

**Biogeochemistry, transient tracers and oxygen isotopes from discrete samples and profile observations during the R/Vs Arni Fridriksson and the Bjarni Saemundsson seasonal cruises in the North Atlantic Ocean from 2002-02-15 to 2006-05-29.**

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**PACKAGE DESCRIPTION:** This dataset includes temperature, salinity, oxygen, nitrate, silicate, phosphate, dissolved inorganic carbon, partial pressure of CO<sub>2</sub>-water, CFCs and the 18O/16O ratio collected from discrete samples and profile observations during the R/Vs Arni Fridriksson and Bjarni Saemundsson seasonal cruises in the North Atlantic Ocean from 2002-02-15 to 2006-05-29.

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**IDENTIFICATION INFORMATION FOR THIS DATA PACKAGE:**

**NCEI ACCESSION:**

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**EXPOCODE:** 46BS20020215

**CRUISE ID:** B2-2002; B5-2002; B9-2002; A10-2002; A1-2003; A9-2003; B3-2003; B10-2003; B1-2004; B5-2004; B11-2004; B15-2004; B2-2005; B6-2005; B10-2005; B13-2005; B2-2006; B4-2006

**SECTION/LEG:**

**TYPES OF STUDY:**

Discrete measurement; Profile;

**TEMPORAL COVERAGE:**

START DATE: 2002-05-02

END DATE: 2006-05-29

**SPATIAL COVERAGE:**

NORTH: 69.002°

WEST: -35.221°

EAST: -8.990°

SOUTH: 64.326°

**GEOGRAPHIC NAMES:**

North Atlantic Ocean

**PLATFORMS:**

R/V Arni Fridriksson, R/V Bjarni Saemundsson (ID: 46FR, 46BS)

**RESEARCH PROJECT(S):**

**VARIABLES / PARAMETERS:**

<b>CTDTMP</b>	
Abbreviation:	CTDTMP
Unit:	DEG_C
Controlled vocabulary name:	WATER TEMPERATURE
Observation type:	CTD
In-situ / Manipulation / Response variable:	in-situ
Detailed sampling and analyzing information:	Temperature in °C. Measured with a Sea-Bird SBE3 Oceanographic Temperature Sensor. Lower CTD to 10m, then raise back to surface, wait for pump to start, then begin downcast. Lowering speed as close to 1 m/s as possible. On upcast, stop rosette before fire bottle.
<b>SALNTY</b>	
Abbreviation:	SALNTY
Unit:	
Controlled vocabulary name:	SALINITY
Observation type:	discrete
In-situ / Manipulation / Response variable:	in-situ
Detailed sampling and analyzing information:	Salinity measured on discrete samples with a Guildline Autosol Salinometer 8400B. 200 mL coated borosilicate glass bottles with plastic insert. Stored at room temperature and analyzed in laboratory within a month from sampling.
<b>OXYGEN</b>	
Abbreviation:	OXYGEN
Unit:	UMOL/KG
Controlled vocabulary name:	DISSOLVED OXYGEN
Observation type:	discrete
In-situ / Manipulation / Response variable:	in-situ
Detailed sampling and analyzing information:	In-bottle Winkler titration. Second sample drawn from the Niskin. Temperature difference between lowest in situ temperature and ambient temperature on deck is 12°C at most. The upcast takes 30 minutes max and the water column has rather uniform temperature. Drawn temperature is not recorded. Samples are stored in a cool location and analyzed on board.
<b>PHSPHT</b>	

Abbreviation:	PHSPHT
Unit:	UMOL/KG
Controlled vocabulary name:	Phosphate
Observation type:	discrete
In-situ / Manipulation / Response variable:	in-situ
Detailed sampling and analyzing information:	Measured on Chemlab three channel autoanalyzer. Samples are kept refrigerated if analyzed on ship within 24 hours. Otherwise, they are kept frozen upright and analyzed in the lab after allowing them to thaw in the dark. In spring and summer, samples from the surface layer (0-60m) are syringe filtered through 0.45 um Whatman filter to avoid turbidity blank effect. Calibration range within 0-1.2 umol/l, to match the concentration of the samples. Quasimeme test material used.
<b>SILCAT</b>	
Abbreviation:	SILCAT
Unit:	UMOL/KG
Controlled vocabulary name:	Silicate
Observation type:	Discrete
In-situ / Manipulation / Response variable:	In-situ
Detailed sampling and analyzing information:	Measured on Chemlab three channel autoanalyzer. Samples are kept refrigerated if analyzed on ship within 24 hours. Otherwise, they are kept frozen upright and analyzed in the lab after allowing them to thaw in the dark. In spring and summer, samples from the surface layer (0-60m) are syringe filtered through 0.45 um Whatman filter to avoid turbidity blank effect. Calibration range within 0-15 umol/l, to match the concentration of the samples. Quasimeme test material used.
<b>NITRATE+NITRITE</b>	
Abbreviation:	NITRAT
Unit:	UMOL/KG
Controlled vocabulary name:	NO2+NO3
Observation type:	Discrete
In-situ / Manipulation / Response variable:	In-situ
Detailed sampling and analyzing information:	Measured on Chemlab three channel autoanalyzer. NITRAT is NO2+NO3. Samples are kept refrigerated if analyzed on ship within 24 hours. Otherwise, they are kept frozen upright and analyzed in the lab after allowing them to thaw in the dark. In spring and summer, samples from the surface layer (0-60m) are syringe filtered through 0.45 um Whatman filter to avoid turbidity blank effect. Calibration range within 0-20 umol/l, to match the concentration of the samples. Quasimeme test material used.
<b>TCARNB</b>	

Abbreviation:	TCARBN
Unit:	UMOL/KG
Controlled vocabulary name:	DISSOLVED INORGANIC CARBON (DIC)
Observation type:	Discrete
In-situ / Manipulation / Response variable:	In-situ
Detailed sampling and analyzing information:	Dissolved Inorganic Carbon in $\mu\text{mmol/kg}$ . Measured on discrete samples by coulometry with a UIC Inc CM-5010 coulometer. Samples are drawn into borosilicate glass bottles and the stopper is sealed with grease. Samples are preserved with $\text{HgCl}_2$ saturated, kept in the dark in a cool location and returned to the laboratory for coulometric determination. The system is calibrated by 99.998 % $\text{CO}_2$ gas at known temperature and pressure with two stainless steel loops of known volumes.
<b>PCO2</b>	
Abbreviation:	PCO2
Unit:	UATM
Controlled vocabulary name:	partial pressure of carbon dioxide - water
Observation type:	Discrete
In-situ / Manipulation / Response variable:	In-situ
Detailed sampling and analyzing information:	Analyzed by gas chromatography with the flask equilibrator coupled to the GC. Samples are collected in 500 mL volumetric flasks with a screw cap. Samples are preserved with $\text{HgCl}_2$ (0.4 ml) and analyzed ashore by equilibration at $4^\circ\text{C}$ with a gas of known $\text{CO}_2$ concentration followed by gas chromatography with a flame ionization detector.
<b>PCO2TMP</b>	
Abbreviation:	PCO2TMP
Unit:	DEG_C
Controlled vocabulary name:	partial pressure of carbon dioxide - water
Observation type:	Discrete
In-situ / Manipulation / Response variable:	
<b>CFC-11</b>	
Abbreviation:	F11
Unit:	PMOL/KG
Controlled vocabulary name:	Freon-11 (trichlorofluoromethane)
Observation type:	Discrete
In-situ / Manipulation / Response variable:	In-situ
Detailed sampling and analyzing information:	Water samples were collected using Niskin bottles. CFC samples were collected in 60 cm <sup>3</sup> glass ampoules using a method adapted from Busenberg and Plummer (1992). The ampoules were filled directly from the Niskin bottles using a stainless

	<p>steel filling tee (Bulsiewicz et al., 1998) and flushed with at least 120 cc of the water prior to flame sealing under continuously flowing ultra-high purity nitrogen. These samples were returned to Lamont-Doherty Earth Observatory where they were measured for CFC-11, CFC-12, and CFC-113 within a few months of collection. The measurements were carried out using a purge and trap system interfaced to a gas chromatograph with an electron capture detector (Bullister and Weiss, 1988; Smethie et al., 2000). Measurement precision was the larger of 1% or 0.01 pmol/kg for CFC-11, 2.5% or 0.01 pmol/kg for CFC-12, and 0.03 pmol/kg for CFC-113. The concentrations are reported on the SIO 93 calibration scale. pCFC-11, pCFC-12 and pCFC-113 are the partial pressures of these gases in the atmosphere at the time the water parcel was at the surface, assuming equilibrium between the surface water and the atmosphere. It was calculated by dividing the concentration in the water by the solubility of the gas reported by Warner and Weiss (1985) for CFC-11 and CFC-12 and Bu and Warner (1995) for CFC-113.</p>
<b>CFC-12</b>	
Abbreviation:	F12
Unit:	PMOL/KG
Controlled vocabulary name:	Freon-12 (dichlorodifluoromethane)
Observation type:	Discrete
In-situ / Manipulation / Response variable:	In-situ
	<p>Water samples were collected using Niskin bottles. CFC samples were collected in 60 cm<sup>3</sup> glass ampoules using a method adapted from Busenberg and Plummer (1992). The ampoules were filled directly from the Niskin bottles using a stainless steel filling tee (Bulsiewicz et al., 1998) and flushed with at least 120 cc of the water prior to flame sealing under continuously flowing ultra-high purity nitrogen. These samples were returned to Lamont-Doherty Earth Observatory where they were measured for CFC-11, CFC-12, and CFC-113 within a few months of collection. The measurements were carried out using a purge and trap system interfaced to a gas chromatograph with an electron capture detector (Bullister and Weiss, 1988; Smethie et al., 2000). Measurement precision was the larger of 1% or 0.01 pmol/kg for CFC-11, 2.5% or 0.01 pmol/kg for CFC-12, and 0.03 pmol/kg for CFC-113. The concentrations are reported on the SIO 93 calibration scale. pCFC-11, pCFC-12 and pCFC-113 are the partial pressures of these gases in the atmosphere at the time the water parcel was at the surface, assuming equilibrium between the surface water and the atmosphere. It was calculated by dividing the concentration in the water by the solubility of the gas reported by Warner and Weiss (1985) for CFC-11 and CFC-12 and Bu and Warner (1995) for CFC-113.</p>
<b>CFC113</b>	
Abbreviation:	F113
Unit:	PMOL/KG
Controlled vocabulary name:	Freon-113
Observation type:	Discrete
In-situ / Manipulation / Response variable:	In-situ

	<p>Water samples were collected using Niskin bottles. CFC samples were collected in 60 cm<sup>3</sup> glass ampoules using a method adapted from Busenberg and Plummer (1992). The ampoules were filled directly from the Niskin bottles using a stainless steel filling tee (Bulsiewicz et al., 1998) and flushed with at least 120 cc of the water prior to flame sealing under continuously flowing ultra-high purity nitrogen. These samples were returned to Lamont-Doherty Earth Observatory where they were measured for CFC-11, CFC-12, and CFC-113 within a few months of collection. The measurements were carried out using a purge and trap system interfaced to a gas chromatograph with an electron capture detector (Bullister and Weiss, 1988; Smethie et al., 2000). Measurement precision was the larger of 1% or 0.01 pmol/kg for CFC-11, 2.5% or 0.01 pmol/kg for CFC-12, and 0.03 pmol/kg for CFC-113. The concentrations are reported on the SIO 93 calibration scale. pCFC-11, pCFC-12 and pCFC-113 are the partial pressures of these gases in the atmosphere at the time the water parcel was at the surface, assuming equilibrium between the surface water and the atmosphere. It was calculated by dividing the concentration in the water by the solubility of the gas reported by Warner and Weiss (1985) for CFC-11 and CFC-12 and Bu and Warner (1995) for CFC-113.</p>
<b>18O/16O ratio</b>	
Abbreviation:	18O
Unit:	Per mille
Controlled vocabulary name:	<sup>18</sup> O/ <sup>16</sup> O ratio
Observation type:	Discrete
In-situ / Manipulation / Response variable:	in-situ
Detailed sampling and analyzing information:	<p>Water samples were collected using Niskin bottles. Samples for 18O were drawn into dark 60 ml glass bottles and screwed caps tightly sealed. Oxygen isotope measurements were carried out at the Institute of Earth Sciences University of Iceland.</p> <p>The oxygen isotope measurements were performed on the Finnigan MAT 251 Mass-spectrometer. The isotope data is expressed as:</p> $\delta^{18}\text{O}_{\text{sample}} = ((R_{\text{sample}}/R_{\text{standard}})-1)1000\text{‰}$ <p>where R is <sup>18</sup>O/<sup>16</sup>O and the standard used is SMOW-Standard Mean Ocean Water (Craig, 1961).</p> <p>Oxygen is extracted from the water by equilibrating 5 ml of degassed water with a small amount of CO<sub>2</sub> gas in a sealed tube for 3 h, in a shaking waterbath (Epstein and Mayeda, 1953). The measurements are subsequently corrected for the CO<sub>2</sub> gas which also was used as a secondary reference standard. The accuracy of the measurements is 0.03‰.</p>

**DATA PACKAGES RELATED TO THIS ONE:**

[https://doi.org/10.3334/cdiac/otg.carina\\_irmingersea\\_v2](https://doi.org/10.3334/cdiac/otg.carina_irmingersea_v2); [https://doi.org/10.3334/cdiac/otg.carina\\_icelandsea](https://doi.org/10.3334/cdiac/otg.carina_icelandsea)

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**ADDITIONAL INFORMATION:**

none

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