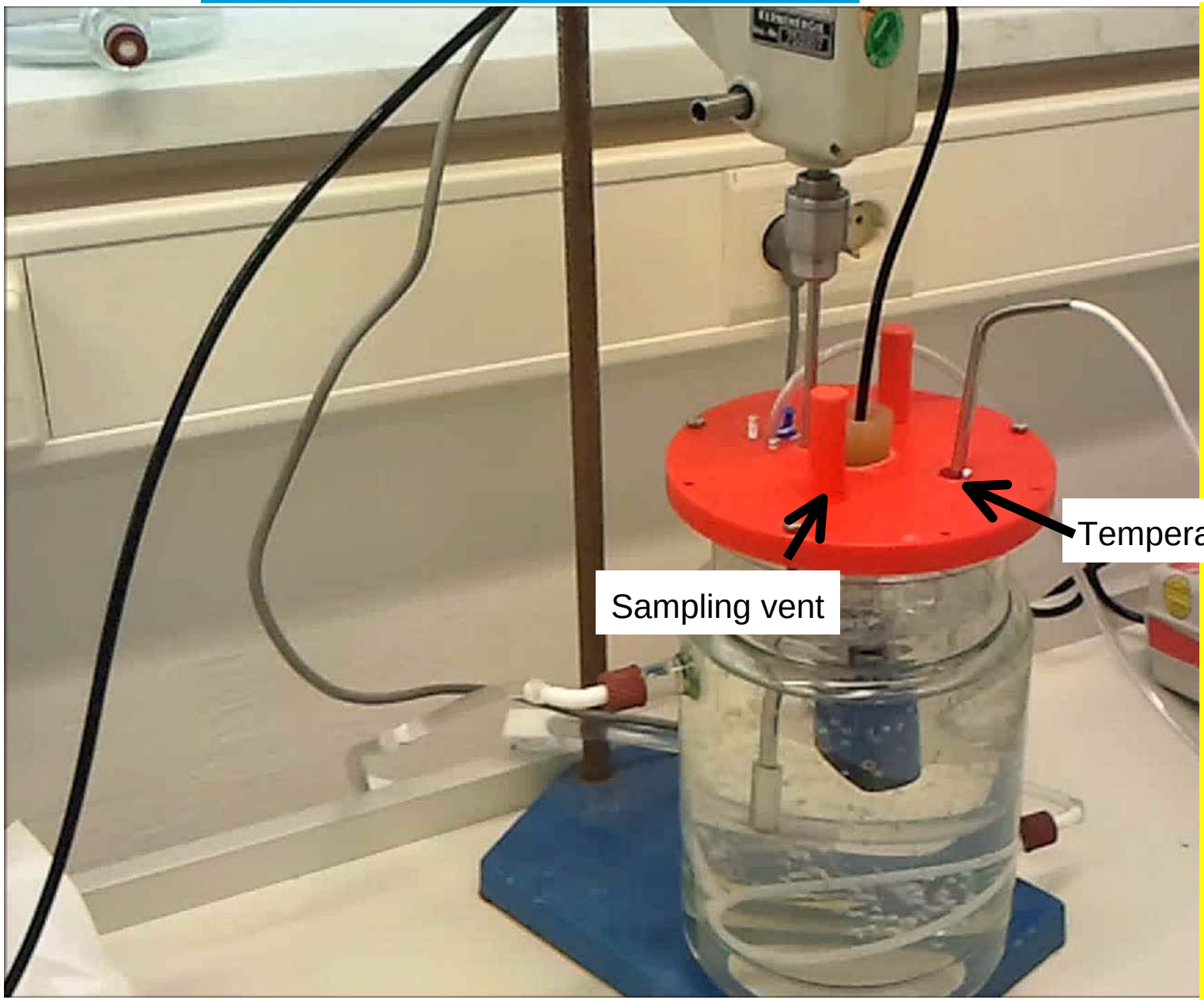
Sensor calibration setup

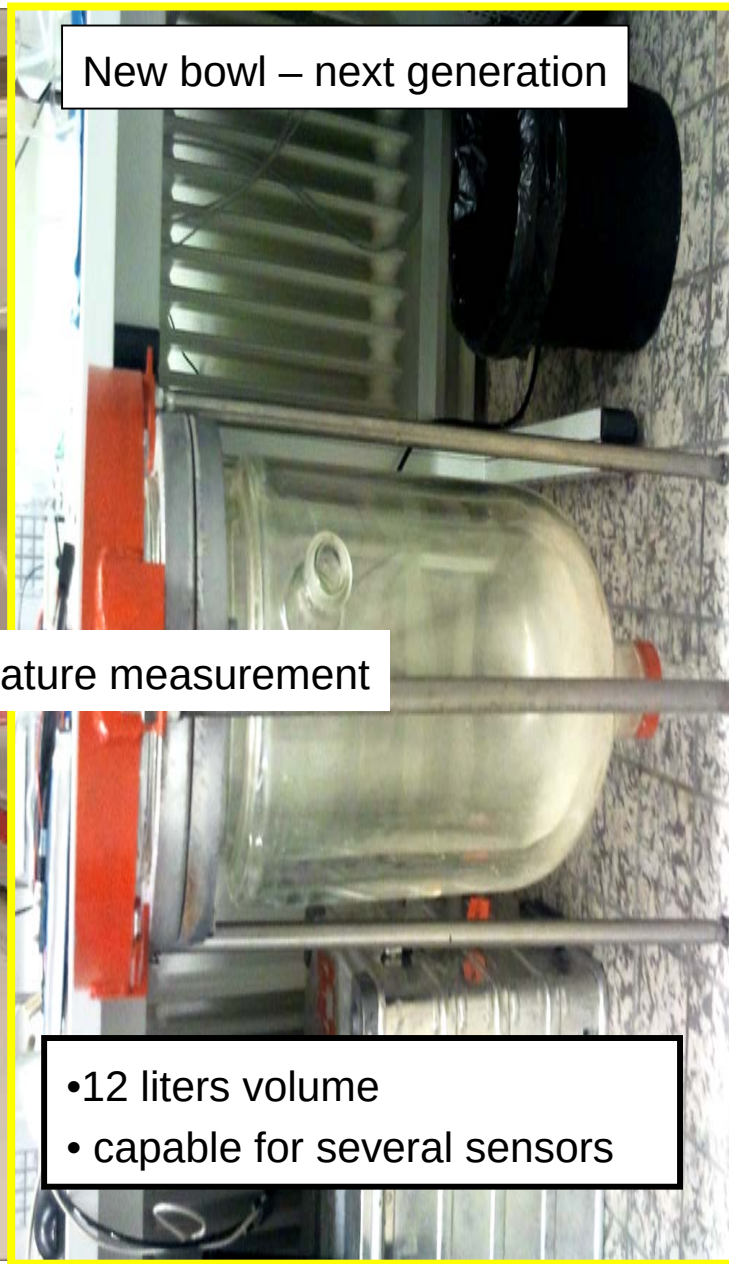
Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research



Test setup for lab sensor calibration

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research





Conclusions and to do list

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

- 2-year period of quality assurance
- Underestimation of Aanderaa optode measurements (≈ 10-15%)
- Drifting optode measurements on LysBris
  → Reasons for that? Biofouling?
- Calibration over wide range helpful
- Individual optode calibration is beneficial
  → Calibrating before and after optode change in Ferrybox is needed on regular basis

To do:

- ❖ Continue quality assurance for 2012
- ❖ Determine correction functions for each sensor
- ❖ Intercalibration of different sensors

Thanks for your attention!