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FRV *Scotia*

CRUISE REPORT 4/91 4SR91

15-24 April 1991

Personnel

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Objectives

1. To conduct a hydrographic survey north and west of Orkney, and east of Shetland.

2. To investigate the use of a towed underwater body for joint ADCP/CTD surveys of frontal regions.

Narrative

Scotia set sail from Greenock at 1300 (all times GMT) on Monday 15 April, and proceeded to the start of the JONSIS line east of Orkney. During passage the VM-ADCP was installed, tested and logging started, and test tows were performed using the CTD mounted on the undulating sled. (Cruise track - Fig. 1).

Hydrographic work commenced at 0900 on Wednesday 17 April. The JONSIS line was surveyed using water bottles and CTD casts. On completion part of the line was re-surveyed using the towed CTD system. Two standard lines east of Shetland were then surveyed using CTD casts. On completion at 0800 on Friday 19 April *Scotia* steamed to the start of a 25 hour ADCP survey line lying to the east of Shetland. This line was completed by 1200 on Saturday 20 April. The line was then surveyed using the towed CTD.

Scotia then steamed north to commence a third section out from the coast of Shetland into the northern North Sea. On completing this line passage was made to the start of the Nolso/Flugga line. The first three stations along this standard section were completed during Sunday 21 April, and *Scotia* sailed to the start of a second 25 hour ADCP survey off Moussa, Shetland. This line was completed by 1900 on Monday 22 April and was again surveyed using the towed CTD.

A six hour CTD tow was then performed from the northern North Sea into the Fair Isle Passage. This was completed by 0200 on Tuesday 23 April. *Scotia* then sailed to the Moray Firth coast were a series of three coastal zone CTD tows were performed. These were completed by 2318 on Tuesday and scientific work ceased.

Results

All data from CTD casts and tows were validated and edited during the cruise, and sections produced of temperature and salinity using the package SURFER. ADCP surveys were also worked up on board, and mean transports computed through the two sections. In summary, the results showed:

Hydrographic Sections : The JONSIS line revealed a predominantly well mixed northern North Sea, with seasonal stratification not yet developed. There was some indication of Atlantic inflow, however, at stations 5-6. The three sections east of Shetland again revealed some inflow close to the coast, with surprising T and S sections along the ES3 line (60°50'N - Fig. 2 attached).— At present these sections are viewed with some doubt, and may demonstrate the weaknesses of the interpolation methods employed by the graphics package SURFER. The three stations along the Nolso/Flugga line revealed a core of high salinity water (35.38) above the 200 m contour.

Water Mass Indices:

Index	Derived from	T	S	SigT
APRIL 1991:				
Fair Isle Current	JONSIS 1-1a-2	7.34	34.99	27.36
Offshore Northern North Sea	JONSIS 5-10	7.23	35.30	27.62
Atlantic Water	Nolso/Flugga 1-2	8.22	35.37	27.53
20 YEAR MEAN (WINTER):				
Fair Isle Current	JONSIS 1-1a-2	8.0	34.89	27.17
Offshore Northern North Sea	JONSIS 5-10	7.4	35.18	27.49
Atlantic Water	Nolso/Flugga 1-2	9.8	35.29	27.21

Hence the northern North Sea was slightly cooler than general, but with increased salinities.

Coastal Zone Undulating CTD tows:

The towed CTD system worked extremely well during the cruise. In all seven "flights" were performed. This system should prove a valuable tool in future hydrographic studies, particularly of localised frontal features. Again the parameters describing the interpolation

routine within the program SURFER appeared to affect the resulting sections fundamentally. It is suggested that other members of the Laboratory who employ SURFER ensure that its parameter setup is suitable for the job they are using it for.

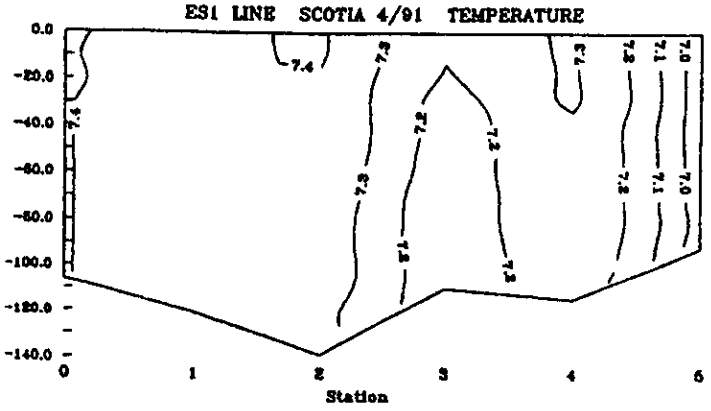
25 Hour ADCP Surveys:

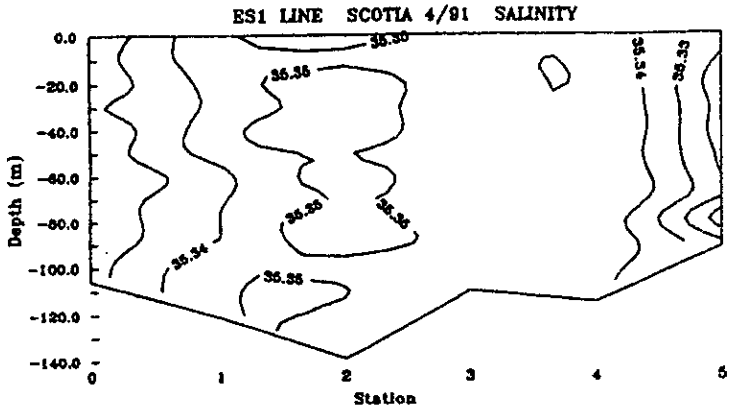
Two 25 hour ADCP surveys were performed - both east of Shetland. The northerly section showed weak flow towards the south of -0.58×10^4 m^3 s^{-1}. This same section exhibited a transport of 26×10^4 m^3 s^{-1} during September 1990 when the northern North Sea was vertically stratified. A section east of Mousa revealed a significant southerly flow of 20.1×10^4 m^3 s^{-1} over a 25 hour period. This may have been associated with the strong tides in this area, although a full analysis must await until meteorological data has been obtained.

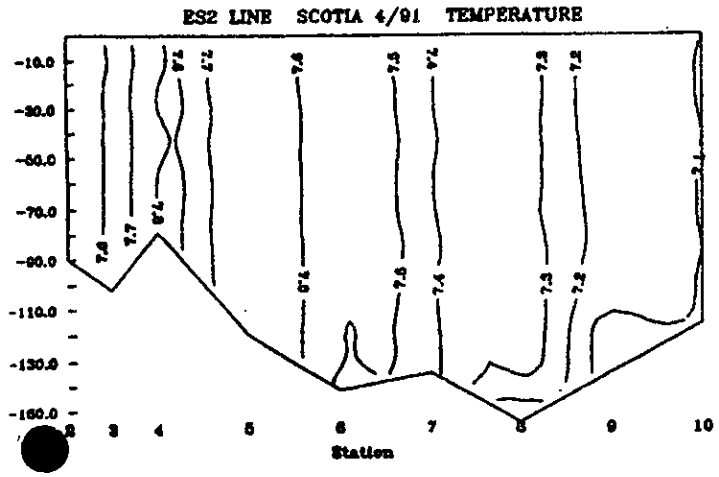
W R Turrell

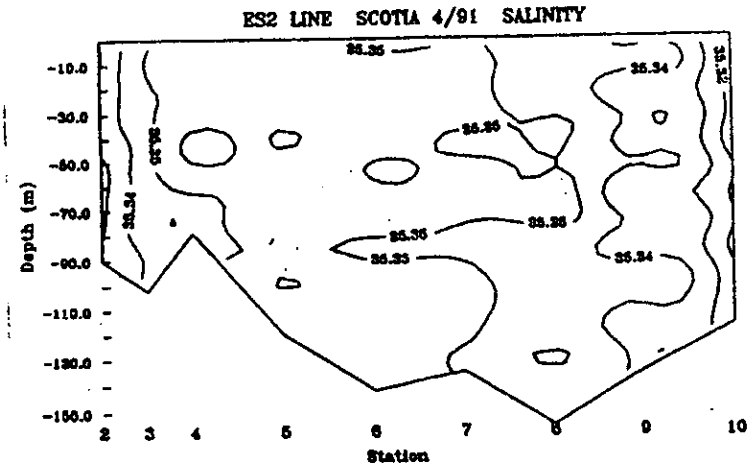
27 August 1991

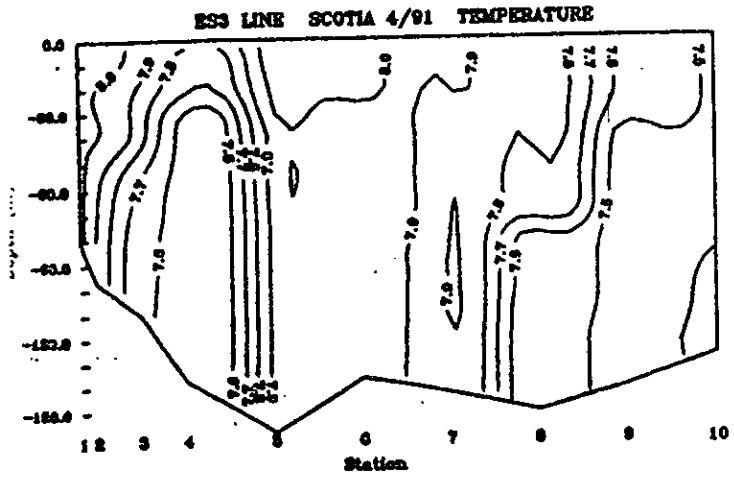
FIG 2

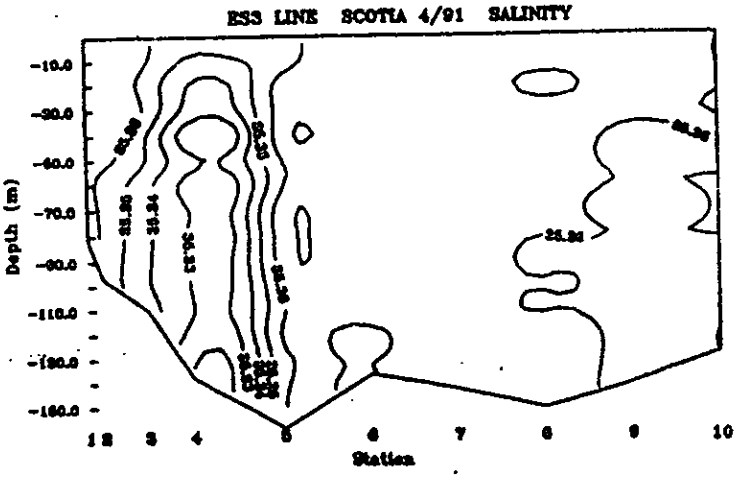

ES1 LINE SCOTIA 4/91 TEMPERATURE
Station


ES1 LINE SCOTIA 4/91 SALINITY
Depth (m)
Station


ES2 LINE SCOTIA 4/91 TEMPERATURE
Station


ES2 LINE SCOTIA 4/91 SALINITY
Depth (m)
Station


ES3 LINE SCOTIA 4/91 TEMPERATURE
Station


ES3 LINE SCOTIA 4/91 SALINITY
Depth (m)
Station