

1st ICOS OTC $p\text{CO}_2$ instrument inter-comparison exercise

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Inter-comparison at a glance

- Inter-comparison of state of the art $p\text{CO}_2$ instrumentation
- 2 week exercise: 28. June – 09. July 2021
- 1 week preparation 21. – 27. June
- 30 to 40 people on site
- Building groups for each instrument type (users and vendors)
- Defined conditions for a successful deployment → each instrument needs a short document like a “Quick Start Guide”
- Focus on surface applications
- Different $p\text{CO}_2$ levels (200 – 800 μatm) and temperatures (5 - 30°C)
- Enough expertise and time to change/adjust settings and instruments
- 5 cbm tank with natural sea water (North Sea) that is temperature controlled

Why?

Last published inter-comparisons took place in

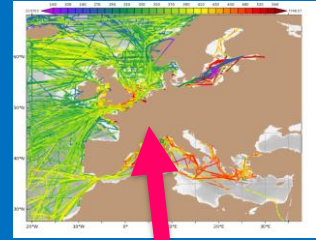
- 1996 (Körtzinger et al., 2000, Mar. Chem. 72) on board the research vessel R/V Meteor
 - 7 underway $p\text{CO}_2$ instruments
 - 1 μatm agreement is possible
 - Systems can show differences up to 10 μatm
 - Accurate temperature measurements are critical

ICOS-Oceans use a variety of state-of-the-art instruments that were developed after the inter-comparison in 1996. The global community is in strong need of independent instrument's validation.

- How do ICOS measurements compare to global standards?
- How to ensure to get the best result of each type of instrument?

Where?

Marine Station Ostende
Flanders Marine Institute (VLIZ)

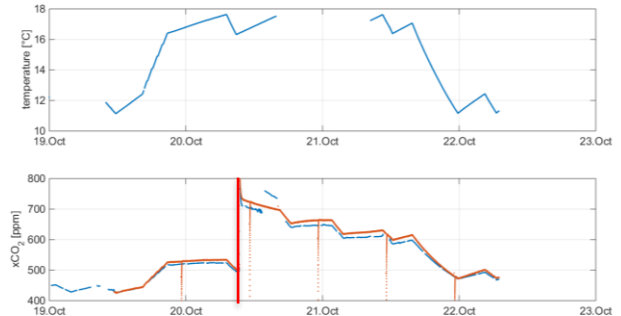


How?

- 5 cbm tank with homogeneous temperature and $p\text{CO}_2$ distribution
- Submersible sensor and pumped equilibrator based systems
- $p\text{CO}_2$ change by addition of acid/base
- All equilibrator temperature probes will be checked before the exercise
- Calibration gases will be provided by ICOS CAL lab (min. 4 gases + 1 target)



Facilities at VLIZ. Only one tank will be used.



Test results from a pre-test at VLIZ. Red values are from a submerged sensor, blue from an equilibrator based system. At the red bar acid was added to increase the $p\text{CO}_2$.

We do it...

...for the Science

- Rigorous assessment of instrument capabilities and documenting their measurement uncertainty. We will improve the quality and aid the reduction of ocean $p\text{CO}_2$ data, enabling better estimates of ocean CO_2 uptake and ocean acidification.

...for the observational community

- Increased coordination and interaction across the user community
- Improved understanding of the capabilities of the instruments tested

...for the instrument manufacturers

- The interaction with an extensive user group will give feedback about any ways to improve their instruments.
- Rigorous tests of system capabilities and benchmarking of systems

Results will be published with real instruments' names

- This will give the community guidance in choosing an instrument appropriate for their application
- This will give the community guidance in operating their instrument following defined practices

Short manual in form of a quick start guide for each instrument (max. 2 page: Hardware, Software, Maintenance)

- Defined procedures for instruments handling
- Users can state in their metadata if they followed all points or not
- Users will have the responsibility to follow the guide
- Companies have the responsibility to ensure that their instruments fulfill the specs also in the field

Questions?

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OTC website

<https://otc.icos-cp.eu/>