

Carbonate Chemistry Facility for UK Ocean Acidification Research Programme

Eric Achterberg, Cynthia Dumousseaud

Objectives of the facility

The UK carbonate system facility is operational and provides:

- High quality measurements of dissolved inorganic carbon (DIC) and total alkalinity (TA)
- Guide for best practices (including details on sampling, transport and use of the facility's online sample logging and receipt system)
- Training workshops at the National Oceanography Centre (Southampton) for sampling, storage, transport and data analysis (dates to be announced)
- Telephone and email technical support to the UK OA RP researchers

Prof. Eric Achterberg (eric@noc.soton.ac.uk; +44 23 8059 3199)

Dr. Cynthia Dumousseaud (cd6@noc.soton.ac.uk; +44 23 8059 3641)

Instrumentation

For experimental work samples: Apollo SciTech instruments

- Small volume (0.2-1.5 ml for DIC; 1-25 ml for TA)
- Precision: ± 0.1 % or better (precision reduced at lower sample volumes)
- TA: Acid-Base titration (open-cell titration)
- DIC: Infrared analysis (Li-Cor analyser)
- Use of Certified Reference Materials (Prof. A. Dickson; Scripps) to assess accuracy of the measurements



Front view of the DIC Analyser (Apollo SciTech) in use at NOC, Southampton (left); Total Alkalinity Titrator system (Apollo SciTech; right)

Instrumentation

For oceanic samples: VINDTA 3C (Marianda, Germany)

- Larger volumes (~150 ml total for both measurements)
- Precision: ± 0.1 % or better
- TA: Acid-Base titration (closed-cell titration)
- DIC: Coulometric analysis
- Use of Certified Reference Materials (Prof. A. Dickson; Scripps) to assess accuracy of the measurements

Front view of the VINDTA 3C and the UIC coulometer in use at NOC, Southampton



Sampling procedures and transport

Practical guide now available at <http://www.noc.soton.ac.uk/ukoacf>
(includes recommendations for sampling, storage and transport of samples)

Sampling:

- Borosilicate glass bottles (100 or 250 ml)
- Silicon tubing used to prevent bubbles in the sample (if possible)
- Samples poisoned with mercuric chloride (saturated solution; 0.02% v/v)
- Samples stored in dark until analysis

For more information on recommended procedures:

Dickson et al. 2007: Guide to best practices for ocean CO₂ measurements

EPOCA: Guide to best practices for ocean acidification research and data reporting

Carbonate System Facility

LIMS Software

Username and password protected

Input by user:

- sample information (ID, number...)
- ancillary data: salinity, temperature, pressure, phosphate and silicate concentration
- optional: pH (including pH scale), $p\text{CO}_2$

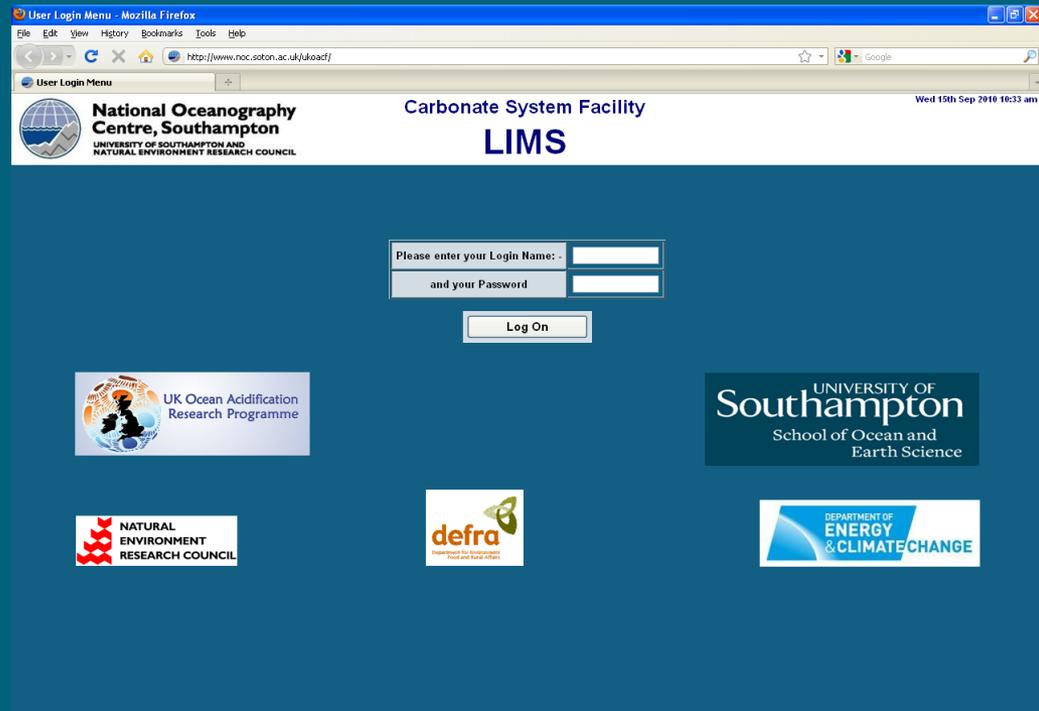
Output by Carbonate System Facility (once samples analysed):

- analysed TA and DIC
- calculated pH (total scale)
- calculated $p\text{CO}_2$
- carbonate and bicarbonate ion concentration
- calcite and aragonite saturation state

Carbonate System Facility LIMS Software

Software available at: <http://www.noc.soton.ac.uk/ukoacf>

Cost of analysis: £12 per sample (for both DIC and TA) for UK OA projects



Carbonate Facility LIMS website