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MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND

1988 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 6
(PROVISIONAL: Not to be quoted without prior reference to the author)

STAFF

P A Gurbutt (24 June-15 July)
D S Kirkwood
E M Gmitrowicz
J W Read
J Wooltorton
M C Fulcher
S R Jones
A Watson (PML, 27 June-15 July)
E Fogelqvist (PML, 27 June-15 July)

R R Dickson (15 July-20 July)
E Shreeve (15 July-20 July)

DURATION

Left Lowestoft 1230h 21 June
Arrived Lowestoft 1230h 20 July
All times are Greenwich Mean Time

LOCALITY

North Sea (Yorkshire Coast) and North Atlantic (East Greenland, Denmark Strait and South Iceland)

AIMS

1. To lay two lines of four conventional current meter moorings off the Yorkshire coast en route to Iceland and to service these eight rigs on homeward leg.

2. To lay four complex rigs (conventional and S4 current meters plus thermistor chains) and the WAVEC wave measurement buoy in the centre of the HF radar overlap region on the homeward leg.

3. To recover the array of eight current meter moorings off East Greenland, each with two current meters per mooring, and to relay the eight moorings with three current meters per mooring, one SEACAT and two thermistor chains.

4. To work CTD and Freons section along the line of moorings off East Greenland and two parallel sections along "NORWESTLANT 3 and 4" if time and/or weather permits.

5. To work XBTs for MOD(N) at six hourly intervals throughout the cruise when depths greater than 200m.

6. To collect bulk samples of deep water off Greenland for ICES nutrient intercalibration work.

NARRATIVE

RV CIROLANA sailed from Lowestoft and proceeded to the Yorkshire coast and laid the two lines of current meter mooring (E-M, Figure 1a) before steaming to Aberdeen where P A Gurbutt was picked up from the pilot boat. RV CIROLANA then sailed to Reykjavik, firing XBTs en route. On arrival the ship was met by S Malmberg from the Icelandic Fisheries Laboratory, who had the SEACAT and nephelometer awaiting our collection. A Watson and E Fogelqvist (PML) joined the ship in Reykjavik in order to carry out the Freon analysis during the Atlantic part of the cruise (Figure 1b). The ship sailed on the 28 June towards the line of current meter moorings laid in 1987, stopping en route to test acoustic releases and CTD to be used during this cruise.

Seven out of the eight moorings were successfully recovered and eight moorings deployed. A line of 10 CTD stations was worked with water samples for nutrients and oxygen being taken at them all and Freons at nine. A bulk sample for the ICES intercalibration exercise on nutrients was also collected. On board analysis for Freaons 11, 12 and 113 revealed young water in a near bottom layer, identified as overflow water, and as the transit time of the overflow flow water from the Denmark Strait is probably only a month or so (based on current meter results), it was felt that the remaining time would be more profitably spent in trying to characterize the freon signature in the overflow water than in examining differences between the NORWESTLANT sections. After seeking permission from the Danish and Icelandic authorities, CTD stations for freons were worked in the Denmark Strait, near the ice edge, and in a line running down the slope and across into the Eastern Atlantic (following NORWESTLANT section 2).

On return to the North Sea, four moorings (E, F, G, H) deployed on the outward leg were serviced, before RV CIROLANA docked on the Tyne at 1015h 15 July to exchange scientific staff and pick up the WAVEC buoy, S4 current meters and thermistor chains.

Leaving the Tyne at 1505h, CIROLANA proceeded to her working area off Whitby, laying the IOS WAVEC buoy in moderate to heavy swell that evening. From 0830h to 1543h 16 July, the S-4 current meters were ballasted, the four complex moorings incorporating S-4's and thermistor chains were laid in a diamond pattern under the radar overlap zone. The ship then dragged from the outermost mooring (M) on the southern line of rigs whose toroid had been brought ashore in June shortly after its first deployment. The mooring was hooked first time and recovered without damage.

Between 0747h and 1407h 17 July, mooring M was relaid and moorings L, K and J were serviced and redeployed. CIROLANA then worked three closely spaced lines of 33 CTD stations normal to the coast to describe the front in the neighbourhood of the current meter array. These stations were completed by 1656h and the ship then worked a series of 9 repeat CTD lowerings at one station to investigate the short-term variability in the front's thermal structure under a strengthening flood tide. On completion at 1900h GMT 18 July, CIROLANA steamed for Lowestoft docking 1230h 19 July.

RESULTS

1. From the seven moorings successfully recovered from East Greenland, all current meters had full tapes and a preliminary analysis shows over 97% good data return. Most of the moorings, especially in the deeper layer near the slope showed a consistent south westward flowing current of 20-30 cm s-1 with maximum speeds of the order of 90 cm s-1. Figure 2 shows the progressive vector diagram from the deeper meter (1886m) on the third mooring away from the Greenland coast near the foot of the slope.

2. Eight moorings were successfully deployed with three current meters on each. Two moorings had thermistor chains spanning the interface between the cold bottom layer and the intermediate water above, four moorings had current meters with conductivity cells and one had the SEACAT instrument measuring temperature and conductivity.

3. The CTD profiles indicated the presence of a cold near bottom layer (Figure 3 - solid line temperature, dotted line salinity) and the corresponding freon-12 profile (dashed line) shows a decrease from the surface and an increase near this colder layer. The corresponding "freon age" (F12/F113 - solid line with dots) are approximately uniform throughout the water.

4. All nitrate, nitrite, phosphate and oxygen analyses were completed on board and 360 200ml samples were taken for the ICES collaborative study. A random sample of the latter show uniform levels of nitrate.

5. A total of 34 XBT dips were worked for MOD(N).

6. Off the Yorkshire coast, two offshore lines of 4 moorings each were laid, serviced and re-deployed after 3-4 weeks without loss or damage to the 15 current meters. An array of 4 complex moorings and one WAVEX buoy was deployed in support of the HF radar experiment. [Altogether this cruise, a total of 95 current meters were recovered or laid (29 recovered with 2 losses; 66 deployed)].

7. A grid of 34 CTD stations plus one multiple-lowering repeat station was worked across the Flamborough Front (work taken over from the CORYSTES cruise programme to permit her longer working-time off the Tyne).

We are glad to acknowledge the help of Dr S-A Malmberg (Marine Research Institute, Rejkjavik) and the Director, Icelandic Coastguard in so promptly arranging permission to extend our freon sampling into the Denmark Strait.

P A Gurbutt (SIC)
24 June-15 July

R R Dickson (SIC)
15 July-20 July

SEEN IN DRAFT: M J Willcock (Master)
R Graham (Fishing Skipper)

INITIALLED: RJP

DISTRIBUTION:

Basic List +
R R Dickson
P A Gurbutt
E Shreeve
D S Kirkwood
E M Gmitrowicz
J W Read
J Wooltorton
M C Fulcher
S R Jones
A Watson (PML)
E Fogelqvist (PML)

Included

PD

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Figures attached.

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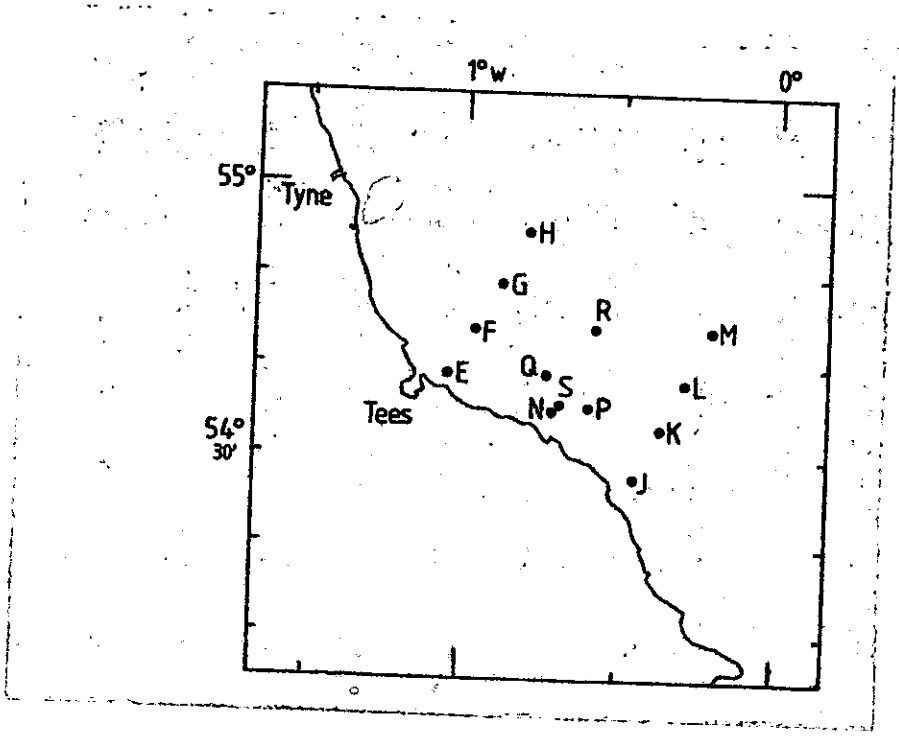
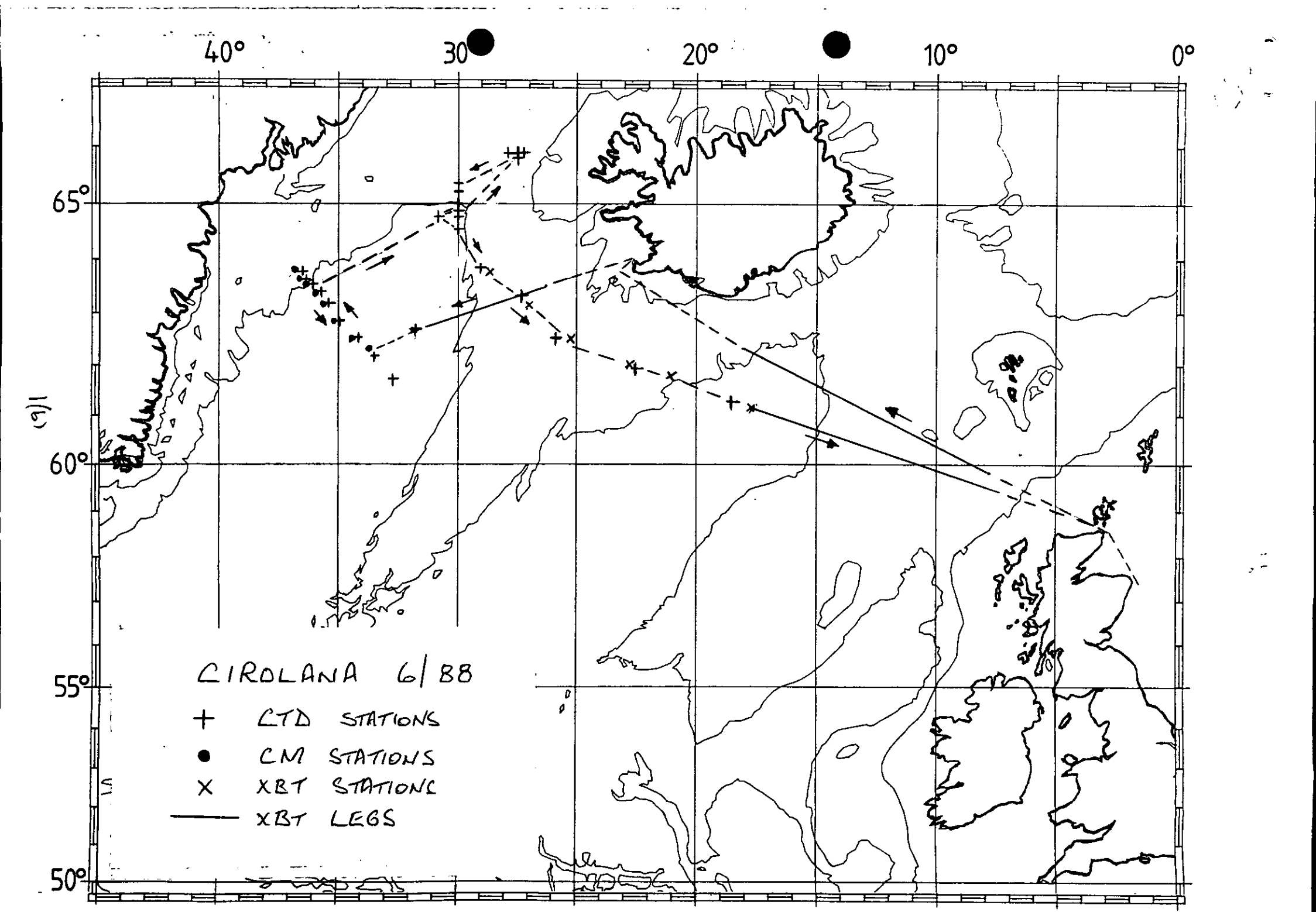
E Shreeve



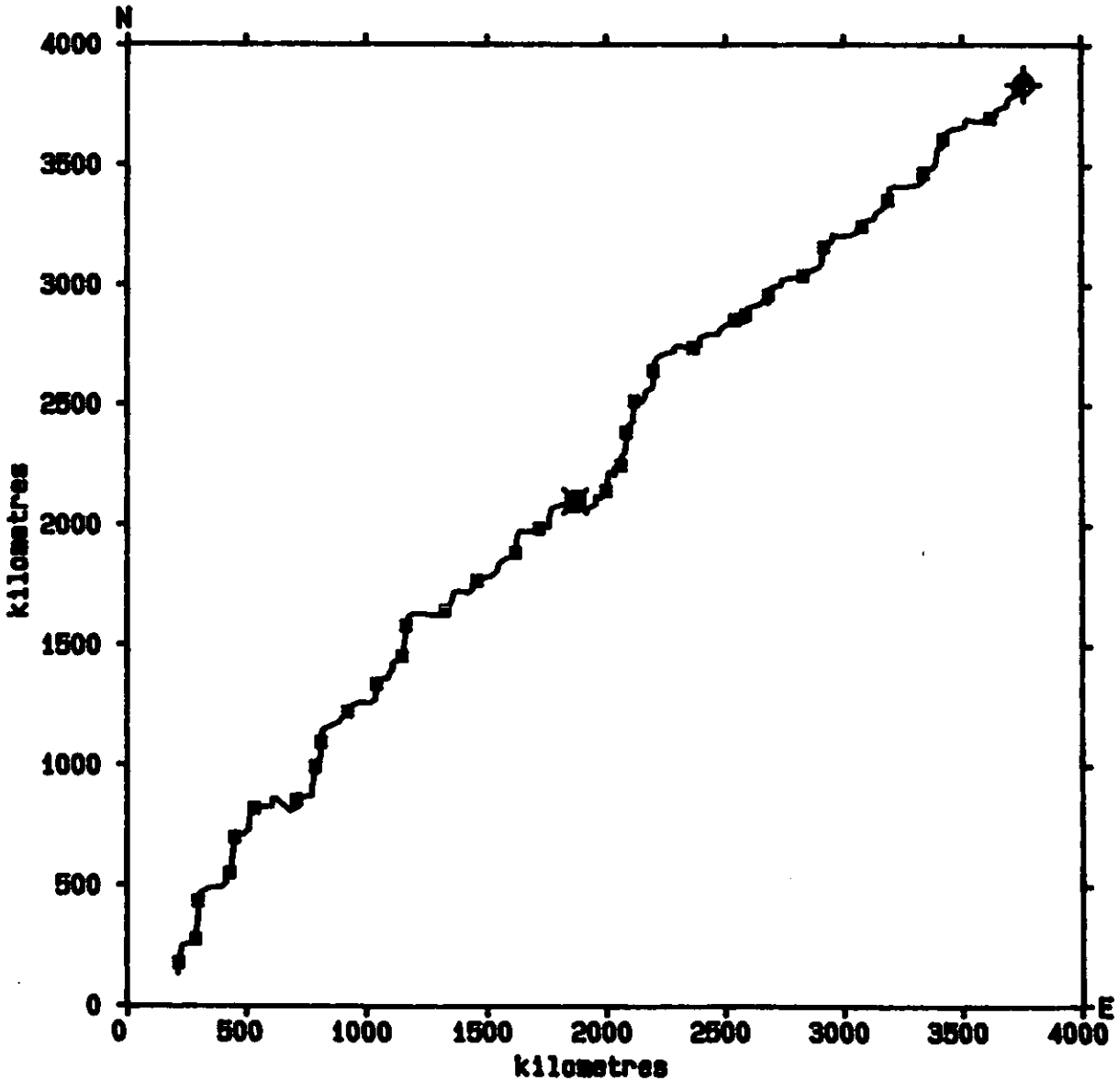
CIROLANA 6/88

CURRENT METERS

NE COAST


40°
30°
20°
10°
0°
65°
60°
55°
50°
CIROLANA 6/88
+ CTD STATIONS
● CM STATIONS
X XBT STATIONS
—— XBT LEGS

PROGRESSIVE VECTOR DIAGRAM OF CURRENTS AT 8703-2 METER 397
LOCATION = LAT 63 29.1N, LONG 38 17.3W, DEPTH = 1886 METRES
OBSERVATION PERIOD = 0647 27 JUN 87 TO 2347 29 JUN 88 (368.8 DAYS)
* EVERY 10.0 DAYS FROM 0647 27 JUN 87
✦ START OF PLOT
✖ START OF NEW YEAR
AVERAGING INTERVAL = 25.0 HOURS (25 POINTS)



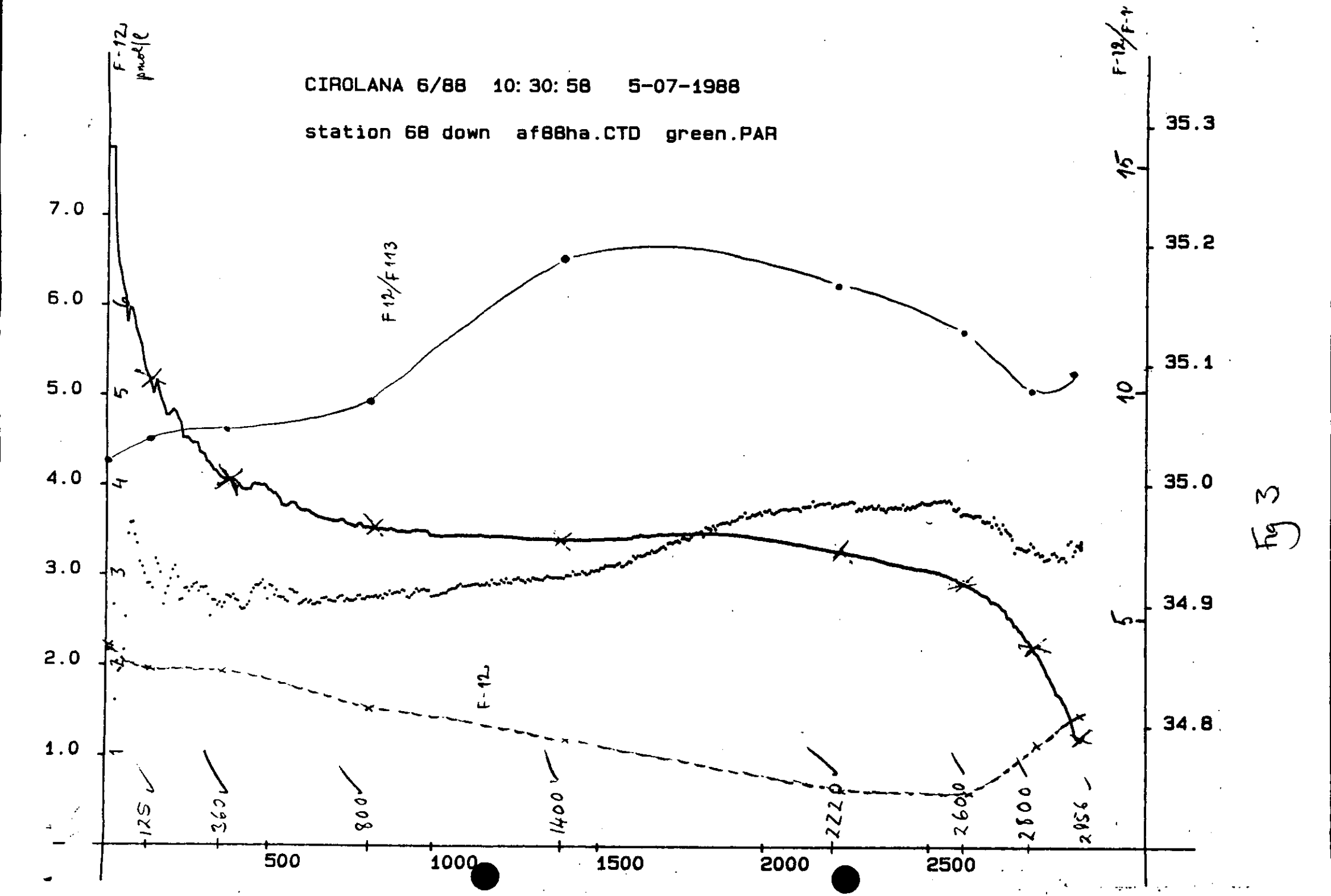

CIROLANA 6/88 10: 30: 58 5-07-1988
station 68 down af88ha.CTD green.PAR
F-12 pmol/l
F-12/F-11
F12/F113
F-12
7.0
6.0
5.0
4.0
3.0
2.0
1.0
35.3
35.2
35.1
35.0
34.9
34.8
15
10
5
500
1000
1500
2000
2500
125
360
800
1400
2220
2600
2800
2956

Fig 3

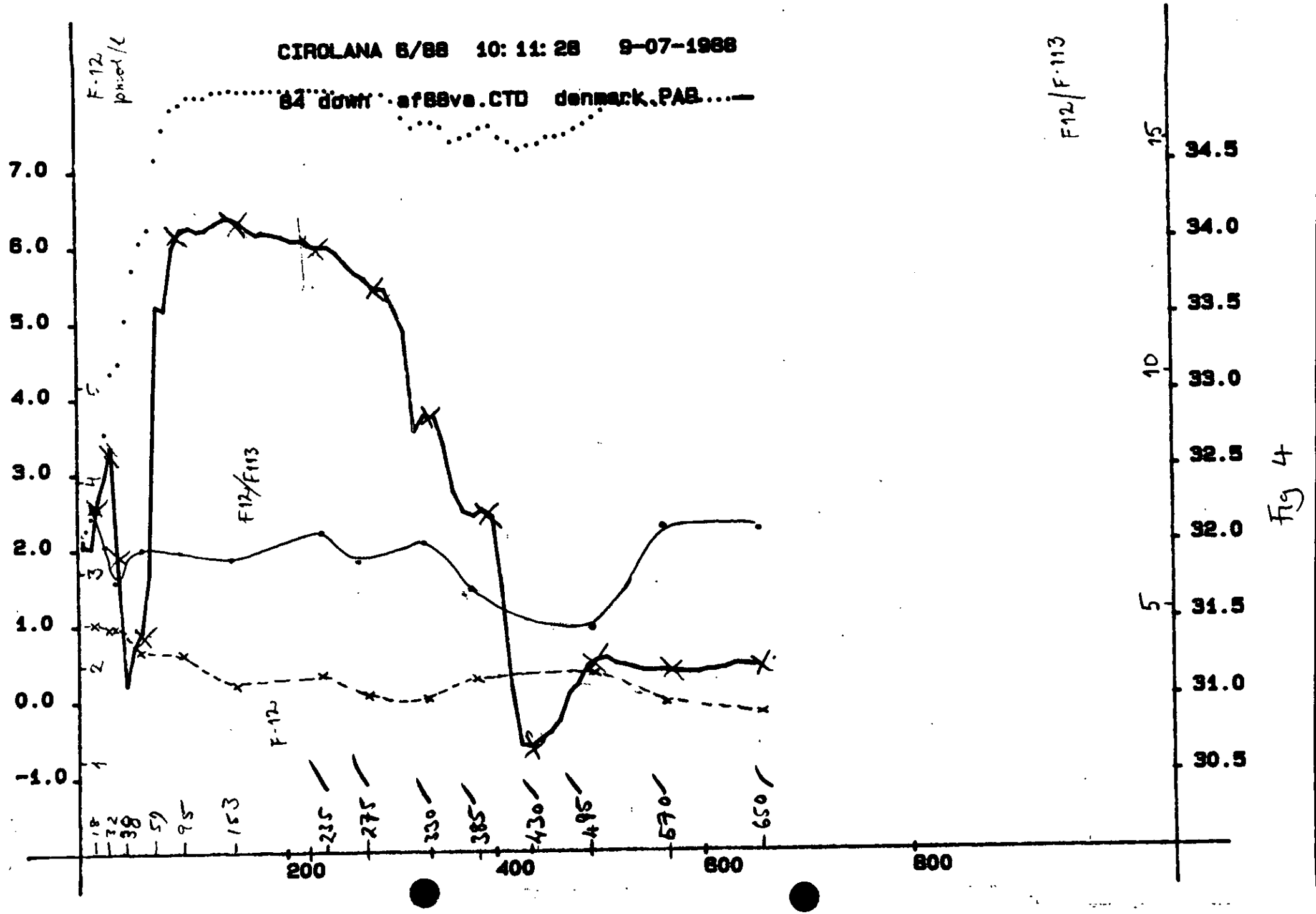

CIROLANA 6/88 10: 11: 28 9-07-1988
84 down afS8ve.CTD denmark.PAB
F-12 pmol/l
F12/F113
F-12
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
200
400
600
800
18
32
38
57
95
153
235
275
330
385
430
495
690
650
F12/F113
15
10
5
34.5
34.0
33.5
33.0
32.5
32.0
31.5
31.0
30.5

Fig 4