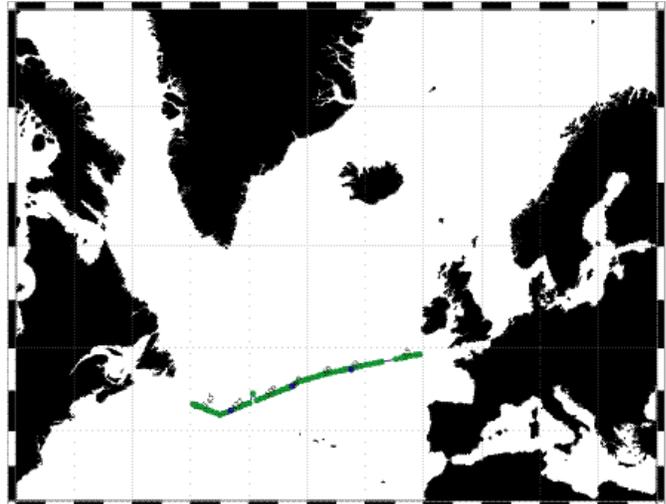


WOCE Line: **AR19**
EcpoCode: **06GA276_2**

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Cruise Plan Gauss cruise Nr. 276
Expedition: M**ER**idional TR**AN**sports in the North Atlantic (METRANA 96)
Ship: FS Gauss, DBBX, L.o.a 68.9 m, 1599 GRT, Inmarsat 3218 111210
Ports: Hamburg to Halifax, NS, Canada to Hamburg, Germany
Dates: 04 May 1996 - 02 Jul 1996



OVERVIEW

We plan to work the WOCE section AR19 in the repeat mode AR19 in the North Atlantic Ocean again along nominally 48 N to WHP standards with a reduced parameter set in May-June 1996. The section will run from the Irish Shelf at 49 10'N, 10W along the track of the Hudson 1982 cruise and essentially the Discovery track of 1957 to 47N, 27W, continuing to 42N, 45W and cutting onto the Newfoundland Shelf to 43 30'N, 50W. The latter part parallels the former BIO mooring array. This track has been worked before in 1993 (Gauss 226) and 1994 (Meteor M30/2).

The section is to measure the northward flow of the North Atlantic Current and the southward recirculation in the Eastern Basin. The southward flow of the Western Boundary Current and the boundary current regimes on both sides of the Mid-Atlantic Ridge (MAR) are to be well resolved. The cruise aims to improve the scientific knowledge of the distribution and sources of water masses, and their flows, velocities and patterns by obtaining high-accuracy measurements of temperature, salinity and oxygen content. These data will be used to estimate geostrophic velocities and transports, and to map properties, mainly nutrient distribution, to deduce the circulation over the entire depth, particularly of the deep basins. Previous recent occupations have been with Gauss 226 in July 1993 as AR19 and Meteor M30/2 in October 1994 as AR19.

Measurements planned include ca. 85 CTD-stations with a Neil Brown MkIIIb CTDO and water samples with a GO 24xIO I rosette system at 24 - 36 levels. Samples will be

analyzed on board for salinity, oxygen and nutrients (silicate, nitrate, nitrite and phosphate). Duplicate samples for salinity will be drawn at random for parallel analysis on board and ashore. In addition 18O-samples will be drawn essentially from all samples.

Hydrographic stations are planned at nominally 30 nm station spacing, with closer spacing over changing topography (500 m depth steps) and slightly larger spacing over abyssal plains (50 nm) if time becomes a constraint. All stations will be run to within 5 - 10 m from the sea floor. At most stations a pogo float will be used to measure the depth-averaged current.

Underway measurements will include bathymetry with a Parasound system, sub-surface temperature and salinity from the sea-water supply and standard meteorological observations including a prototype of a rain-gauge to WMO standards. In addition deep XBTs will be dropped between stations to improve the resolution of the temperature structure.

Ancillary work will include the deployment of two full-depth moorings west of the Mid-Atlantic Ridge at sites previously occupied from 1993 to 1995. All moorings will be turned around in 1997 unless a ship can be found to do so in 1998.

SCIENTIFIC GOALS

Besides providing estimates of the water mass characteristics, their spreading paths and mixing history as a snap-shot in late spring of 1996, the data from this cruise are planned to be compared with historic data sets and recent repeats to determine long-term changes of these properties. The North Atlantic being the most active ocean it subsequently shows the better signal-to-noise ratio of these changes on time-scales of years to decades. Furthermore, the transport estimates from the DWBC array and other current meter arrays will be used to calculate the meridional transports of heat, salt and freshwater through this section and their changes. We also aim at describing the property transfer at intermediate and greater depths, between the western and eastern basins, either through boundary currents or spillover across the MAR.

The repeats since 1993 are part of a long-term assessment of changes in the transports of heat, salt and fresh-water through 48N that will continue until the re-occupation with FS Meteor M39/2 in July 1997 as part of the WOCE - ACCE. While the full-depth hydrographic sections will look at changes at time-scales of years and longer, an on-going XBT/XCTD programme on AX3 has already built up more than 100 monthly repeats since June 1.988, resolving monthly to annual changes.

The recent data have shown a massive invasion of newly formed LSW into the Northwestern Atlantic that has continued into the Northeastern Basin in 1994. Core properties, particularly temperature, density and core layer depth have changed dramatically from known estimates, suggesting a close coupling to the new LSW production phase in the Labrador Sea. The repeats in the 1990s also suggest a cooling of the bottom layers and a warming and salinification of the top IWO m.

By using forcing fields for momentum, fresh-water and heat exchange with the atmosphere from ECMWF products, we hope to resolve changes of the North Atlantic transports in relation to changes in these forcing fields.

DATA

Data storage and distribution information can be obtained at all time from the WOCE Hydrographic Programme Office at the Woods Hole Oceanographic Institution and from the Chief Scientist. Cruise information and information about the status of the data will be made available through the WOCE Data Information Unit WOCE DIU.

CRUISE PARTICIPANTS AND RESPONSIBILITIES

The major groups involved in this WHP repeat programme are the BSH/CTD - group, the BSH oxygen group, BSH nutrient group and a BSH underway sampling group. Oxygen isotopes will be sampled for Karen Heywood of the University of East Anglia, UK.

PERSONS TO CONTACT ARE BESIDES THE CHIEF SCIENTISTS:

CTD operation	K.P. Koltermann/G. Stelter
CTD processing	H.J. Weichert/H.K. Mauritz
salinity	A. Frohse
oxygen	I. Köper/F. Schmiel
nutrients	R. Kramer
sounding and navigation	BSH surveying group
underway measurements	M. Stolley, A. Sy
mooring	K.P. Koltermann
XBT/XCTD	A. Sy
Delphin	A. Schulz/R. Rasmus

ASSOCIATED WORK

Full-depth moorings will be deployed at two sites west of the MAR where previous deployments from 1993 - 1995 have shown the need to continue the time series.

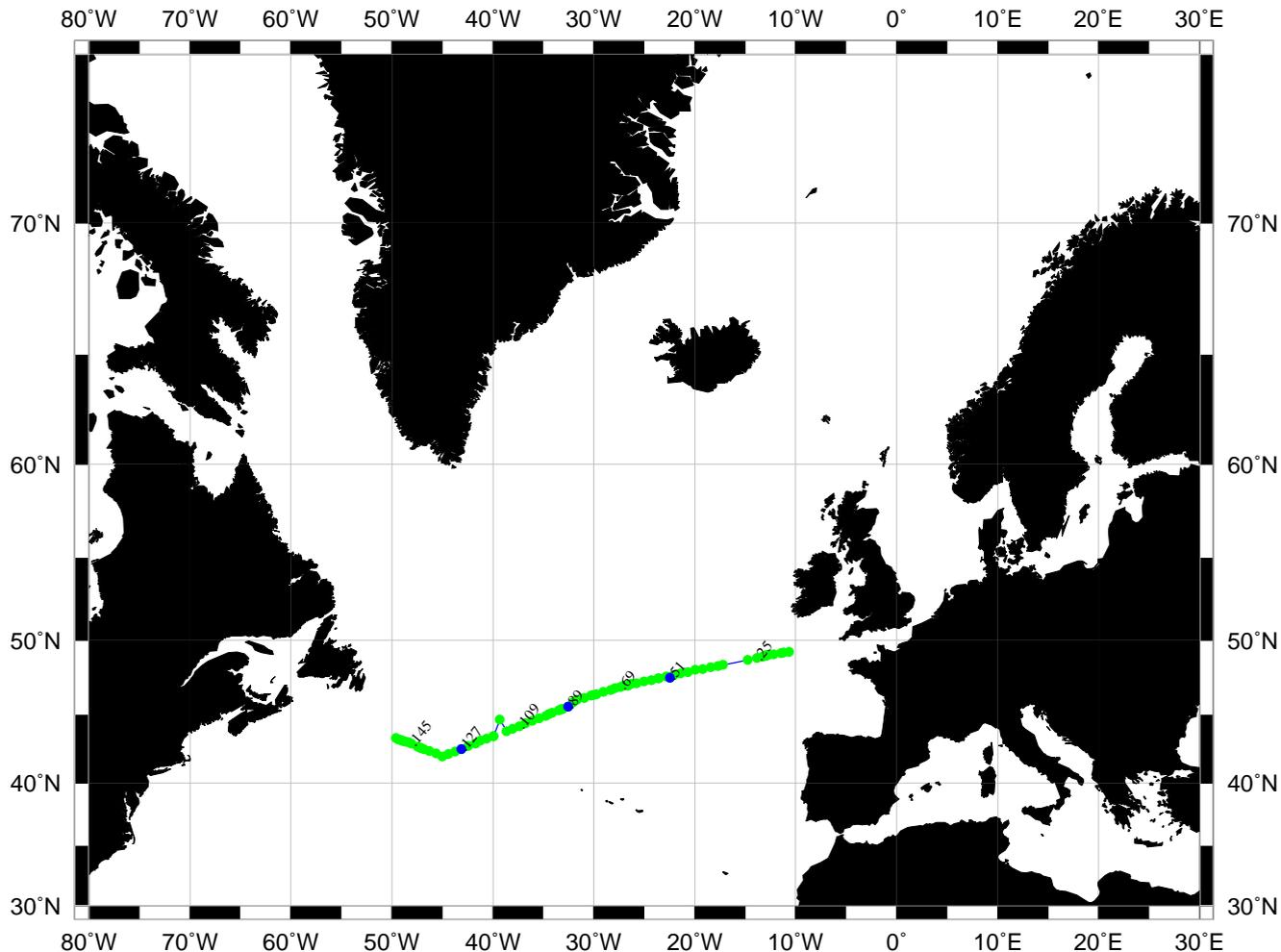
Code	latitude longitude	sounding	levels	PI
BSH-K1	46 20N 30 00W	3200	5cm, 4seacats	Koltermann
	deploy June 1996		3 Tempchains	
	recover Jul 97			
BSH-K3	45 20N 33 08W	3900	5cm, 4seacats	Koltermann
	deploy June 1996		3 Tempchains	
	recover Jul 97			

AX3

RV Gauss will be working the AX3 section on the eastward leg from June 13 to July 2, 1996. AX3 has been in operation almost monthly since June 1998 with ships- of- opportunity. In addition to the high-density XBT work XCTDs will be deployed and several intercalibration stations for CTD/XCTD will be run.

CO₂-surface sampling will be done and an undulating vehicle (Delphin) will be towed eastward to measure the temperature, salinity and fluorescence distributions of the top 100m.

Station locations for AR19: KOLTERMANN, 1996



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