

# ATLANTIC STORAGE OF NATURAL AND ANTHROPOGENIC CARBON

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**INTRODUCTION** - An ambitious UK program is underway (2008-2012) to quantify regional storage and transports of inorganic carbon and transient tracers in the Atlantic Ocean and the adjacent Southern Ocean. In particular, we aim: 1) to establish regional storage and transports for inorganic carbon and their rates of change, 2) to separate so far as possible 'natural' from 'anthropogenic' carbon, 3) to establish new inventories for transient tracers (SF<sub>6</sub>, CFCs and CCl<sub>4</sub>), 4) to use the transient tracers to better constrain estimates of transport of water, heat and carbon and 5) to establish the underlying causes of any changes.

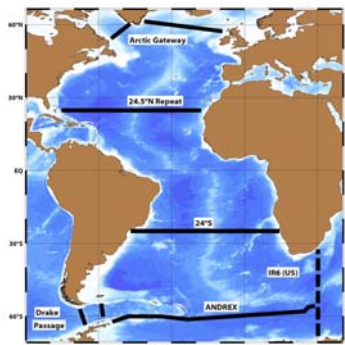


FIGURE 1. The location of the hydrographic sections with inorganic carbon and transient tracers in the Atlantic Ocean and the adjacent Southern Ocean. The dashed line indicates the 2008 US IR6 section.

	WOCE Section	UK Cruise	UK CO <sub>2</sub> & CFC PI	Timing	Earlier carbon & tracer data
Arctic Gateway 1 (west)	A01W	D332	CO <sub>2</sub> : Schuster CFCs: Messias	08-09/2008 (sampled)	?
Arctic Gateway 2 (east)	A01E	Tbd	CO <sub>2</sub> : Schuster CFCs: Messias	Tbd	?
24°N	A04	D346	CO <sub>2</sub> : Schuster CFCs: Brown	06/01-17/02/2010	1992 (DIC, TA); 1998 (DIC, TA); 2004 (DIC, TA, CFCs)
24°S	None	JC32	CO <sub>2</sub> : Schuster CFCs: Messias	07/03-21/04/2009	None
Drake Passage (west)	A21	JC31	CO <sub>2</sub> : Bakker CFCs: Messias	05/02-18/02/2009	1990 (CFC-11, DIC)
Drake Passage (east)	SR1B	JC31	CO <sub>2</sub> : Bakker CFCs: Messias	20/02-27/02/2009	None
Weddell Gyre (northeast)	S4A (part)	JC30 / ANDREX1	CO <sub>2</sub> : Bakker, Hoppema CFCs: Messias, Brown	01/01-14/01/2009	1996 (CFC-11, DIC)
Weddell Gyre (northwest)	None	JR239 / ANDREX2	CO <sub>2</sub> : Bakker CFCs: Messias, Brown	14/03-20/04/2010	None

TABLE 1. The location and timing of the hydrographic sections in 2008 to 2010 in the Atlantic Ocean and the adjacent Southern Ocean on which inorganic carbon and transient tracer measurements will be made.

**METHODS** -The seagoing fieldwork consists of seven full-depth hydrographic sections across different parts of the Atlantic and Southern Ocean in 2008-2010 (Table 1; Figure 1). Dissolved inorganic carbon (DIC), total alkalinity (TA), chlorofluorocarbons (CFCs: CFC-11, CFC-12, CFC-113), carbon tetrachloride (CCl<sub>4</sub>) and sulphur hexafluoride (SF<sub>6</sub>) are measured on the hydrographic sections. Additional Atlantic sections are carried out by US scientists, notably A10 (30°S) and IR6. The UK sections repeat several WOCE sections with measurements of carbon and tracers (A21, A05, S4A) (Table 1). These new observations will be compared to the earlier observations. Models of ocean physics and biogeochemistry will be used to establish the underlying factors giving rise to long-term changes. The project is a collaboration between the University of East Anglia, the National Oceanography Centre Southampton, and the British Antarctic Survey.

**RESULTS AND DISCUSSION** - Carbon and tracer measurements have been completed for three sections (Drake Passage A21 and SR1B, 24°S) and the eastern part of the Weddell Gyre section (Table 1; Figure 1). We present the preliminary distributions of total alkalinity and dissolved inorganic carbon for 24°S (Figure 2) and the northeastern Weddell Gyre (Figure 3).

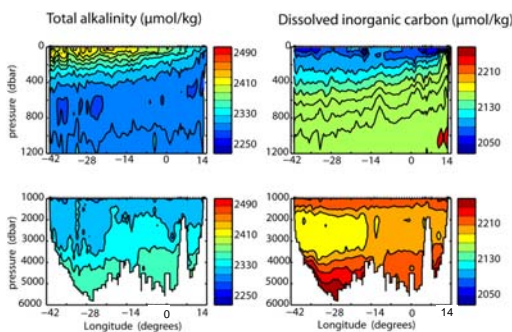


FIGURE 2. The vertical distribution of total alkalinity and dissolved inorganic carbon at 24°S during JC32 (Schuster et al., in preparation).

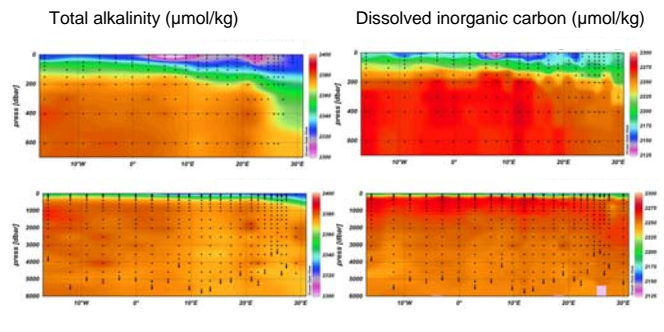


FIGURE 3. The vertical distribution of total alkalinity and dissolved inorganic carbon along the northeastern Weddell Gyre during ANDREX1 / JC30 (Bakker, Hoppema et al., in preparation).

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