European River Ocean System
EROS-2000

R.R.S. Discovery - 203

Western Mediterranean
(2/7/93 - 2/8/93)
Cruise Report

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Contents

1. SUMMARY

The NERC-Plymouth Marine Laboratory has contributed, for the second time, the R R S Discovery in support of the EROS-2000 project in the Western Mediterranean Sea. A total of 35 scientists and technicians participated in the two legs of this Cruise. The objectives of this first leg were to investigate the exchange fluxes of nutrients, trace metals and organic matter between the Western Mediterranean basin and the Atlantic at the Straits of Gibraltar, and with the Eastern Mediterranean along the Straits of Sicily. A total of forty four casts were obtained at fourteen stations, with CTD/clean rosette system. The concentration and speciation of dissolved metals including Fe, Ni, Co, Cd, Pb, Zn, Cu, Al .were determined from surface to deep (2660 m) waters along a track from Gibraltar to Sicily. These results will be used to obtain exchange fluxes of these metals into the W Mediterranean. The particulate form of these metals were also sampled using the Stand Alone Pumps (SAPS). The distribution of nutrients (NO_3, NO_2, Si, NH_4, PO_4) was also determined at their nanomolar levels in order to map the severe biological depletion in these oligotrophic waters. Throughout, an undulating oceanographic recorder (UOR) was towed between all stations to obtain upper oceans sections of salinity, temperature, fluorescence and bio-optics. The photosynthetic status (production rates, nutrient limitation, light limitation...) of the phytoplankton was assessed using a novel US submersible Fast Flash Fluorometer being evaluated for the first time in the Mediterranean.

The objectives of Leg 2 were to investigate the biogeochemical cycling of the bio-essential elements of carbon, nitrogen and phosphorus along radial gradients from the Eutrophic Plume of the River Rhone, to the Oligotrophic gyre of the Balearic basin. A total of nineteen stations and sixty seven deep and shallow CTD casts were obtained along four radial sections. The chemical oceanography of biogases including O_2, H_2O_2, methylamines and dimethylsulphide were obtained using innovative techniques including chemiluminescence, fluorescence, and ion chromatographic techniques. There were seven *in situ* primary production experiments conducted with ^{15}N, ^{14}C isotopes, together with precision O_2 measurements in order to measure the balance between new production and regenerated production. A new *in situ* incubation/inoculation rig developed by Dandaneau was also deployed on three occasions in an intercalibration of production measurements. The inventories, river fluxes and molecular weight distribution of dissolved organic carbon (DOC) were determined using two intercalibrated HRCO-DOC systems on board the Discovery. The three dimensional form and chemistry of the Rhone Plume was investigated in a grid survey when the discharge of the Rhone was deflected by the Mistral into southerly direction. The SAP pumps were also deployed to filter *in situ* several hundred litres of sea water at up to 2500 m depth for particulate and dissolved organic and radio nuclide

elements. Finally, two Lagrangian drifter experiments were conducted to investigate the link between primary production of organic material and its vertical export and fate into the deep Mediterranean. This was achieved using a combination of traps, production rigs, and radionuclides disequilibrium measurements to measure fluxes and particle residence times. These studies will give us a quantitative insight into the impact of discharges of nutrients and pollutants on coastal process.

2. PERSONNEL

Name	Institute	Topic	Leg 1	Leg 2
Dr R Fauzi C Mantoura	PML	PS; Organics	✓	✓
Mr Malc S-Woodward	PML	Nutrients	✓	✓
Mr Stuart Gibb	PML/UEA	Methylamines	✓	✓
Mr David Price	PML/UP	Hydrogen peroxide	✓	✓
Mr Axel Miller	PML	Dissolved Organic C	✓	✓
Dr Nicholas J P Owens	PML	Nitrogen production		✓
Mr Tim Fileman	PML	Stand Alone Pumps	✓	✓
Dr Ray Barlow	PML	Pigments HPLC		✓
Mr John Stephens	PML	Nutrients	✓	
Mr Ian Bellan	PML	U O R	✓	✓
Ms Denise Cummings	PML	Pigments HPLC		✓
Dr Lei Chou	ULB	Aluminium,Trace metals	✓	
Dr Nick Morley	SUDO	Trace metals	✓	
Ms Sophie Tankere	SUDO	Trace metals	✓	
Ms Amanda Murphy	SUDO	Organic fluorescence	✓	
Ms Marie-Helene Cotte	ENS	Trace metals	✓	
Mr Yoon Yi-Yong	ENS	Trace metal speciation	✓	
Dr Stan van den Berg	LUDO	Metal electrochemistry	✓	
Mr Eric Achterberg	LUDO	Metal electrochemistry	✓	
Dr. Zbigniew Kolber	BNL, NY, USA	Fast Repetition Rate Fluorometry	✓	
Prof P J Le B Williams	UCNW	Production		✓
Mr Dominique Lefevre	UCNW	Microheterotrophy		✓
Ms Tracey Bentley	UCNW	Production		✓
Mr Jordi Dachs	Barcelona	DMS, micropollutants		✓
Mr Gunther Fengler	U Hamb	Diss Organic Carbon		✓
Ms Sabine Brasse	U Hamb	Amino acids		✓
Mr Jean-Carlos Miquel	IAEA Monaco	Sediment Traps		✓
Ms Natalie Kootz	U Hamb	Amino Acids		✓
Ms Natalie Simon	Roscoff	Picoplankton		✓
Mireille Pujo-Pay	Marseille	Particulate C,N, P		✓
Mr Pascal Conan	Marseille	14C productivity		✓
Mr Colin Day	RVS	Mechanical Engineer	✓	✓
Mr Gary White	RVS	Mechanics	✓	✓
Mr Derrick Rees	RVS	Mechanics	✓	✓
Mr Alan Taylor	RVS	Mechanics	✓	✓
Mr Andy Hill	RVS	Computing	✓	✓
Mr Darrell Phillips	RVS	Instrumentation	✓	✓

3 SPECIFIC OBJECTIVES

LEG 1

1 To determine the concentrations of dissolved trace metals (Fe, Mn, Zn, Cd, Ni, Cu, Pb, Co, Al) and their electrochemical speciation at the water exchange boundaries of the Straits of Gibraltar and Sicily.

2 To determine the trace metal composition of suspended particulate material sampled using large volume *in situ* filtration .

3 To investigate the supply and exchange of nutrients (NO_3, PO_4, SiO_2, NH_4) dissolved organic carbon (DOC) and radionuclides(^{234}Th..) at the above boundaries. To determine the nanomolar levels of NO_3, NO_2 and NH_4 using chemiluminescence and fluorescence techniques

4 To investigate the optical (UOR) & photochemical properties of phytoplankton pigments (HPLC) and dissolved organic matter (Fluorescence, DOC) and the generation of H_2O_2 during DOC turn over.

LEG 2

1 To map the surface distribution of nutrients, DOC, pigments, phytoplankton, oxygen, bacteria and suspended particulates along contrasting zones of the Rhone Plume and the Gulf of Lions.

2 To investigate the influence of onshore gradients in nutrient concentrations and composition in controlling the balance between new and total primary production.

3 To investigate the vertical sedimentation flux of phytogenic and nepheloid materials using traps, radionuclides tracers and pigment mole mass balance in mesotrophic and oligotrophic waters of the NWM.

5 To investigate the role of bacterial heterotrophy in the remineralisation of carbon and nitrogen in the NWM.

6 To intercalibrate the analytical figures of merit (Blanks, accuracy, precision) of 2 HTCO-DOC systems from European laboratories using biologically contrasting sea water and estuarine samples .

7 To evaluate the vertical and on-shelf distribution and cycling of DON, amino acids and volatile methylamines and their role in nitrogen cycling in the N W M.

4 METHODS

This EROS expedition will focus on the role of the water exchange and near shore and river inputs in the biogeochemcial mass balance of chemical elements in the N W Mediterranean.

A CTD rosette system fitted 12 x 10l clean GoFlow bottles, with chlorophyll fluorometer, oxygen electrode, transmissometer and under water light meter will be deployed to recover water samples which will be carefully split under ultra clean conditions for the following dissolved and particulate constituents:

4.1 Dissolved constituents

Salinity (Guildline calibration of CTD)
Temperature (Calibration with digital reversing thermometers)
Nutrients (Colorometric Auto analyser for NO_3, NO_2, NH_4, PO_4, Si, urea)
Oxygen (Precision Winkler titration, leg 2)
Methylamines & NH_4 (Ion Chromatography)
Trace NO_3 & NH_4 (Chemiluminescence, fluorescence)
Hydrogen peroxide (FIA-chemiluminescence)
Dissolved organic carbon and nitrogen (HTCO-DOC/N)
Dissolved organic fluorescence

Trace metals (Fe, Mn, Zn, Cd, Ni, Cu, Pb, Co, Al) by Solvent Extraction (ADCP) and analysis by GF-AAS with speciation by electrochemistry (ASV,CSV,..).

4.2 Particulate and biological constituents

Stand Alone Pumping SAPS (0.5 - 3 x 10^3 litres)
for pigment biomarkers , C H N (GFF)
for organic micropollutants(GFF)
radionuclides ^{234}Th (Azeopore)
particulate trace metals (Nuclepore)
GFF Filtration for pigments (chlorophyll's, carotenoids, HPLC)
POC/N (CHN Analyser) POP/PON
Primary Production (^{14} C *in situ* incubation)
New Production ($^{15}NO_3$ assimilation)
Lugols Preservation for phytoplankton
Bacterial numbers (AO fluor) production (^{3}H-thymidine)

4.3 Deployments

Bottle *in situ* incubation rigs (Dawn to Dusk and 24 hour) for primary production
Drifting sedimentation traps (2-3 day duration)
Towing of Undulating Oceanographic Recorder during passage
UOR sensor package and Fast Flash Fluorescence Profiling at all stations
Stand Alone Pumps (SAPS) *in situ* filtration on plastic coated wire down to 2500m
Fast Flash Fluorometer
'LET GO' in situ 14C incubation rig (Dandanette)

5 SCIENTIFIC REPORT LEG 1 (2 -14 JULY 1993)

Gibraltar - Monaco

5.1 Scientific log

NOTE: All the times recorded in this scientific log are Local Time, namely GMT + 2 hours. Times on data spreadsheets and CTD profiles produced from the on board computer are in GMT.

Tuesday 29 June 1993

PML party arrive to Gibraltar late pm.

Wednesday 30 June

Unload container, commence installation of equipment aboard Discovery. Liaise with European Community Colleagues on scientific programme, equipment deployment etc

Thursday 1 July

complete equipment trials, calibrations, sleep on board (o/b)

Friday 2 July

0845	(0645 GMT) Depart Gibraltar
1136	Shakedown Station at St D5 (36°00.8' N, 005°20.9' W)
1300	i/b
1314	Undulating Oceanographic Recorder (UOR) deployed whilst steaming to St D1
1841	UOR i/b at St **D1** (35°58.6' N, 06°10.4' W) Bottom depth 123 m
1945	CTD Cast **D1-1**. Trace metals & Biogeochemistry 6 depths down to 100m
2017	CTD i/n
2110	CTD cast **D1-2** Bioptics 6 depths down 70m
2138	CTD i/b
2144	Depart St D1-1 for St D2
2305	Arrive at **St D2** (35°59.00' N, 006°04.6' W)
2329	CTD Cast **D2-1** Biogeochemistry 7 depths down to 75 m)
2358	CTD i/b

Saturday 3 July

0300	at **ST D3** (36°57.7' N, 005°47.8' W)
0324	CTD Cast **D3-1** Reconnaissance profile to 220 m.

0345 CTD i/b

0648 **SAP D3-1** deployed to 120 m depth
vessel drifted into 80 m water; SAP gone aground
1020 SAP aborted: 1 SAP lost, 1 damaged 2 recovered

1111 CTD cast **D3-2** Bioptics 6 depths to 240 m
1144 CTD i/b

1251 CTD Cast **D3-3** Radiochemistry 6 bottles then ABORTED, due to electrical short in the conducting CTD cable
1330 aborted CTD i/b
cut off 90 m of 'bird caged' cable and reterminate

1540 repairs complete

1912 **SAPS cast D3-2**
2149 SAPS i/b

2236 CTD cast **D3-4** Biogeochemistry 12 depths down to 260 m
2327 CTD i/b

Sunday 4 July

0022 CTD cast **D3-5** Radio nuclide (6 depths) & Trace metals 6 depths down to 260m
0058 CTD i/b

0239 Depart St D3 for St D5 (bypassing D4)

0800 At **St D5** (36°01.0' N, 005°21.92'W) bottom depth 827 m

0808 CTD Cast **D5-1** Biogeochemistry 12 depths to 770m

CTD spinning ? & wire problems, failed electrical test. Cut off 100m and reterminate.

1413 CTD Cast **D5-2** Radionuclide & Trace metal 6 depth 736 m
1525 CTD i/b

1622 CTD Cast **D5-3** Bio optics, 6 depths to 240m
1657 CTD i/b

1709 Depart St D5 deploying UOR to St D7, bypassing D6
2301 UOR i/b

2358 At **St D7** (35°59.5' N, 004°04.8' W) bottom depth 1327m

Monday 5 July

0003 CTD Cast **D7-1** Bio-optics 6 depths to 250m
0039 CTD i/b

0130 CTD Cast **D7-2** Biogeochemistry, 12 depths to 1200 m
0246 CTD i/b

0357 CTD Cast **D7-3** Trace metals 12 depths to 1200m
0518 CTD i/b

0530 Depart St D7 for St D8
Deploy UOR
0741 reduced speed to 5 kts fog.
1147 resumed speed to 11 kts
1853 recover UOR
1920 UOR i/b
2112 relaunch UOR resume passage to St D8

Tuesday 6 July

in passage to St D 8
1238 Recover UOR

1317 At **St D8** (38°00.0' N, 002°00.0' W)
1326 CTD cast **D8-1** Biogeochemistry. Fault in CTD cable
1420 abandoned CTD cast. cut 1500 m off CTD cable

1752 CTD cast **D8-2** biogeochemistry. 12 depths down to 2406m
2030 CTD i/b

2122 CTD cast **D8-3** Bio-optics cast 250 m, 6 depths
2201 CTD i/b

2233 CTD Cast **D8-4** ; 12 depths down to 2455 m.

Wednesday 7 July

0048 CTD i/b

0056 Depart St D8 to St D9 deploy UOR
1319 recover UOR

1324 At ST **D9** (38°41.7' N, 004°41.5' W)

1324 CTD cast **D9-1**; Biogeochemistry, 12 depths to 2606m
1556 CTD i/b

1646 CTD cast **D9-2**, Bio-optics cast 6 depths to 250 m.
1712 CTD i/b

1742 CTD cast **D9-3**; Trace metals 12 depths to 2589 m
1947 CTD i/b

2026 Depart St D9, towing UOR to St D10.

Thursday 8 July

in passage D9 to D10 towing the UOR

Friday 9 July

In passage St D9 to D10 towing the UOR
0345 UOR i/b (37°57.4' N, 11°09.3' E)

0445 on **St D10** (37° 50.9' N, 11°15.14' E) bottom depth 460 m
0653 CTD Cast D10-1 (Biogeochemistry)bottle fail, recock
0701 CTD Cast **D10-1**(Biogeochemistry) 12 depth recast to 434 m. Nutrients,DOC,H_2O_2,Ammonia, methylamines, Pigments POC/N,
0749 CTD i/b

0822 CTD Cast **D10-2**; Bio-optics; 6 depths. F-F fluorometer + UOR module
0855 CTD i/b

0933 CTD Cast **D10-3**: Trace metals. 9 depths 450 m
1016 CTD i/b

1020 Deploy Zodiak fro remote. surface sampling of trace metals
1106 Zodiak i/b

1115 Depart St D10 for St D11

1230 At **St D11**(37°44.0' N, 011°27.0' E) (bottom depth 616 m)

1315 CTD Cast **D11-1** Bio-optics cast 8 depths down to 250 m
1330 Surface sampling of trace metals & H_2O_2 using Zodiak

1359 CTD i/b.

1502 CTD Cast **D11-2** Biogeochemistry 12 depths to 602 m for nutrients, ammonia, methylamines, DOC, H2O2, pigments POC/N
1515 Zodiak i/b.
1554 CTD i/b

1705 CTD Cast **D11-3** Trace metals 12 depths to 611m
1755 CTD i/b

1855 **SAPS Cast D11-1**: 550 m : Biomarkers, Metals, Gravimetric
200 m: Biomarkers
2100 SAPS i/b

2109 CTD Cast **D11-4** Bio-optics 6depths to 250 m
2136 CTD i/b

2219 CTD Cast **D11-5** Trace Chromium & DOC Cast
9 depths to 440m
2258 CTD i/b.

2306 **SAPS Cast D11-2**: 3 Pumps at 23 m for Biomarkers Tr Metals & gravimetric . 1 Pump at 90 m Biomarkers

Saturday 10 July

0118 SAPS i/b.
0120 Depart St D11 full speed ahead for St D14.
0830 At **St D14** (36°40.5' N, 012°19.09' E) S off Pantellaria Island (bottom depth 1287 m).
0941 CTD Cast **D14-1** Bio-optics 8 depths down to 150 m
CTD i/b

1041 CTD Cast **D14-2**: Biogeochemistry 12 depths to 1200m
1147 CTD i/b

1226 CTD Cast **D14-3** Trace Metals: 12 depths to 1297 m
CTD i/b

1430 **SAPS Cast D14-1;** 2 pumps at 1000m Tr Metals, gravimetric
2 pumps at 700m Tr Metals , gravimetric.
Surface Sea water sampling from Zodiak abandoned becauseof swell.
1830 SAPS i/b

1858 CTD Cast **D14-4** Bioptics cast to 250 m.
1947 CTD i/b

2000 **SAPS cast D14-1**; 2 pumps at 330 m Tr Metals & gravimetric
2 pumps at 30 m Tr Metals & Gravimetric
2230 SAPS i/b

2235 Depart St D 14 to St D12A

Sunday 11 July

0400 At St **D12A** (37°16.9' N, 011°57.9' E) bottom depth 85 m

0812 CTD Cast **12A-1**Tr metals + Biogeochemistry, 6 depths
0839 CTD i/b

0922 CTD Cast **12A-2** Bio-optics 6 depths
0953 CTD i/b

1019 Depart St D12A to St D12
1309 At St **D12** (37°34.0' N, 011°36.1' E) bottom depth 610 m

1315 launch Zodiak for remote surface sampling

1328 CTD cast **D12-1** Bioptics 250 m depth of profiling
1410 CTD i/b

1419 Zodiak i/b

1442 CTD Cast **D12-2** H2O2/trace metal cast (v.d.Berg) to 120m
1507 CTD cast i/b

1545 CTD Cast **D12-3** Biogeochemistry 12 depths to 622 m
1648 CTD i/b

1728 CTD Cast **D12-4** Trace metals 9 depths
1826 CTD i/b

1900 Departed St 12 direct to St D15 (no UOR tow at this stage)

Monday 12 July

1000 Deployed UOR and continue onwards to St D15
2340 Commence recovery of UOR

Tuesday 13 July

0016 UOR i/b
0037 Arrive at **St D15** (39°59.9' N, 006°00.0' E) bottom 2820 m

0055 CTD Cast **D15-1** Biogeochemistry, 12 depths down to 2750 m
0315 CTD i/b

0352 CTD **D15-2** Bioptics upper 250 m 8 depths
0429 CTD i/b

0506 CTD Cast **D 15-3** Trace Metals. 12 depths down to 2824 m
0739 CTD i/b

0809 Depart St D15 for D16 deploy UOR. Heavy swell/seas
1440 Commence recovery of UOR
1520 At St **D16** (41°00.8' N, 006°00.1' E) UOR i/b

1530 CTD **D16-1** Bioptics 9 depths down to 250 m
1610 CTD i/b

1659 CTD **D16-2** Biogeochemistry 12 depths down to 2500.
1908 CTD i/b

1940 **SAPS cast D16-1**, 2 pumps at 450 and 150 m depth, Trace metals.
2211 SAPs recovered, filters separated, pumps recharged

2224 CTD Cast **D16-3** Trace metals 12 bottles cast down to 2500m

Wednesday 14 July

0054 CTD i/b

0112 SAPS Cast D16-2 deployed: 2 pumps at 1400 & 2300m depth
0830 all SAPS i/b

0900 CTD Cast **D16-4** Bioptics down to 250 m
0940 CTDi/b

1311 Rubber Zodiak sampling
1355 Zodiak i/b

1403 Deploy UOR for 2 hr calibration tow
1545 Recover UOR, PES Fish; proceed for Monaco

Thursday 15 July

0700 Arrive at Monaco. end of Leg 1.
Leg 1 Scientist disembark together with minor equipment
Leg 2 scientist embark and fix equipment o/b

Friday 16 July

In port at Monaco. Continue equipment commissioning

5.2 Individual reports leg1

5.2.1 Amanda Murphy

CRUISE REPORT DISCOVERY 203 2-15 JULY 1993

Amanda Murphy
Dept. of Oceanography, Southampton University.
Supervisor: Dr. Mark Varney.
The fluorescence of DOM in seawater.

160 unfiltered seawater samples (100-150 ml) were collected during the cruise, to be analysed as soon as possible upon return to Southampton University. Samples were collected at all stations from all depths, with some surface samples also taken en route to individual stations, from the ships non-toxic seawater supply (approximately 5m depth). The samples were preserved by adding 50 ul of a 3% solution of HgCl2 to each bottle immediately upon sampling, and then storing the samples in the dark at 40 C. The samples will be analysed by fixed wavelength pair (excitation 315 nm, emission 410 nm), synchronous scanning, and 3D EEM fluorescence spectrometry.

The aim is to examine the nature and distribution of organic fluorophores in the Mediterranean Sea, with respect to geographical location and depth. Hopefully, analysis will be carried out on filtered and unfiltered samples, to try and assess the respective contributions to the overall fluorescence.

5.2.2 Sophie Tankere and Nicholas Morley

DISCOVERY CRUISE 203
INDIVIDUAL REPORT
Sophie Tankéré , Nicholas Morley
Department of Oceanography
University of Southampton UK

Trace Metal Fluxes in the Western Mediterranean

AIMS:
1 Take samples to measure total dissolved trace metals at all stations.
2 Take samples at some interesting stations to study speciation of trace metals by using CHELEX columns.
3 Take samples to measure particulate trace metals at some stations.

WORKING CONDITIONS:
I was working in a "clean" container. Working conditions were not the best: important sources of iron which could induce contaminations.

PROCEDURES
Samples for dissolved trace metals, were collected using Go-Flo bottles fitted on a rosette with a CTD instrumentation. Samples were filtered immediatly after collection using nitrogen pressure through Nuclepore filters (0.4 um pore diameter) in 1l polyethylene bottles. Samples for total dissolved trace metal measurement were acidified to pH of about 2 for storage. Samples for speciation studies went through chelex columns.

Samples for particulate were collected using SAPS and a pumping system and stored in petri dishes.

LIST OF SAMPLES

STATION 1 : Sampling for total dissolved trace metals (TDTM)
LAT 35o57.366 N
LON 06o15.661 W
DEPTH 125 m
CAST 1

No Go-Flo	Depth (m)	No TD
1	100	2701
3	60	2704
5	40	2702
7	25	2705
9	15	2703
11	10	2706

STATION 3 : Sampling for TDTM and particulate
LAT 35o57.710 N
LON 05o46.727 W
DEPTH 329 m
CAST 5

No Go-Flo	Depth (m)	No TD
1	254	2707
3	180	2710
5	119	2708
7	79	2711
9	39	2709
11	15	2712

PARTICULATE

No filter	depth(m)	sampler	volume(l)
F7	250	SAP	72.2
F8	15	PUMP	20
F10	15	PUMP	20

STATION 5: Sampling for TDTM
LAT 36o0'59.2" N
LON 05o22'14" W
DEPTH 745 m
CAST 2

No Go-Flo	Depth (m)	No TD
1	734	2713
3	400	2716
5	150	2714
7	80	2717
9	50	2715
11	20	2718

STATION 7: Sampling for TDTM, CHELEX speciation and particulate
LAT 35o58.721 N
LON 04o.719 W
DEPTH 1330 m
CAST 3

No Go-Flo	Depth (m)	No TD	No CHELEX	vol(ml)/chelex
1	1242.2	2719	2884	510
2	1009.4	2722	2885	510
3	802.4	2720	2886	510
4	604.9	2723	2887	510
5	410.2	2721	2888	510
6	182.5	2724	2889	510
7	166.1	2725	2890	500
8	150.2	2726	2892	500
9	121.3	2727	2894	500
10	80.5	2728	2891	500

11	50.3	2729	2893	500
12	19.8	2730	2895	500

PARTICULATE

No filter	depth(m)	sampler	volume(l)
F12	15	PUMP	40

STATION 8 : Sampling for TDTM and particulate
LAT 38o0.O22 N
LON O1o58.587 E
DEPTH 2466 m
CAST 4

No Go-Flo	Depth(m)	No TD
1	2456	2731
2	2000	2734
3	1000	2732
4	600	2735
5	400	2733
6	343	2736
7	241	2737
8	150	2740
9	85	2738
10	65	2741
11	42.3	2739
12	14	2742

PARTICULATE

No filter	depth(m)	sampler	volume(l)
F15	10	PUMP	28

STATION 9: Sampling for TDTM, CHELEX speciation and particulate
LAT 38o41.433 N
LON 04o41.417 E
DEPTH 2607 m
CAST 3

No Go-Flo	Depth(m)	No TD	No CHELEX	vol(ml)/CHELEX
1	2589	2743	2896	530
2	2000	2744	2897	500
3	1500	2745	2898	500
4	1000	2746	2899	530
5	600	2747	2900	530
6	441	2748	2901	500
7	230	2749	2902	530
8	160	2750	2903	500
9	124	2751	2904	500
10	96	2752	2905	500
11	73	2753	2906	500
12	15	2754	2883	530

PARTICULATE

No filter	depth(m)	sampler	volume(l)
F17	15	PUMP	40

STATION 10: Sampling for TDTM and particulate
LAT 37o49.757 N
LON 11o14.689 E
DEPTH 460 m
CAST 3

No Go-Flo	Depth(m)	No TD
1	447	2755
2	280	2756
3	210	2757
4	159	2758
5	125	2759
6	76	2760
7	50	2761
8	30	2762
9	10	2763

surface sampling 2764 (depth 0.5 m)

PARTICULATE

No filter	depth(m)	sampler	volume(l)
F18	15	PUMP	35
F19	0.5	HAND	20

STATION 11: Sampling for TDTM and particulate
LAT 37o44.459 N
LON 11o28.010 E
DEPTH 614.5 m
CAST 3

No Go-Flo	Depth(m)	No TD
1	610.7	2765
2	551	2766
3	450	2767
4	375	2768
5	274	2769
6	208	2770
7	177	2771
8	142	2772
9	85.5	2773
10	65.5	2774
11	34.7	2775
12	9.2	2776

suffface sampling 2777
PARTICULATE

No filter	depth(m)	sampler	volume(l)
F20	15	PUMP	30

F21	15	PUMP		25
F22	550	SAP	102.2	
F23	25	SAP	19.3	
F25	0.5	HAND		20

STATION 14 : Sampling for TDTM and particulate
LAT 36o40.50 N
LON 12o19.22E
DEPTH 1288m
CAST 3

No Go-Flo	Depth(m)	No TD
1	1311	2778
2	1213	2779
3	1010	2780
4	706	2781
5	403	2782
6	328	2783
7	252	2784
8	151	2785
9	110	2786
10	65	2788
11	42	2789
12	25	2790

PARTICULATE

No filter	depth(m)	sampler	volume(l)	
F24	700	SAP	122.1	
F26	1000	SAP	105.6	
F27	15	PUMP		35
F29	15	PUMP		37
F30	300	SAP	97.8	
F31	30	SAP	21.7	

STATION 12 A : Sampling for TDTM and CHELEX speciation
LAT 37o17.301
LON 11o58.143
DEPTH 85 m
CAST 1

No Go-Flo	Depth(m)	No TD	No CHELEX	vol(ml)/CHELEX
1	68	2787	2869	530
3	56	2791	2870	530
5	40	2792	2871	530
7	30	2793	2872	530
9	20	2794	2873	530
11	9	2795	2874	530

STATION 12: Sampling for TDTM, CHELEX speciation and particulate
LAT 37o34.117 N
LON 11o36.136 E
DEPTH 614 m
CAST 4

No Go-Flo	Depth(m)	No TD	No CHELEX	vol(ml)/CHELEX
1	646	2796	2861	610
3	404	2797	2862	610
4	202	2798	2863	610
5	176	2799	2864	610
7	146	2800	2865	610
8	130	2801	2866	610
10	35	2803	2867	610
11	15	2804	2875	610

PARTICULATE

No filter	depth(m)	sampler	volume(l)
F32	15	PUMP	42
F33	15	PUMP	40
F34	0.5	HAND	20

STATION 15: Sampling for TDTM
LAT 40o00.306'N
LON 06o00.111'E
DEPTH 2702m
CAST 3

No Go-Flo	Depth(m)	No TD
1	2825	2805
2	2785	2806
3	2000	2807
4	1500	2808
5	1000	2809
6	532	2810
7	312	2811
8	246	2812
9	130	2813
10	62	2814
11	37	2815
12	15	2816

STATION 16: Sampling for TDTM and particulate
LAT 40o56.275'N
LON 05o52.551'E
DEPTH 2660 m
CAST 3

No Go-Flo	Depth(m)	No TD
1	2656	2817
2	2616	2818
3	2400	2819

4	1800	2820
5	1400	2821
6	1100	2822
7	400	2823
8	220	2824
9	180	2825
10	150	2826
11	87	2827
12	20	2828

PARTICULATE

No filter	depth(m)	sampler	volume(l)
F35	450	SAP	107.7
F36	150	SAP	84.2
F37	1400	SAP	203.5
F38	2273	SAP	160.2
F39	15	PUMP	50
F40	15	PUMP	50

5.2.3 Yoon Yi Yong and Marie H. Cotte

The study of trace metal speciation

YOON Yi Yong and Marie H. COTTE
Institut de Biogeochimie Marine
Ecole Normale Superieure
Montroughe FRANCE

1L samples were taken at every stations of Discovery Cruise 203, 500 ml were acidified with suprapur HCl to measure total dissolved trace metals (Cu, Cd, Pb, Ni, Zn, Fe) in the laboratory of IBM at Montrouge and another 500 ml of samples were passed through Sep - Pak column and extracted by methanol and MilliQ water mixed solution on bord to measure the trace metal concentration complexed by hydrophobic organic matter using GFAAS measurement.

5.2.4 Lei Chou

DISCOVERY CRUISE 203 LEG 1
Cruise Report

Lei CHOU
Laboratoire d'Oceanographie Chimique
Universite Libre de Bruxelles

The objective of this study is to identify and to characterize the endmembers of different water masses with respect to dissolved and particulate trace metal contents at the southern boundaries of the western Mediterranean sea, i.e. Straits of Gibraltar and Sicily. Water samples were taken with teflon lined Go-Flo bottles and filtered through 0.4 um Nuclepore filter under nitrogen atmosphere with filter holder fitted directly at the outlet of the Go-Flo bottles. Filtrate has been acidified with Merck suprapure concentrated HCl (100 ul/100 ml) and will be analyzed for dissolved Al and Si. Samples have been collected at the following stations: (1) in the Strait of Gibraltar and adjacent area D1-1, D3-5 and D5-2, (2) in the Alboran Sea D7-3, (3) in the Strait of Sicily D10-3, D11-3, D12-4, D12A-1 and D14- 3, and (4) in the deep Western Mediterranean D8-4, D9-3, D15-3 and D16-3 (Station ETRO, Marion Dufresne cruise).

Suspended matter has also been collected with 0.4 um Nuclepore filters using Stand Alone Pumps: (1) in the Strait of Gibraltar at Station D3, (2) in the Strait of Sicily at Stations D11 and D14, and (3) in the Western Mediterranean at Station D16. Details of the SAP operations are given in the report of Tim Fileman. Samples will be analyzed for the following particulate trace metals: Pb, Fe, Mn, Co, Cr, Ni, Cu and Cd. Particulate Al will also be analyzed because it is a good indicator for particles of terrestrial origin. Particulate organic carbon will be determined in order to investigate the influence of biological activity on the particulate trace metal composition.

Finally radionuclide samples were taken for the Monaco group in the Strait of Gibraltar area at Station D3 and D5. Attempts have been made to collect pure surface Atlantic inflow water and deep Mediterranean outflow water.

D3-5 means Station D3 and Cast 5.

5.2.5 Constant M.G.van den Berg and Eric P. Achterberg

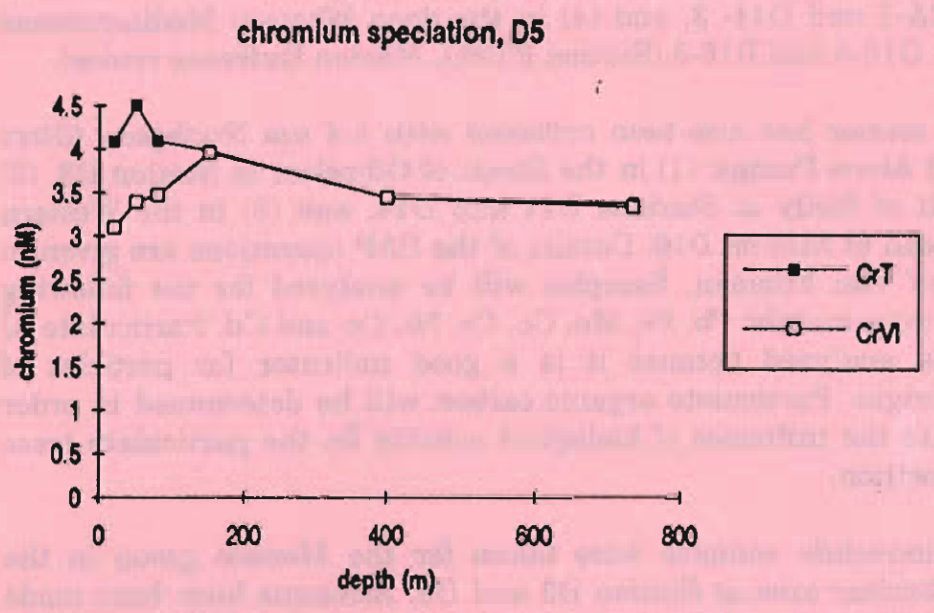
Metal speciation and budgets in the Western Mediterranean

Constant M. G. van den Berg and Eric P. Achterberg
Oceanography Laboratory, University of Liverpool

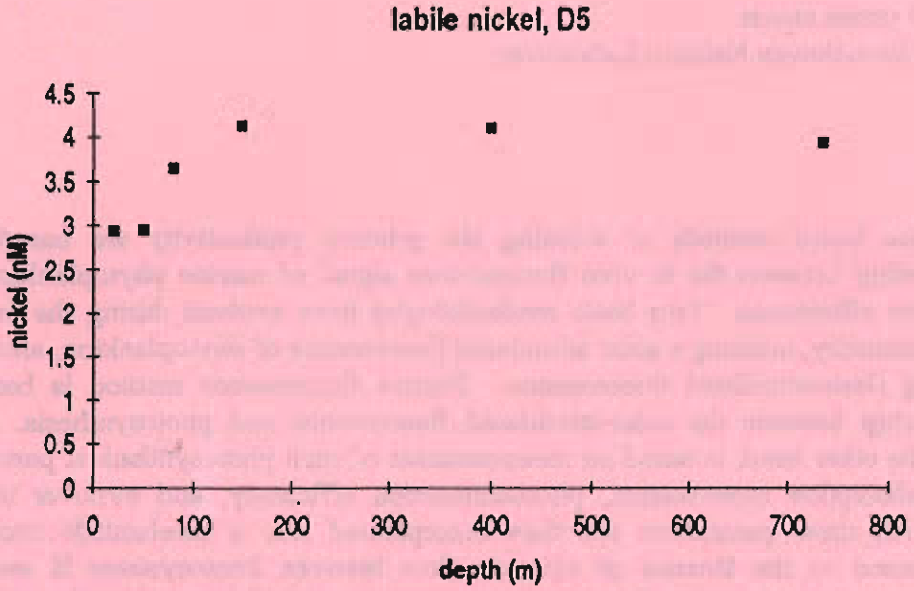
During this cruise we collected water samples both for on-board analysis of metal speciation, and for later determination of total metal concentrations in the laboratory in Liverpool. We determined (or attempted to determine) the speciation of chromium (VI and III) at all stations, and of iron of selected samples. The labile (reactive) concentrations of nickel and vanadium were determined on-board at most stations. An advantage of the on-board determinations of iron was that low iron levels could be used as an indication of successful (contamination free) sample collection and filtration.

Cathodic stripping voltammetry was used for the metal determinations using automated (pumped) batch methods.

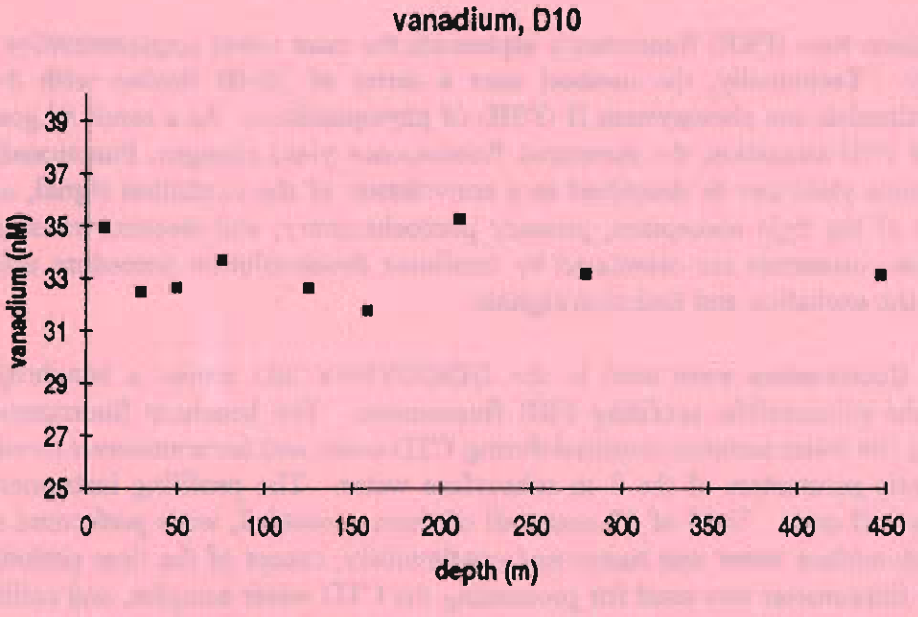
Chromium: preliminary results indicate the presence of CrIII in surface waters (top 100m) as shown in Fig.1.



Nickel: preliminary data indicate lower levels in the surface waters which originate from the N.Atlantic, whereas higher levels are present in the deeper Mediterranean waters, in agreement with our previous data from the Valdivia cruise(See Figure 2).



Vanadium: preliminary data indicate fairly constant levels between 33 and 35 nM, in line with the concentrations expected for sea water. The vanadium concentration in the Mediterranean is a little higher than in ocean waters due to the higher salinity (see Figure 3).



Acknowledgement

We thank the PSO, officers and crew of the Discovery for their assistance during the work on-board, and the Chef for the delicious food.

5.2.6 Zbigniew Kolber

DISCOVERY 203 cruise report
Zbigniew Kolber, Brookhaven National Laboratory
UPTON, N.Y.
U.S.A

Fluorescence based methods of assesing the primary productivity are based on a functional relationship between the in vivo fluorescence signal of marine phytoplankton, and their photosynthetic efficiences. Two basic methodologies have evolved during the last few years: passive fluorometry, utilizing a solar stimulated fluorescence of phytoplankton, and active fluorometry, using flash-stimulated fluorescence. Passive fluorescence method is based on empirical relationship between the solar-stimulated fluorescence and photosynthesis. Active fluorescence, on the other hand, is based on measurements of such photosynthetical parameters as the effective absorption cross-section, photoconversion efficiency, and turnover time of photosynthesis. All these parameters are then incorporated into a mechanistic model of photochemistry, based on the kinetics of electron flow between Photosystems II and I of phytoplankton. Basically, the passive fluorescence represents a black box approach, where the relationship between input (fluorescence) and output (photosynthesis) is functionally identified from the observed correlation betweeen these two signals, and finely tuned using such parameters as irradiance and tememperature. The active fluorescence, on the other hand, reperesents an analytical approach, where the components of the system are identified, and their parameters are directly measured. As a result, the active fluorometry is more robust in varying coditions of nutrients, trace metal, irradiance, and temperature in the world's oceans.

Fast Repetition Rate (FRR) fluorometry represents the most novel implementation of the active fluorometry. Technically, the method uses a series of 30-60 flashes with 5-10 us repetition rate to stimulate the photosystem II (PSII) of phytoplankton. As a result of gradually increasing level of PSII saturation, the measured fluorescence yield changes. Functionally, the observed fluorescence yield can be described as a convolution of the excitation signal, and the kinetic parameters of the light absorption, primary photochemistry, and electron transfer from PSII to PSI. These parameters are calculated by nonlinear deconvolution procedure using the recorded traces of the excitation and emission signals.

Two FRR fluorometers were used in the DISCOVERY 203 cruise: a benchtop FRR fluorometer, and the submersible, profiling FRR fluorometer. The benchtop fluorometer was used for processing the water samples acquired during CTD casts, and for continuous monitoring of the photosynthetic parameters of the 3 m subsurface water. The profiling instrument was used at CTD biooptical casts. Total of 17 casts, all of them succesfull, were performed during the cruise. The sub-surface water was monitored continuously, except of the time period when the benchtop FRR fluorometer was used for processing the CTD water samples, and calibration (total of about 90% of the cruise track).

Acquired data will be analyzed in terms of photosynthetic activity, spatial distribution of the photosynthetic parameters, and their ralationship with local hydrography.

5.2.7 E. Malcolm S. Woodward and John A. Stephens

DISCOVERY 203, (EROS 2000) FIRST LEG CRUISE REPORT.

E. MALCOLM S. WOODWARD and JOHN A. STEPHENS

PLYMOUTH MARINE LABORATORY

OBJECTIVES.

To investigate the nutrient structures for inflow and export of water to and from the North Western Mediterranean from the Atlantic Ocean through the Gibraltar Straits, and from the eastern Mediterranean through the Straits of Sicily.
To make intercomparisons with trace metal analyses taken at the same stations and depths to investigate interrelationships between the metals and nutrients.

METHODS

The six major nutrient species analysed were:
Nitrate: Nitrite: Phosphate: Silicate: Ammonia and Urea.
These were analysed according to the methods described in 'Nutrient analysis techniques', EMS Woodward, January 1992, Plymouth Marine Laboratory.
A nanomolar ammonia analysis method was deployed according to the method of Ron.Jones, 1992.
Trace nitrate and nitrite analysis was carried out using a chemiluminescent analysis technique according to Garside, 1983.

RESULTS

Nutrients were analysed for the following CTD stations:

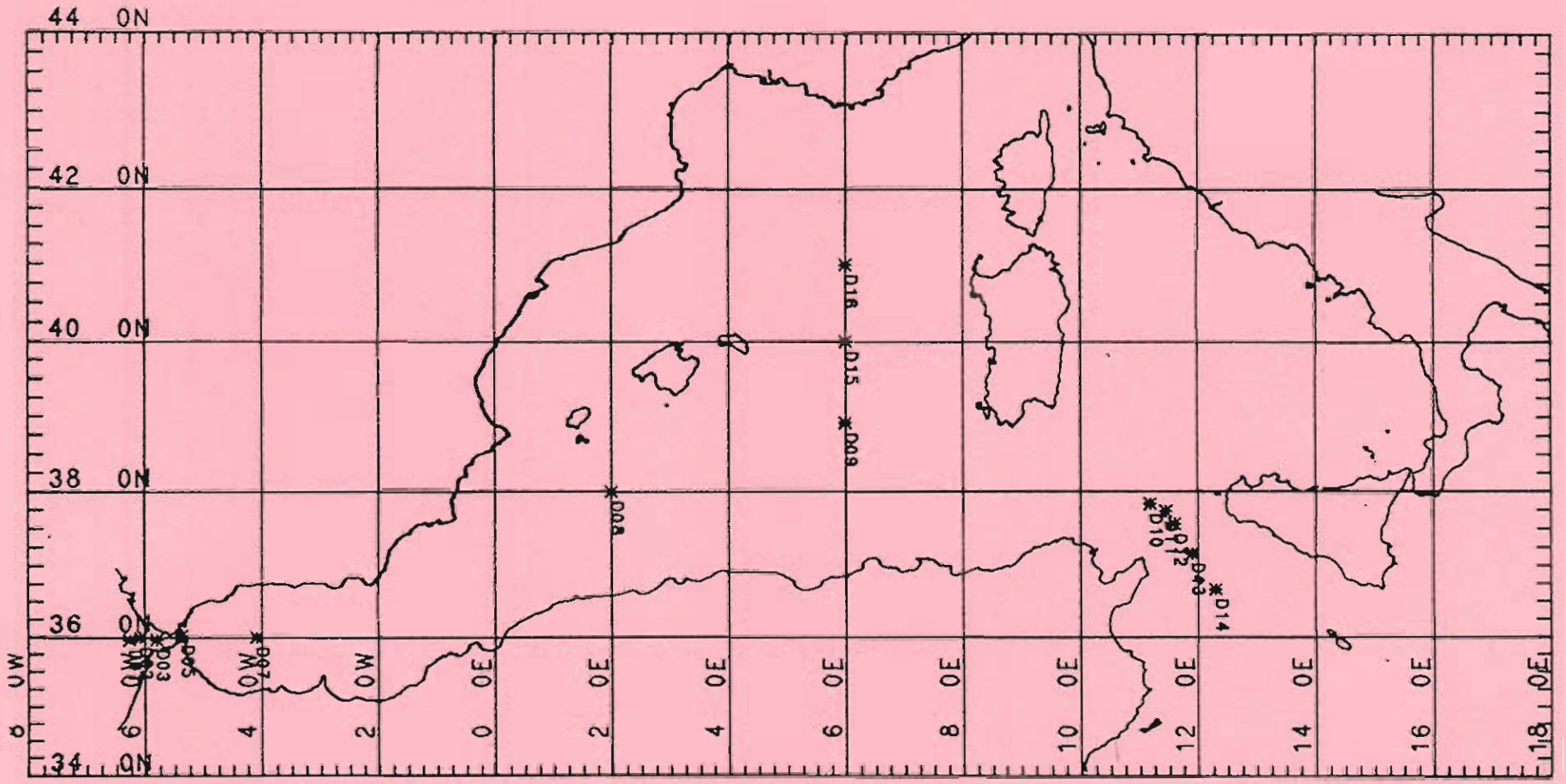
D1 (6 depths)	D2 (6 depths)
D3 - 1 (12 depths) (BGC cast)	D3 - 4 (12 depths) (BGC cast)
D3 - 5 (6 depths) (Metals)	D5 - 1 (12 depths)
D5 - 2 (6 depths) (Metals)	D7 -2 (12 depths)
D8 - 1 (12 depths) (BGC)	D8 - 4 (12 depths) (Metals)
D9 - 1 (12 depths) (BGC)	D9 -3 (12 depths) (Metals)
D10 - 1 (12 depths) (BGC)	D10 - 3 (9 depths) (Metals)
D11 - 3 (12 depths) (Metals)	D14 - 1 (8 depths) (Bioptics)
D14 - 2 (12 depths) (BGC)	D14-3 (12 depths) (Metals)
D12A-1 (12 depths) (GGC)	D12-3 (12 depths) (BGC)
D15 - 1 (12 depths) (BGC)	D15 - 3 (12 depths) (Metals)
D16 - 2 (12 depths) (BGC)	D16 - 3 (12 depths) (Metals)

Continuous on-line analysis was carried out for the major nutrients, semi-continuous on-line nanomolar ammonia analysis, and regular discrete nanomolar nitrate and nitrite analyses were carried during the following transects:

D5 (1510, 4/7/93)-(2130, 4/7/93) - D7.
D7 (1300, 5/7/93) - (2000, 5/7/93)
D8 (2245, 6/7/93) - D10(1700, 8/7/93)
D12 (0800, 12/7/93) - D16 (1340, 13/7/93).

RESULTS:
Generally the nutrients were as expected with the complicated overlying structures of Atlantic and mediterranean waters in the straits of Gibraltar, and the shallower shelf waters mixing in the Sicily straits. The area in between these sites was very nutrient deplete with surface nitrate concentrations in the region of 25 - 50 nmoles. The new nanomolar ammonia system for the first time has given us reliable ammonia concentration data for the water column, in an area only previously able to be expressed as less than 0.1 umoles. The surface concentrations for the transect work between Gibraltar, Sicily and the central western Mediterranean are all in the range between 20 and 50 nmoles.
Vertical profiles were analysed at all stations and we found a distinct structure in the ammonia profile with generally an increase in the ammonia concentrations at the chlorophyll maximum, Results of the CTD in the Gibraltar strait is shown below, alongside the nitrite and nitrate data, (Figure 1). There is a very distinct ammonia maximum at the chlorophyll maximum, with an associated nitrite maximum.

5.3 Figures



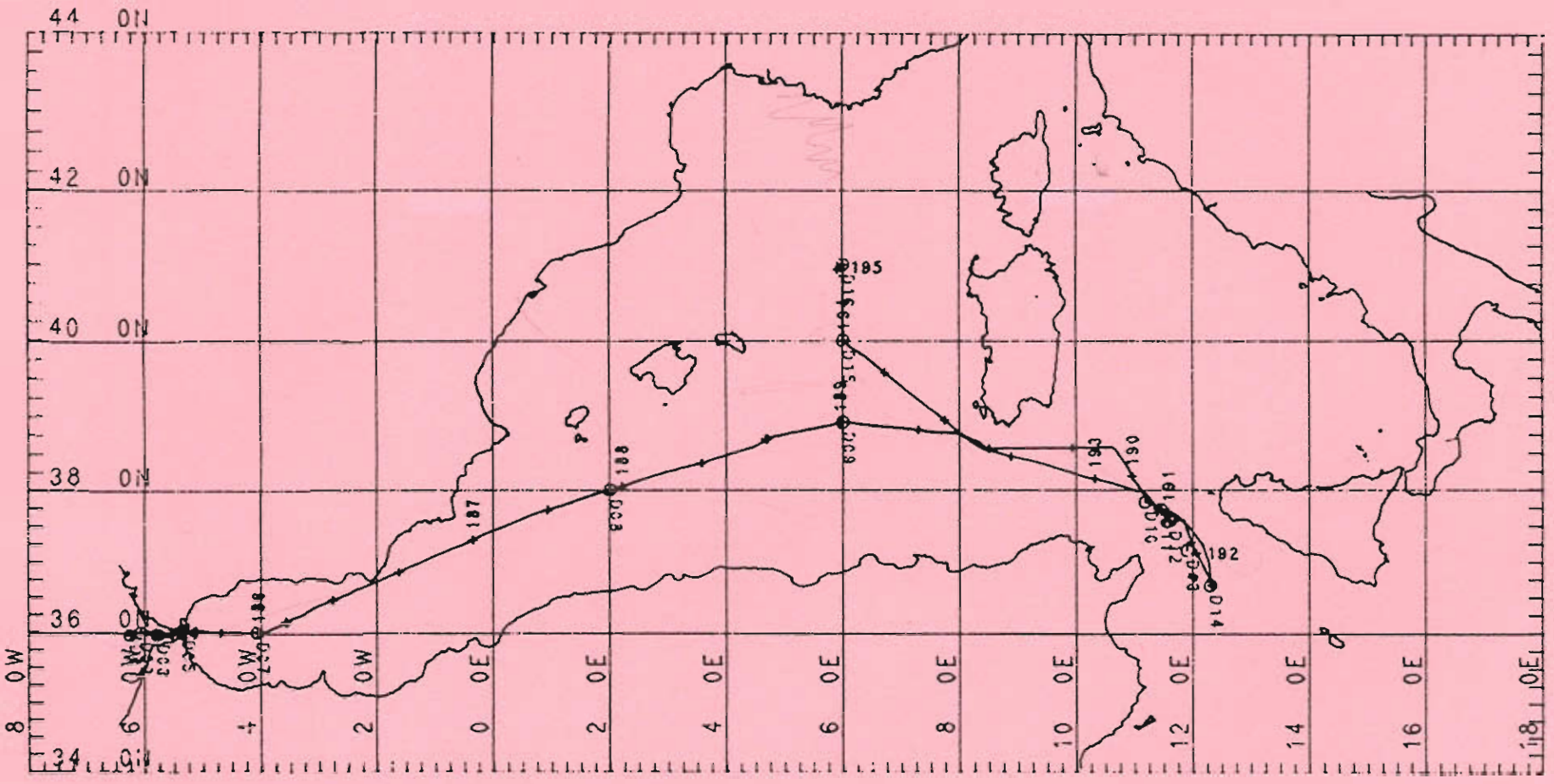
MERCATOR PROJECTION

GRID NO. 1

SCALE 1 TO 11000000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 40

Discovery 203/ EROS 2000/ Mantoura Leg 1 Track



MERCATOR PROJECTION

GRID NO. 1

SCALE 1 TO 11000000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 40

Discovery 203/ EROS 2000./ Montoura Leg 1 Track

6 SCIENTIFIC REPORT LEG 2 (17 JULY -2 AUGUST)

Monaco-Nice

6.1 Scientific log

NOTE: All the times recorded in this scientific log are Local Time, namely GMT + 2 hours. Times on data spreadsheets and CTD profiles produced from the on board computer are in GMT.

Saturday 17 July

0600 Depart Monaco proceed for St MA-1 (same as D16 in Leg 1) slowed down due to Fog.

1848 **Shakedown station** (41° 39.0' N 06° 21.8' E) PES fish o/b
CTD cast to 300 m, preliminary samples for calibration etc.
1958 CTD i/b

1942 UOR deployed at 4 kts towards MA1

Sunday 18 July

0021 UOR i/b

0030 At Station **MA1** (40° 59.5'N 06° 00.1' E) bottom depth 2614 m

0035 CTD Calibration cast: **MA1-1**
0111 CTD i/b

0150 Deployed Sediment Traps at 100m and 200 m depth
0234 completion of sediment trap deployment

0306 CTD production cast **MA1-2**, 60 l at 10 & 15 m
0323 i/b

0344 CTD Production cast **MA1-3**, 60 l at 24 & 50 m
0356 i/b

0410 CTD Production cast **MA1-4**, 60 l at 65 & 95 m

0432 CTD Special cast **MA1-5** H_2O_2 12 depths 12 m
0450 CTD cast i/b

0542 Commence deployment of production rigs
including standard ^{14}C, O_2, ^{15}N & 'LETGO' ^{14}C system

0628 Rig deployment completed

0700 CTD Cast **MA1-6 Deep** Biogeochemistry 12 bottles 200-2500m
0908 i/b; clean subsampling .

1006 CTD Cast **MA1-7 Shallow** Biogeochemistry 12 bottles 0-200m including UOR package
1039 CTD i/b clean subsampling as per Figure 1.

1140 CTD Cast **MA1-8**, Thymidine Productivity 30 l at 9, 74, 114 m
1211 CTD i/b

1252 CTD Cast **MA1-9** (NO_2 max & H_2O_2) 12 bottles upper 120m
1325 i/b

1404 CTD Cast **MA1-10** (Picoplankton) 60 l at 10 & 75 m depth
1436 CTD i/b

1522 CTD Cast **MA1-11** (Trap cast) 12 bottles to 120 m depth
1547 i/b

1620 Zodiak deployed to tow rigs apart

1622 CTD Cast **MA1-12** (Trap cast) 20 at 150, 175, 200 m, 10 l at 70, 80, 90 , 120 m
1647 CTD i/b

1800 **SAPs** cast, 2 pumps at 10 & 35 m depth for biomarkers, and radionuclides

1932 SAP i/b

1950 CTD Cast **MA1-13** (H_2O_2) 12 depths to 120 m
2024 CTD i/b

2235 **SAPS** profiling 2 pumps to 50 & 70 m depth for biomarkers and radionucliides

Monday 19 July

0012 SAPS i/b

0027 CTD Cast **MA1-14** (H2O2) 12 depths
0052 CTD i/b

0430 CTD Cast **MA1-15** Sampling water for Deck incubation (Conan)

0438 CTD i/b

0542 Recover Productivity rigs
0550 Rigs i/b

1030 CTD Cast **MA1-16** (Trapping cast) 5 at 20 l, 2 depths at 10 l
1103 i/b

1111 CTD Cast **MA1-17** (Trapping cast) 9 depths at 10 l
1129 i/b

1253 CTD Spcial cast **MA1-18** (NO_2 max) Cruzado, 12 samples at high resolution 2 -83 m depths
1311 i/b

1355 CTD Special cast **MA1-19** deep (1750 m) DOC. 9 depths
1543 i/b

1543 **SAP**s cast 2 pumps 100 & 300m depth for biomarkers and radionucliides
1833 SAPS i/b

1855 CTD **MA1-20** 6 bottles to 120 m depth
1922 i/b

2111 **SAPS** cast 2 pumps at 1100 and 2000 m depth for biomarkers & radionuclides

Tuesday 20 July

0304 SAPS recovery i/b

0327 CTD Production cast **MA1-21** 60 l at 5 & 10 m
0348 CTD i/b

0408 CTD Production cast **MA1-22**, 60 l at 20 & 50 m
0417 CTD i/b

0430 CTD Production cast **MA1-23**, 60 l at 75 & 90 m depth
0443 CTD i/b

0530 commence deployment of productivity rig
0628 complete deployment of productivity rigs.

1043 CTD **MA1-24**, Special CTD cast ultrafiltration
1105 CTD i/b

1204 CTD Cast **MA1-25**, Biogeochemistry 0-200 m 12 bottles

1243 CTD i/b

1336 CTD Cast **MA1-26**, Biogeochemistry 12 bottles 200-2500 m
1548 CTD i/b

1624 Commence recovery of **Sediment Trap**
1700 Trap i/b

2030 Zooplankton net o/b
2052 Zooplankton i/b

2116 Grappled Production rig
2152 Production gear i/b

2201 **Depart St MA1 for MA9** towing UOR
Force 8 to 9 winds, swell , heavy seas. Decreased vessel speed non undulating UOR

Wednesday 21 July

in passage to St MA9 during Mistral winds from the N/NW

1408 Recovered UOR

1731 UOR overboard resumed 10 kts
1945 commenced recovery of UOR

2100 at **MA9** Roustan Buoy (43 17.7' N 04 48.8'E) bottom depth 55m

2115 CTD Profile **MA9-1** 59 m out of Rhone plume
2130 CTD i/b

2139 CTD Profile **MA9-2** within Rhone plume
2155 CTD i/b hove to overnight

Thursday 22 July

0305 CTD Production cast **MA9-3** 60 l at surface & 7 m depth
0320 CTD i/b

0334 CTD Production Cast **MA9-4** 60 l at 10 15 m depth
0343 CTD i/b

0355 CTD production Cast **MA9-5** 60 l at 20 and 40 m depth
0406 CTD i/b

0416 Zooplankton o/b (Stuart)
0433 i/b

0533 Commence deployment of production rigs
0557 Production rigs deployed

0903 CTD Cast Thymidine **MA9-6**, 30 l at 3, 30 40 m depth
0917 CTD i/b

1130 CTD Cast **MA9-7** Biogeochemistry 20 litres at 6 depths out of plume
1208 CTD i/b

1345 CTD Cast **MA9-8** Biogoechemistry 20 litres at 6 depths within plume
1355 CTD i/b

1415 **SAPs** cast at 8 and 30 m depths Biomarkers & Carbon
1520 SAP i/b

1554 CTD special Cast **MA9-9** (H_2O_2) 6 depths
1611 CTD i/b

2127 Prodcution rig grappled
2154 Rig i/b

fitted submersible pump for surface (2m) sampling during plume mapping
Nutrients on line; S, T, Fluor logged
Approach position 2 nm East of SE corner of Plume Grid

2354 Deploy UOR at 4 kts
commence grid Stations 1 - 25 (see table xxx)

Friday 23 July

0600 completed Plume Grid
0700 UOR i/b

Postponed the Zodiak trip to Rhone Estuary
1000 Deployed UOR. Passage MA9 to MA2
1934 arrive at MA2, UOR inboard
Position designated St **MA2** (41°42.0'N, 05°36.4'E)

1951 CTD Cast **MA2-1** Biogeochemistry 2431 m bottom. 12 bottles 0-200 m
2025 CTD i/b

2117 CTD Cast **MA2-2** Biogeochemistry 2431 m 12 bottles 200-2466m depth

2310 CTD i/b
Depart MA2 for MA3

Saturday 24 July

0221 Arrive St **MA3** (42°10.0'N, 05°22.'E)

0308 CTD Cast **MA3-1** Production 60 l at 20 and 5 m
0331 i/b

0354 CTD Cast **MA3-2** Production; 60 l at 40 & 50 m
0410 i/b

0429 CTD Cast **MA3-3,** Production ; 60 l at 60 & 80 m
0443 i/b

0610 Production Rigs deployed

0659 CTD Cast Special Picoplankton **MA3-4** at 5 & 53 m
0718 i/b

0813 CTDCast Special Thymidine **MA3-5** at 80. 57. 5 m
0813 i/b

0945 CTD Cast **MA3-6** Deep Biogeochemistry 12 depths 150-2320m
1148 i/b

1250 CTD Cast **MA3-7** shallow Biogeochemistry 12 depths to 150m
1325 i/b

1250 Deploy Zodiak to inspect 'LET GO' rig
1412 Zodiak i/b; LET GO Spar parted & rig lost

1412 Depart for MA4
1600 Arrive **MA** 4 (42°26.7'N, 05°14.1'E) bottom 2136 m

1603 CTD Cast **MA4-1** Shallow Biogeochemistry 12 depths 0-150m
1641 i/b

1727 CTD Cast **MA4-2** Deep Biogeochemistry 12 depths 150-1995m
1924 CTD i/b

2107 Production Rig grappled
2121 Rig i/b

2130 Depart MA3 for MC1 Towing UOR

Sunday 25 July

0510 Passing through **MC1** (42°00.0'N, 03°41.88'E) depth 990m
0618 Completed return to MC1 & recovery of UOR
0614 UOR i/b

0704 CTD Cast **MC1-1**Single Biogeochemistry 12 depths to 988 m
0815 CTD i/b

0848 Depart MC1 towing UOR to MC2
1119 Comm recovery of UOR

1200 At St **MC2** (42°18.0'N, 03°58.24'E) bottom depth 1350m

1205 CTD Cast **MC2-1** single Biogeochemistry 0-1337 m
1330 i/b

1335 Depart for St MC3 towing UOR
1630 pass through MC3 and UOR recovered

1647 At St **MC-3** (42°37.7'N, 04°13.5'E) bottom depth variable 742 m

1651 CTD Cast **MC3-1** single Biogeochemistry 0 - 778 m 12 depths
1756 i/b

1759 Depart, steam for ST MC4 towing UOR
2050 UOR recovered in vicinity of MC4

2120 At St **MC-4** (42°55.6'N, 04°29.8'E) bottom depth 480 m

2124 CTD Cast **MC4-1**single Biogeochemistry 12 depths 0-482m
2215 i/b

2218 Depart for St MA5

Monday 26 July

0154 At St **MA-5** (42°44.0'N, 05°05.'E) bottom depth 1592 m

0305 CTD Cast **MA5-1**Production; 60 l at 5 & 15 m
0330 i/b

0344 CTD Cast **MA5-2** Production 60 l at 19 & 30 m
0400 i/b

0418 CTD Cast **MA5-3** Production; 60 l at 47 & 80 m
0435 i/b

0559 Production Rig deployment completed

0700 CTD Special cast **MA5-4** Picoplankton 60 l 5 & 45 m
0725 i/b

0809 CTD Special cast **MA5-5** Thymidine 30 l 5, 50 & 80 m
0837 i/b

1012 CTD Cast **MA5-6** Deep Biogeochemistry 200-1550 m
1140 CTD i.b

1200 Production rig parted from Dhan, proceed to recover
1330 recovery of Dhan, Rig and completed, reconnected and redeployed

1400 CTD Cast **MA5-7** shallow Biogeochemistry 12 bottles 0-200m
1435 CTD i/b

1537 CTD Cast **MA5-8** Special cast
1610 i/b

2128 Production Rig grappled & recovered

2150 Plankton net deployed

2214 Depart St MA5 towing UOR to MF1

Tuesday 27 July

0238 passed St MF1 & comm recovery of UOR
0304 UOR Recovered

0700 at St **MF1** (42°45.1'N, 05°59.66'E) 2400 m depths

0706 CTD Cast **MF1-1**Deep Biogeochemistry 12 depths 150-2434m
0910 i/b

0958 CTD Cast **MF1-2** Shallow Biogeochemistry 12 depths 0-150m
1035 i/b

1043 Depart ST MF1 towing UOR for St MF2
1309 UOR i/b

1343 at ST **MF2** (42°55.7'N, 05°35.6'E) bottom depth 1344 m

1346 CTD Cast **MF2-1** single Biogeochemistry 0-1325 m
1516 i/b

1527 Depart St MF2 towing UOR for St MF3
1803 UOR i/b

1832 at ST **MF-3** (43°06.78'N, 05°12.18'E) bottom 230 m

1833 CTD Cast **MF3-1** Biogeochemistry 12 depths 0-234 m
1916 i/b

1941 Depart ST MF3 towing UOR towards MA9 (Roustan)
2110 UOR i/b

2158 CTD **MA9-10** Rhone surface outflow; DOM ultrafiltration
2218 i/b

2220 Depart MA9 for MA7
2356 Hove to **MA7** (43°05.8'N, 04°56.41'E) bottom depth 111 m

Wednesday 28 July

0309 CTD Cast **MA7-1** Production 60 l at 1 & 10 m
0325 i/b

0342 CTD Cast **MA7-2** Production 60 l at 20 & 40m
0353 i/b

0417 CTD Cast **MA7-3** Production 60 l at 60 & 80 m
0431 i/b

0536 Commence deployment of Production rigs
0553 Rigs deployed

0703 CTD Cast **MA7-4** Picoplankton 60 lat 5 & 60 m depth
0719 i/b

0807 CTD Cast **MA7-5** Thymidine 30 l at 1, 5 & 65 m depth
0808 i/b

1000 CTD Cast **MA7-6** Biogeochemistry 0-110 m
1028 i/b

1051 Depart for MA6
1200 at **MA6** (42°56.0'N, 04°59.8'E) bottom depth 685 m

1224 CTD Cast **MA6-1**single Biogeochemistry 0 - 704 m
1325 i/b

1330 Depart for St MA8 bypassing MA7

1530 at St **MA-8** (43°12.6'N, 04°50.3'E) bottom depth 95 m

1546 CTD Cast **MA8-1** Biogeochemistry 12 bottles to 95 m
1630 i/b

1700 Depart St MA8 for MA7

2206 Recovered Production Rig & hove to at St MA6

Thursday 29 July

0950 Deployed Zodiak for water sampling of Rhone Estuary
1330 Zodiak i/b

1352 Depart St MA9 for ME2 towing UOR
1415 cought fish buoy lines (43°17.3'N, 04°45.2'E)
1529 line cleared

1551 Redeployed UOR (43°16.0'N, 04°41.7'E)
1717 Recover UOR

1730 At St **ME2** (43°17.36'N, 04°25.9'E) bottom depth 50m

1740 CTD Cast **ME2-1** Biogeochemistry 2 bottles at 6 depths
1758 i/b

1803 Depart towing UOR
2020 UOR i/b

2045 At ST **ME1** (43°21.77'N, 04°00.22'E)
2052 CTD Cast **ME1-1** Biogeochemistry , 6 depths two bottles
2108 i/b

2110 Depart for **MD1**
Fog on way retarded arrival

Friday 30 July

0255 at St **MD1**(43°47.5'N, 03°44.3'E) 140 m depth

0305 CTD **MD1-1**Production cast 60 l at 5 & 20 m
0322 i/b

0338 CTD **MD1-2** Production cast 60 l at 40 & 50 m
0348 i/b

0406 CTD **MD1-3** Production cast 60 l at 60 & 80 m
0419 i/b

0431 Plankton net
0440 i/b

0547 Production rig deployed

0640 commence deployment of sediment traps at 60 & 90 m
0708 Traps deployed

0720 CTD Special cast **MD1-4** Picoplankton at 5 & 50 m
0738 i/b

0819 CTD Special cast **MD1-5** thymidine at 5, 36 & 60 m
0840 i/b

1010 SAP cast
1114 SAP i/b

1204 CTD Cast **MD1-6** Biogeochemistry 12 bottles 0-130 m
1230 i/b

1410 SAP #15 o/b
1521 SAPS i/b

1557 CTD Cast **MD1-7** for Trap , 12 depths 0-110m
1627 i/b

1916 SAPS # 16 deployed
2040 SAPS i/b

2054 CTD Cast **MD1-8** H2O2 cast 12 bottles (0-80 m)
2116 i/b

2331 SAPS # 17 o/b

Saturday 31 July

0031 Recover SAPS #17 i/b

0046 CTD Cast **MD1-9** H_2O_2 12 depths (0-80m)
0109 i/b

0600 Grappled Production rig
0611 completed rig recovery

Search and relocated Trap rig

0811 CTD Cast **MD1-10** H_2O_2 12 depths (0-80m)
0839 i/b

1021 CTD Cast **MD1-11** H_2O_2 12 depths (0-80m)
1047 i/b

1114 CTD Cast **MD1-12** Trap cast (0-111 m)
1135 i/b

1303 CTD Cast **MD1-13** H_2O_2 & production 12 depths (0-100m)
1326 i/b

1640 CTD Cast **MD1-14** H_2O_2 12 depths (0-80m)
1703 i/b

Hove to by traps

Sunday 1 August

Hove to by Traps

1400 Commence recovery of traps
1430 Recovry complete.

END OF SCIENTIFIC PROGRAMME FOR DISCOVERY 203.

1445 Depart St MD1 for Nice

6.2 Individual reports leg 2

6.2.1 Antonio Cruzado

NUTRIENT MEASUREMENTS DURING THE EROS-2000 RRS DISCOVERY CRUISE IN THE WESTERN MEDITERRANEAN

Antonio CRUZADO

Centre d'Estudis Avancats de Blanes
Cami de Sta. Barbara, 17300 BLANES, Spain

INTRODUCTION

The nutrient distributions in the Northwestern Mediterranean Sea have been intensively studied during the EROS 2000 project in and around the Gulf of Lions. Vertical profiles of all nutrients show a marked seasonal variation with a minimum at the surface, particularly strong above the thermocline during the summer. Nitrate and phosphate concentrations show maximum values at intermediate depths, slowly decreasing at greater depths, while silicate concentrations increase monotonically with depth (Cruzado and Velasquez, 1990).

The Gulf of Lions, in the Northwestern Mediterranean Sea, receives water from the adjacent areas: Modified North Atlantic Water (MAW) which, on its way from the Atlantic Ocean, flows through the Straits of Gibraltar and along southern Spain and northern Algeria until it crosses the Sicilian Channel. During this long route,the MAW spreads above the thermocline over most of the western basin. Also the Levantine Intermediate Water (LIW) is present at intermediate depths, often overlaid by a remain of Winter Intermediate Water locally produced. Most of the water column is occupied by the Western Mediterranean Deep Water (WMDW) which happens to be formed in the region during cold winters (all ?).

However, parts of the outer Gulf of Lions area and much of the Catalan Sea are not invaded by MAW and only contain warm WMDW poorly mixed with some LIW, thus keeping the surface salinity well above 38 psu (Salat and Cruzado, 1982). This fact conforms with a circulation characterized by the disorganization of the Liguro-Provencal current which, in part turns around the Provencal coast towards the Gulf of Marseille and the proximity of the Rhone river plume. Offshore, the circulation is cyclonic thus rising the nutrient isopleths and causing the normally deep phytoplankton populations to shoal. On the contrary, the western part of the Gulf of Lions is under an anticyclonic gyre which causes the stagnation of the Rhone river water along the Languedoc coast.

The surface waters of the western basin have, in summer, extremely low nutrient concentrations. This causes very low concentrations of phytoplankton (chlorophylls) to be present above the thermocline. Most of the pigments (perhaps production) are found below the thermocline just about the nutrient gradient zone (nutricline). The various nutrients show slightly different behaviour in such zone, though the trend shown by nitrate, silicate and phosphate basically coincide with differences in deeper waters were nitrate and phosphate go through a maximum. Nitrite shows a completely different behaviour since, always in very small concentrations, it peaks just at the top of the nitracline where (coincidentally ?) the Deep Chlorophyll Maximum is.

MATERIAL AND METHODS

During the cruise carried out on board the British RRS DISCOVERY from July 15th to August 2nd between Monaco and Nice, a number of stations in the Gulf of Lion and a grid in the proximity of the Rhone river were covered. Samples were collected from Niskin bottles mounted on a General Oceanics rosette sampler attached to a Mark III CTD system. Nutrient analysis were performed on untreated samples immediately after sampling (see Table I) with a modified SKALAR autoanalyzer system. The analytical methods used have been described elsewhere (Cruzado and Velasquez, 1990b). The water used for blanks (DDW) was prepared in the laboratory with a Milli-Ro/Milli-Q system followed with distillation. The salinity effect was taken into account for phosphate computations.

The accuracy of the methods employed, including the automatic measurement of the peaks, is illustrated in Table II. The data were obtained from replicate analysis of standards of various concentrations. For the higher concentrations, similar to those found in the deep waters, the accuracy is better than 1 % for Nitrite and Silicate, better than 2 % nitrate and around 5 % for phosphate.

ACKNOWLEDGEMENTS

Thanks are given to Fawzy Mantoura, Chief Scientist, and all the participants and crew of the RRS DISCOVERY for the great assistance provided during the work on board. The work reported in this paper was carried out under contract STEP.CT.90.0080.C with the Commission of the European Communities partially financing these activities.

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TABLES

Table I. Samples analysed during the cruise RRS DISCOVERY

Date	Time (local)	Station_Cast	Num. of Samples(*)
07-17-1993	20:05	sd_01	14
07-18-1993	01:37	ma1_01	14
	11:24	ma1_07	14
07-18-1993	12:18	ma1_06	14
	13:51	ma1_09	14
	14:48	ma1_02	14
07-19-1993	13:40	ma1_18	14
07-20-1993	13:15	ma1_25	14
	15:19	ma1_21	14
	16:06	ma1_26	14
07-22-1993	14:18	ma9_07	14
	15:10	ma9_08	14
	16:12	ma9_03	14
	22:32	map_01	cont
07-24-1993	00:42	ma2_02	14
	01:43	ma2_01	14
	13:00	ma3_06	14
	13:53	ma3_07	14
	14:44	ma3_02	14
	17:02	ma4_01	14
	20:15	ma4_02	14
07-25-1993	10:39	mc1_01	14
	13:57	mc2_01	14
	18:39	mc3_01	14

	22:44	mc4_01	14
07-26-1993	13:23	ma5_05	14
	14:14	ma5_02	14
	15:06	ma5_07	14
07-27-1993	12:46	mf1_02	14
	13:42	mf1_01	14
	15:46	mf2_01	14
	19:41	mf3_01	14
	20:32	mf3_rous	cont
07-28-1993	01:08	mf3_rous	cont
	13:25	ma7_06	14
	14:19	ma6_01	14
07-29-1993	14:38	ma7_02	14
	15:29	ma8_01	14
	16:20	rh_8_5dl	14 (**)
	17:13	rh_4_1dl	14 (**)
	18:10	rh_8_1	10 (***)
	18:59	me2_01	14
	21:30	me1_01	14
07-30-1993	14:21	md1_06	14
	15:18	md1_02	14

* Two standards were run with each set of 12 samples.
** Triplicated (1:10) diluted river water samples.
*** Undiluted river water samples (NO_2 and PO_4).

Nutrient	Concentr. (uM) Stand.	Analys.	Standard Deviation	Coeff. (%) Variation
Nitrate				
	10	10.0325	0.1994	1.9874
	5	4.9417	0.2354	4.7633
	2	1.8992	0.1108	5.8330
	1	0.9901	0.0702	7.0941
	0	0.1450	0.1799	124.0470
Silicate				
	10	9.9467	0.0743	0.7474
	5	5.0776	0.1023	2.0142
	2	2.0386	0.0559	2.7443
	1	1.0162	0.0804	7.9072
	0	-0.0486	0.0610	125.4090
Nitrite				
	2	1.9999	0.0130	0.6514
	0	0.0012	0.0019	153.9552

Phosphate

2	1.9664	0.1043	5.3049
1	1.0038	0.1168	11.6320
0.4	0.3774	0.0892	23.6346
0.2	0.2560	0.1487	58.0913
0	0.0149	0.0306	205.6826

6.2.2 Axel Miller

RRS DISCOVERY 203 - North West Mediterranean
2nd July - 2nd August, 1993

CRUISE REPORT

Axel E J Miller

DISSOLVED ORGANIC CARBON

Introduction

Rapid and precise techniques are now available for the determination of dissolved organic carbon (DOC). Increasingly used for this purpose is high temperature catalytic oxidation (HTCO). Such techniques involve the direct injection of acidified and decarbonated sea water onto a catalyst, at high temperatures (680 - 900°). Plymouth Marine Laboratory have recently purchased a Shimadzu TOC 5000 HTCO analyser.

An integral component to the debate over application of this methodology is rigourous characterisation of the analytical figures of merit in order to nullify any uncertainties over data quality.

Objectives

Determination of DOC in contrasting waters from oligotrophic and eutrophic systems of the North West Mediterranean, by HTCO.

Investigation of the analytical figures of merit of the Shimadzu TOC 5000, Total Organic Carbon Analyser; with emphasis an characterisation and subsequent quantification of "blank" signals.

Stations Sampled

Leg 1 D1, D3-4, D5-1, D7-2, D8-2, D9-1, D11-3, D14-2

Leg 2 MA1-6, MA1-7, MA1-25, MA1-26, MA9-7, MA9-8, MA2-1, MA2-2, MF3-1, MA8-1, Rhone River, ME2-1, ME1-1, MD1-6.

The following samples were ampoulated (preserved with dilute phosphoric acid), for analysis in the future:

MC1-1, MC2-1, MC3-1, MC4-1, MA5-6, MA5-7, MF1-2, MA7-6, MA6-1 [Ampoulated].

Observations

Leg 1

The analyser has confirmed the laboratory trials findings (Feb. 1992; March, 1993), that precise auto-injection can give reproducible data to a precision of >2% at sea. Figure 1 illustrates the vertical distribution of of HTCO-DOC, at an oligitrophic station, together with the contriobutions of the blank and the analytical precision.

Although a contamination is occasionally evident (*e.g.* at 1200m), it is clear that we are well on the way to obtaining precise determination of DOC at sea. Experimental investigations highlighted likely point sources of contamination within sample collection and prepartaion procedures.

Leg 2

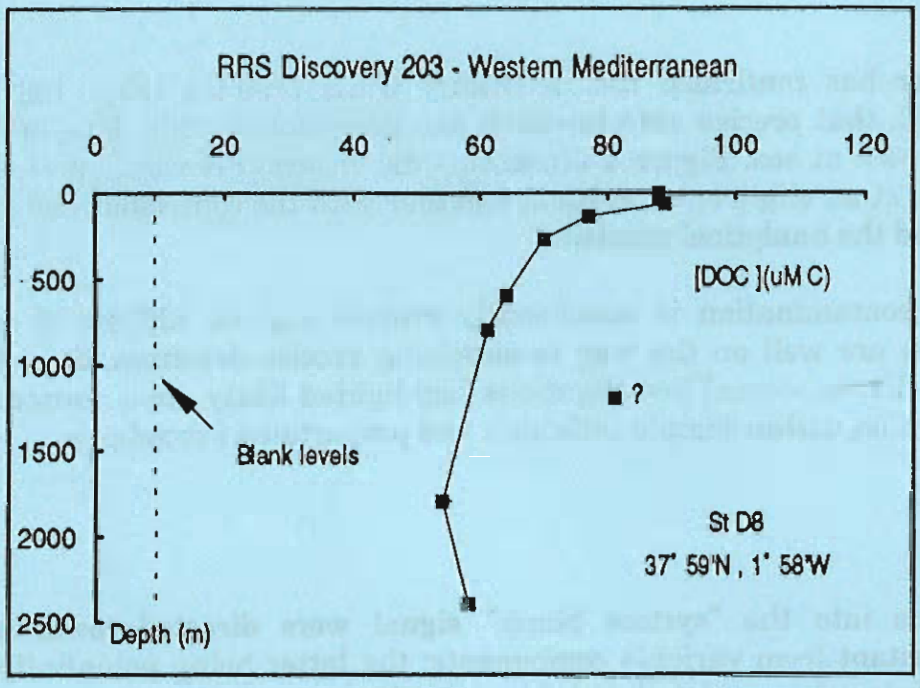
Investigations into the "system blank" signal were directed towards isolating constant from variable components; the latter being potentially sub-divided into volume related and carbon loading related signals.

An intercalibration exercise between the Ionics (Brasse, Hamburg) and the Shimadzu TOC 5000, centred on the analysis of identical samples from two casts (MA9-7 & MA9-8) showed the latter instrument to determine consistently lower DOC concentrations, with an offset of around 60-80μMC). It is not yet clear whether the root cause this phenomenon is lower oxidation efficiency of the Shimadzu, or systematically high instrument blank for the Ionics.

Samples form ultrafiltration size fractionation (Fengler, Hamburg) were analysed with a view to mass-balancing the various components. The <300 Dalton size fraction accounted for the major proportion of the total. DOC values determined for the various fractions will be utilised in conjunction with hydrogen peroxide production measurements (Price, Plymouth), in order to decipher photochemical relationships between the two.

See over for figure 1.

Figure 1


RRS Discovery 203 - Western Mediterranean
0
20
40
60
80
100
120
0
500
1000
1500
2000
2500
Depth (m)
Blank levels
[DOC](uM C)
?
St D8
37° 59'N , 1° 58'W

6.2.3 Jaun-Carlos Miquel

EROS 2000
Cruise Discovery 203, leg 2 (17 July to 2 August 1993)

VERTICAL FLUX OF BIOGENIC PARTICLES

Cruise Report
Juan-Carlos Miquel
IAEA Marine Environment Laboratory
B.P. 800 - MC 98012 Monaco

Vertical fluxes of biogenic particles are important to understand the dynamics of the water column and their assessment gives an estimate of the export of particles produced in the overlying water column. Until now, relatively few works have measured downward fluxes with concomitant measurement of primary production in the water and this type of data is lacking from the Mediterranean. One of the main objectives of the cruise was to quantify primary production at several stations and, thereof, provided a unique opportunity to carry out a simultaneous work on vertical fluxes.

Two stations were chosen to deploy the traps rig. A central station in the NW Mediterranean, MA1, supposed oligotrophic and a northern station, MD1, supposed mesotrophic. The position of this second station was defined based on the topography so as to be close to the more productive northern waters and, at the same time, to have enough water under the fluorescence maxima to deploy there the traps. The rig included two traps with a collecting surface of 1/8 and 1 m2. The smaller trap was the shallower one and both were buffled with the same type of buffle. At MA1 the rig stayed at sea for 60 hours, the traps were at 100 and 200 m depth, cups were preserved with formaldehyde and collected sequentially for two periods of 24 hours and then 12 hours. At MD1 the rig stayed out during 54 hours and the traps were at 60 and 90 m depth over a bottom that fluctuated between 105 and 130 m. The programming of the collectors was different at each depth. At 60 m, cups collected during 24, 24 and 6 hours and were preserved. At 90 m a higher resolution was adopted, collecting sequentially 4 times 12 hours and finally 6 hours.

At MA1 the rig drifted 14.5 N Miles on a S-SE direction (Fig. 1a). Currents were relatively weak, most often less than 30 cm s-1 and the minor changes in direction observed are due to changes in current directions. At MD1 the rig initially drifted north at about 4 NM per day and then south and back northwards (Fig 1b). These inversions in drifting direction are associated to inversions of currents direction in the upper 30-40 m of the water column. At the latter site currents were complex, with very different directions above and below 30-40m and important and rapid changes with time.

Visual observation on board indicates that fluxes were low at both depth and for all 2 1/2 days at site MA1. Inversely, at MD1 fluxes at 60 m seem to be substantially more important that at MA1 during all the 54 hours of the experiment. Unfortunately, no data was collected at 90 m depth because of malfunctioning of the trap motor. The rest of the analysis will be done back in the laboratory and will include measurement of mass flux, carbon and nitrogen fluxes, zooplankton produced fecal pellets flux and, if the size of the sample allow it, organic carbon flux, chlorophyll and silica fluxes. A subsample of each trap sample was taken for later HPLC pigment analysis at Plymouth Laboratory.

While the traps were in the water, at each station two vertical profiles for carbon, total chlorophyll and particulate silica were done from the surface down to the deepest trap (Niskin bottles, 15 depths at MA1, 12 depths at MD1). These profiles were aimed to estimate standing stocks of the parameters in the water column for later correlation with their respective downward fluxes. At station MD1 we could notice an increase in particle load of the waters at 100 and 110 m.

Finally, a 8-depths profile for particulate and dissolved radionuclides was done at each station (SAP, in-situ pumps). Several radio-elements will be measured, particularly 234Th, 210Po and 210Pb. 234Th will be used to estimate indirectly the vertical fluxes of particles. The model used is based on the decay of the particle reactive 234Th from uranium. For this purpose, subsamples of seawater were taken for uranium measurements.

See over for figure 1.

Figure 1.

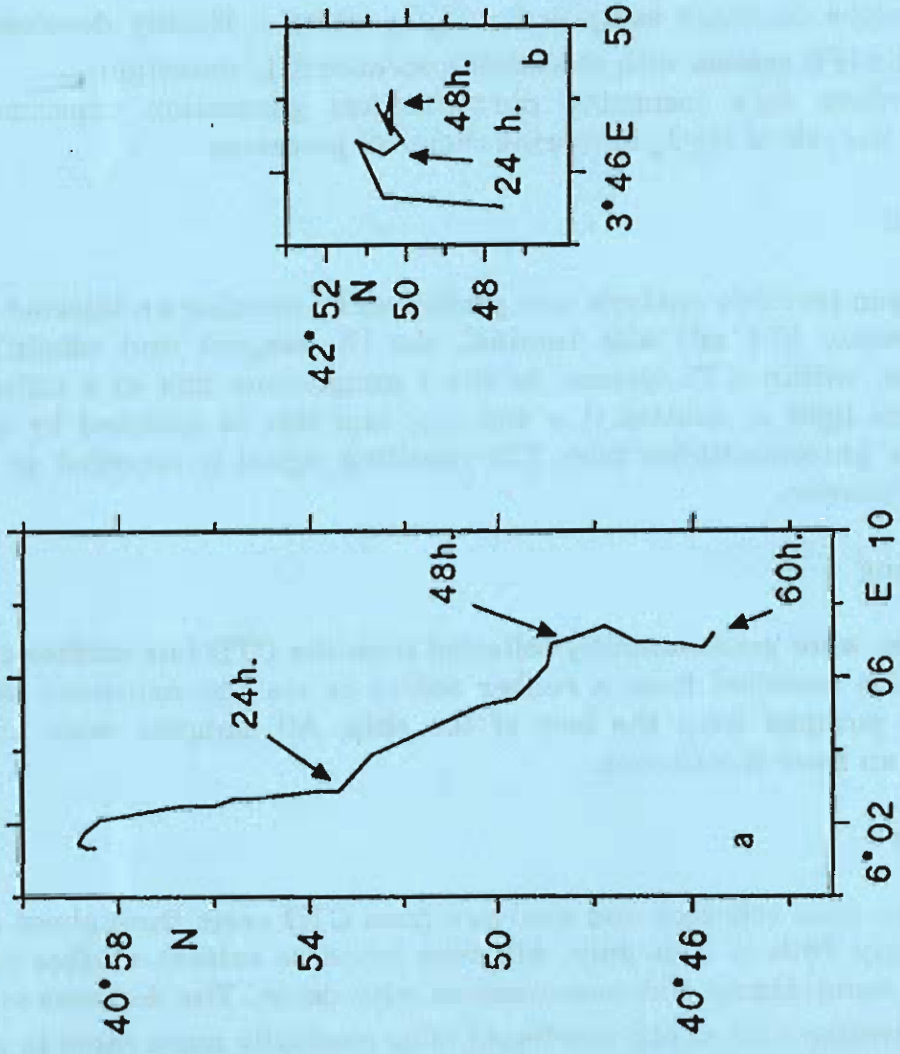


Fig.1. Drifting of the traps rig at station MA1 (a) and at station MD1 (b).

6.2.4 David Price

H_2O_2 Determination In The Rhone Plume And The Adjacent Mediterranean Sea

Leg 2, Disco 203

David Price
(University of Plymouth and Plymouth Marine Laboratory)

Objectives

To analyse seawater samples for H_2O_2 using a freshly developed flow injection (FI) system with chemiluminescence (CL) detection.
To perform deck incubated photochemical generation experiments to assess the role of H_2O_2 in marine chemical processes.

Method

Hydrogen peroxide analysis was performed by reacting an injected sample of seawater (0.1 ml) with luminol, the CL reagent and cobalt(II), the catalyst, within a FI system. As the 3 components mix at a coiled glass flow cell light is emitted (l = 436 nm) and this is detected by an end-window photomultiplier tube. The resulting signal is recorded on a strip chart recorder.

Sampling

Samples were predominantly collected from the CTD but surface samples were also collected from a rubber zodiac or via the non-toxic seawater supply pumped from the bow of the ship. All samples were analysed within an hour of collection.

Results

Samples were collected and analysed from CTD casts throughout the leg from July 18th to 31st July. All were found to exhibit surface maxima with a rapid decrease in concentration with depth. The decrease in H_2O_2 concentration with depth was found to be markedly more rapid in regions close to the Rhone compared with oligotrophic stations. This is attributed to the higher loading of inorganic material from the river which increases the scattering and quenching of light in the water column. Not all data has been processed but typical surface concentrations were approximately 80-120 nM with little or no H_2O_2 below 30-40 m at the Rhone coastal stations.

Two 24 hour survey experiments were performed to examine the H_2O_2 diurnal cycle at MA1 (oligotrophic) and MD1 (eu/mesotrophic). The

diurnal variations at MA1 were found to be less pronounced than had been expected but highest levels were found in the late afternoon and early evening. Data from MD1 is to be processed but a more pronounced variation is expected to become apparent.

Photochemical generation experiments using sealed silica tubes were found to demonstrate a waters H_2O_2 generation potential and these experiments were used in an attempt to understand the production and decay processes controlling H_2O_2 distribution and the role it plays in marine chemistry. Much of this data is still to be processed but the effect of different M. Wt. fractions of DOC were found to have considerable different generation potentials with the 300-8000 Dalton fraction producing the highest levels of peroxide (ca. 10 mM after 5 hours). Ultrafiltration was carried out by Gunter Fengler to obtain the size fractionated solutions and DOC determinations were performed by both Sabine Brasse and Axel Miller using separate analytical systems. Other incubations included an optical check of the experimental procedure, comparing oligotrophic water to Rhone plume water and the effect of filtration and Seppak treated water.

6.2.5 T.L. Bentley, D. Lefevre and P.J.LeB. Williams

Measurement of net, growth, community respiration and bacterial metabolism.

EROS Discovery cruise 203.
July 1993
T.L. Bentley, D. Lefevre and P.J.LeB. Williams
UCNW - SOS

AIMS :

The aim of the work was to determine :
1) net community production and respiration
2) bacterial metabolism
3) whether nutrients or light limited production

OBJECTIVES :

1) Measurement of oxygen flux at 6 depths along the EROS MA transect
2) Measurement of respiration in fractions less than 0.8 microns and less than 200 microns, using oxygen uptake and ETS measurements.
3) Direct measurement of bacterial growth using the thymidine uptake technique and bacterial counts.

PRODUCTIVITY MEASUREMENTS

Seven productivity stations were worked (MA1_2; MA1_21; MA9_3; MA3_3; MA5_5; MA7_3 and MD1_1), were in vitro / in situ measurements of gross production, net community production and respiration were made at 6 depths (typically 2-3 depths in the surface mixed layer, one at the oxygen maximum, one at the chlorophyll a maximum, and one below the chlorophyll a maximum). The precision of the measurements was high (mean S.E. of the 120 or so observations averaged 0.2 m.moles m-3 d-1). The rate with the single exception of the Rhone-influenced station MA7, were low, characteristic of extreme oligotrophy. In the oligotrophic stations, the productivity maximum lay deep in the water at the chlorophyll a maximum.
The most striking observation was the contrast between the gross production, respiration and the net production rates. Whereas the first two processes showed systematic variations with depth, related to the chlorophyll a maximum close to zero through the water column. This implies a very tightly coupled community cycling with no net growth, probably limited by nutrients.

BACTERIAL METABOLISM

Sampling station :
At stations MA1_8; MA9_6; MA3_5; MA5_5; MA7_5 and MD1_5 measurements were made of 3H methyl thymidine uptake and the rate oxygen-determined respiration of the less than 0.8 microns and the less than 200 microns fractions.
At station MA3, a time series was carried out to determine the realtionship between 3H-methyl-thymidine uptake and bacterial numbers to determine a conversion factor from 3H-methyl-thymidine uptake to carbon production.

The determination of oxygen uptake by incubation during 24 hours were lost on the first three stations due to the incubation temperature being too high. Successful measurements were obtain at stations MA5; MA7 and MD1. Sampling was made at three depths : at 5 m (the mixed layer), the chlorophyll a maximum and just below the chlorophyll a maximum.

In the mixed layer the respiration rate was high in costal stations, and the rates below the thermocline were not significant . At the oligotrophic station (MA5) the respiration rate was low and throughout on the water column. The respiration rate of the fraction less than 0.8 microns was usualy 50 to 100 % of the less than 200 microns fraction. In some cases the rates in the less than 0.8 microns were exceded that of the less than 200 microns fraction; this could be due to increase bacteria numbers due to reduction of predator control.

ADDITIONNAL MEASUREMENTS

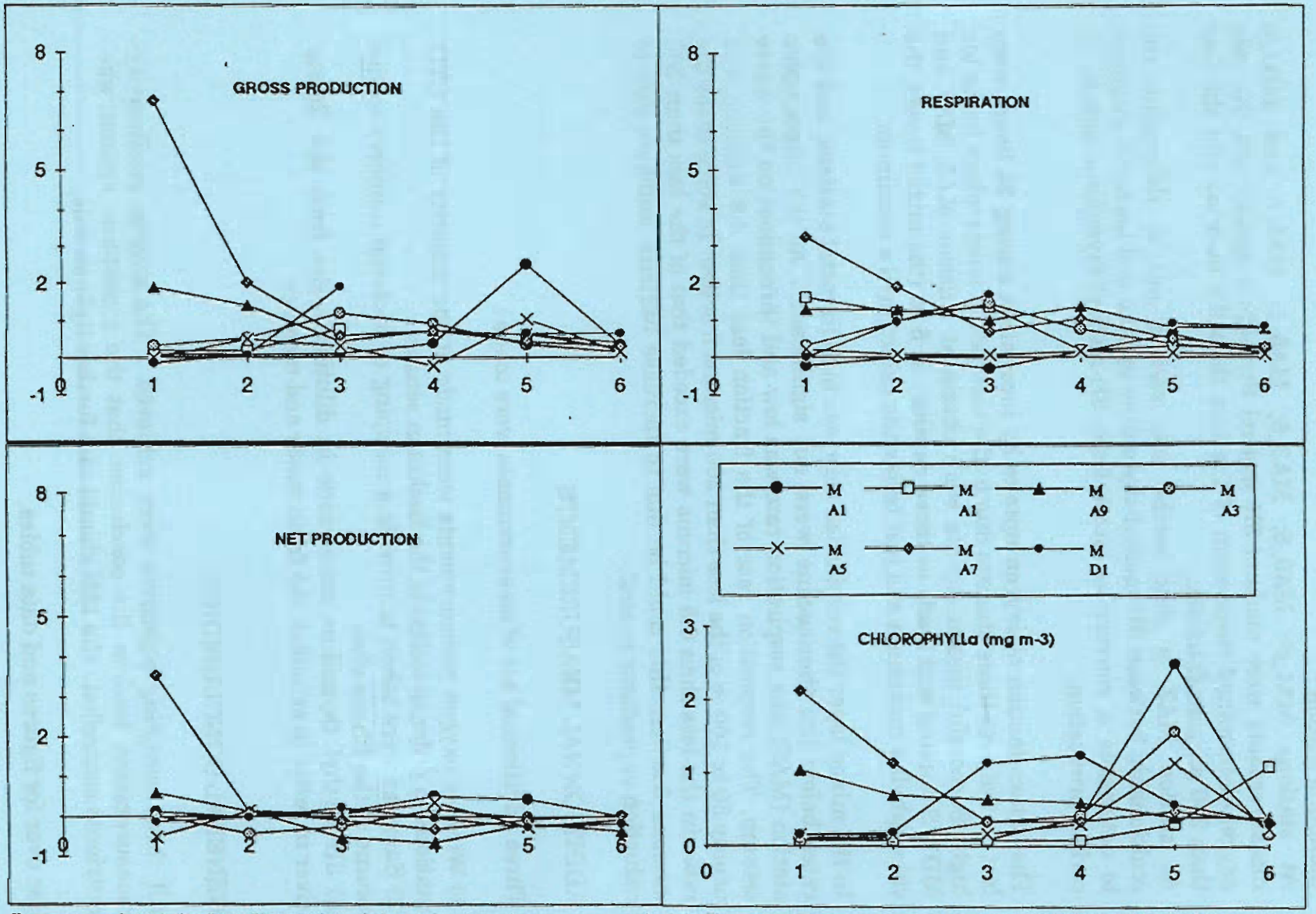
Three additionnal set of measurements were made :

1) Winkler oxygen measurements were made at the majority of the CTD stations in order to calibrate the Beckman sensor.
2) Samples were taken to provide a mapping of bacterial numbers in the plume of the Rhone river
3) 3H-Methyl thymidine were made in dilution series from the Rhone river in order to establish the fresh water end-member.

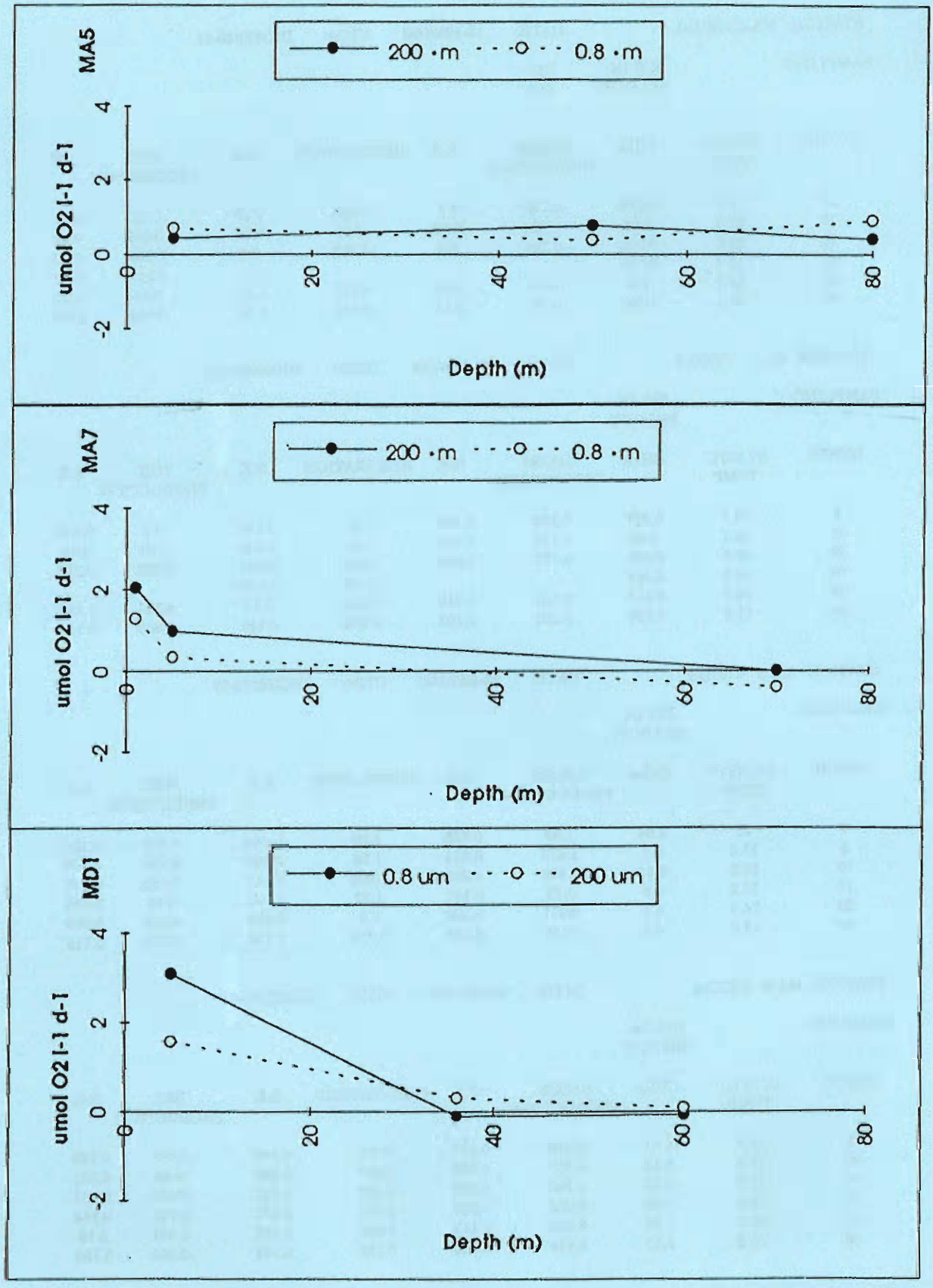
GENERAL CONCLUSIONS

All three sampling objectives were achieved . The oxygen productivity measurements lead to the conclusion that the planktonic system was nutrients controlled - the 15N should cast further light on this.

See over for figures and data tables.



The rates of metabolism (the ordonate) are in m.moles oxygen m-3 d-1 ; The depth axis (the abcisse) is the depth number of the sample.


MA5
200 •m
0.8 •m
umol O2 l-1 d-1
4
2
0
-2
0
20
40
60
80
Depth (m)
MA7
200 •m
0.8 •m
umol O2 l-1 d-1
4
2
0
-2
0
20
40
60
80
Depth (m)
MD1
0.8 um
200 um
umol O2 l-1 d-1
4
2
0
-2
0
20
40
60
80
Depth (m)

STATION: MA-1 PROD-1 DATE: 18-19/07/93 CTD#: DIO3X049-51

SAMPLING: RIG IN: 630
RIG OUT: 600

DEPTH	*IN SITU* TEMP	CHLa	GROSS PRODUCTION	S.E.	RESPIRATION	S.E.	NET PRODUCTION	S.E.
10	21.4	0.084	-0.106	0.1	-0.222	0.13	0.12	0.14
15	21.1	0.08	-0.094	0.12	-0.01	0.25	-0.018	0.25
25	20.6	0.099	-0.194	0.3	-0.302	0.3	0.108	0.24
50	15.4	0.384					0.508	0.53
65	13.7	2.5	1.06	0.25	0.62	0.17	0.44	0.21
95	13.1	0.34	0.76	0.11	0.064	0.14	0.012	0.104

STATION: MA-1 PROD-2 DATE: 20-21/07/93 CTD#: DIO3X067-69

SAMPLING: RIG IN:
RIG OUT:

DEPTH	*IN SITU* TEMP	CHLa	GROSS PRODUCTION	S.E.	RESPIRATION	S.E.	NET PRODUCTION	S.E.
5	22.7	0.077	0.182	0.193	1.61	0.146	-1.4	0.162
10	22.7	0.08	0.192	0.186	1.21	0.105	-1.01	0.18
20	20.9	0.083	0.771	0.358	1.363	0.043	-0.652	0.359
50	15.3	0.083			0.184	0.089		
70	14.3	0.305	0.626	0.216	0.299	0.15	0.327	0.166
90	13.8	1.096	0.223	0.101	0.234	0.115	-0.012	0.118

STATION: MA-9 PROD-3 DATE: 22-23/07/93 CTD#: DIO3X075-77

SAMPLING: RIG IN:
RIG OUT:

DEPTH	*IN SITU* TEMP	CHLa	GROSS PRODUCTION	S.E.	RESPIRATION	S.E.	NET PRODUCTION	S.E.
0	17	1.04	1.89	0.125	1.29	0.043	0.593	0.124
5	15.4	0.7	1.416	0.231	1.28	0.158	0.126	0.208
10	15.2	0.64	0.438	0.205	0.996	0.147	-0.528	0.178
15	15.2	0.6	0.72	0.167	1.37	0.193	-0.65	0.135
20	14.9	0.4	0.611	0.109	0.8	0.063	-0.189	0.099
40	13.3	0.4	0.412	0.145	0.778	0.144	-0.366	0.115

STATION: MA-3 PROD-4 DATE: 24-25/07/93 CTD#: DIO3X084-86

SAMPLING: RIG IN:
RIG OUT:

DEPTH	*IN SITU* TEMP	CHLa	GROSS PRODUCTION	S.E.	RESPIRATION	S.E.	NET PRODUCTION	S.E.
5	19.5	0.11	0.318	0.137	0.31	0.146	0.007	0.188
20	19.3	0.12	0.527	0.189	0.967	0.286	-0.44	0.331
40	17.9	0.33	1.196	0.222	1.455	0.217	-0.259	0.081
50	13.6	0.42	0.925	0.222	0.747	0.173	0.178	0.154
60	13.2	1.57	0.339	0.147	0.365	0.102	-0.027	0.16
80	13.2	0.17	0.144	0.155	0.153	0.144	-0.009	0.188

STATION: MA-5 PROD-5 DATE: 26-27/07/93 CTD#: DIO3X097-99

SAMPLING: RIG IN:
RIG OUT:

DEPTH	*IN SITU* TEMP	CHLa	GROSS PRODUCTION	S.E.	RESPIRATION	S.E.	NET PRODUCTION	S.E.
5	18.7	0.15	-0.004	0.047	0.52	0.071	-0.524	0.132
15	18.7	0.16	0.495	0.186	0.352	0.164	0.144	0.152
20	16.9	0.17	0.308	0.152	0.248	0.036	0.061	0.046
30	13.9	0.3	-0.232	0.819	-0.582	0.702	0.35	0.58
45	13.4	1.14	1.04	0.14	1.3	0.102	-0.259	0.129
80	13.3	0.24	0.154	0.136	0.238	0.113	-0.084	0.114

STATION: MA-7 PROD-6 DATE: 29-30/07/93 CTD#: DIO3X

SAMPLING: RIG IN:
RIG OUT:

DEPTH	*IN SITU* TEMP	CHLa	GROSS PRODUCTION	S.E.	RESPIRATION	S.E.	NET PRODUCTION	S.E.
0	16.8	2.13	6.78	0.21	3.23	0.56	3.55	0.188
10	16.8	1.14	2.018	0.078	1.902	0.081	0.116	0.942
20	14.8	0.33	0.588	0.066	0.69	0.932	-0.103	0.069
40	13.5	0.34	0.728	0.166	1.054	0.198	-0.326	0.143
60	13.2	0.48	0.414	0.128	0.49	0.132	-0.076	0.064
80	13.2	0.34	0.305	0.086	0.275	0.132	0.029	0.133

STATION: MD-1 PROD-7 DATE: 30-31/07/93 CTD#: DIO3X

SAMPLING: RIG IN: 545
RIG OUT: 600

DEPTH	*IN SITU* TEMP	CHLa	GROSS PRODUCTION	S.E.	RESPIRATION	S.E.	NET PRODUCTION	S.E.
5	20.5	0.16	-0.148	0.161	-0.012	0.152	-0.136	0.204
20	19.2	0.19	0.076	0.172	0.958	0.85	-0.018	0.162
40	13.6	1.14	1.899	0.112	1.69	0.088	0.212	0.107
50	13.3	1.25					-0.0393	0.543
60	13.1	0.57	0.644	0.132	0.906	0.133	-0.26	0.012
	13.1	0.34	0.652	0.169	0.824	0.169	-0.172	0.057
				0.18		0.20		0.20

6.2.6 S. Brasse, G. Fengler and N. Kootz

Dissolved organic Carbon and Amino acids

Project Eros 2000

RRS Discovery Cruise 203 Leg 2
Cruise Report

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Indroduction

The NWM-sea receives a significant amount of terrestrially derived organic material by riverine input, especially from the Rhone. A large proportion of this material is transported in the dissolved Phase.
The main objective of this study is, to characterise compositions and to determine the spatial distributions of aminoacids (DCAA + DFAA) within the dissolved organic carbon (DOC). Throughout transects from the mouth of the Rhone into NWM-sea.

Additionally, our interest is focused on the composition and reactivity of terrestrial and marine DOM. Only little is known about this, because of the lack of suitable methods for its isolation. The convential method for isolation has been adsorption of acidified DOM onto nonionic XAD resins. This Method typically recovers a small fraction of the total DOC and requires a large manipulation of pH during isolation, and is selective for hydrophobic constituents. In contrast, tangential-flow ultrafiltration concentrates organic molecules primarely on the basis of size rather than of chemical properties and requirs no pH adjustments that my change chemical associations and structures. Ultrafiltration therefore appears to be a more appropriate method for isolation a representative fraction of DOM than adsorption an XAD resins. We adapted a tangential-flow ultrafiltration system and tested it on different samples in NWM-sea.

Beyond it, there were an interest in intercomparison of two instruments (SHIMADZU 5000 and IONICS 555 with BINOS 100 NDIR-Detector, Rosemount) at sea using freshly obtained seawater. Investigate any temporal change in the DOC concentration during the cruise.

Methods

Sampling and preservation

Vertical CTD-Hydrocast samples were taken with 10 l GO-FLO bottles and filtered immediatly after sampling under a slight vacuum through precombusted Whatman GFF-Filters. (Stations are listed in the appendix). Samples for DOC-Analysis have been preserved with 10 % Phosporic-acid after filtration and samples for aminoacid-analysis have been preserved with $HgCL_2$. Most of the analysis will be performed within the laboratories of the Max-Plank-Institution.

Dissolved organic carbon (DOC)

The DOC will be determined by a commercially avaliable Carbon Analyzer (IONICS 555). Only the TC (Total carbon) furnace will be used. The quartz furnace tube (16 mm id. * 36cm long) contain 6.5 cm of Platinum pillow catalyst from Ionics, Inc. This catalyst consists of small squares of Platinum gauze folded into small pillows about o.5 cm on edge. These are tightly fitted into the portion of the quarz tube contained inside the furnace. Liquid samples (100ul) are injected directly on to the Platinum Catalyst. The effluent from the furnace passes through a water separator, a mossy tintrap to remove HCl gas, through a cold trap at 1^0C, a $MgClO_4$ trap, a particel filter (Balston Type 9900-05-BK DFU and finally into NDIR analyser. Due to the motion sensitivity of the HORIBA 2000 NDIR-analyzer we used instead a motion insensitiv NDIR-analyzer (BINOS 100; Rousemount). Oxygen was used as the carrier gas at 130 ml/min. The furnace temperature was 800^0C. Peak areas were determined with HP 3396A Integrator. The experimental precision was at < 5 %.

Dissolved combined and free aminoacids (DCAA and DFAA)

Individual amino acid concentrations will be determined with a commercial two pump HPLC system BIOTRONIK) coupled to a fluorescence dedector (JASCO 820). DFAA analyses will be carried out by mixixing 100 ul boric acid buffer with 1ml seawater to yield a final pH of 9.5. 10ul of the reagent (50mg OPA in 250 ul Methanol plus 25ul mercaptoethanol) will be added and after 4 min 100 ul of the mixture will be injected. DCAA measurements will be done by determination of the amount of total hydrolysable amino acids. 1ml of the sample will be hydrolysed under argon in o.5 ml of 6n HCL (merck suprapur) for 22 h at 110^0C. The acid was evaporated and then the sample was analysed similar to DFAA measurements.

Ultrafiltration

All the samples analysed were first filtered on precombusted Whatman GFF glass filter in all glass filtrationsystem (Stations are listed in the Appendix). The filtrate is identified as DOC, including small dissolved molecules and colloidal material. The different molecular fractions was isolated with a modified tangential filtration system (DT-MODUL (ROCHEM). The samples were fractionated using different memmbranes with nominal cut offs of 8000 dalton (PES 8000 KALLE) and the 300 dalton (NF 40 Filmtec DOW). Both membranes were made of modified Polyethersulfon. The water is forced through the module by a gear pump (TUTHILL). Operation pressure for the 8000 dalton Membran is 5 bar and for the 300 D Membran 10 bar. Gaskets and the O-rings of the DT-Modul were made of viton. Tubing, and the gear-pump were made of fluorpolymer and stainless steal. The blanks of the system were very low, never exeeding 8 umolC/l. In these experiments we performed the ultrafiltration by using the cascade-system, starting with the greatest cut off of the membranes, to minimize physicochemical interactions in the retained Fraction. Three fractions were got, specially >8000 dalton, 300-8000 dalton and <300 dalton. Concentrations of DOC and volumes of water were recorded for the inital water, and the different fractions, so that a mass balance of DOC could be established. We measured the concentration of DOC in the different molecular fractions by an intercomparison of a high-temperature Method in which a Shimadzu TOC 5000 (Plymouth Marine Laboratorie) and a IONICS 555 DOC-analyser (Max-Planck-Institut of Meteorologie) was used. Each investigator processed his subsample separetely. The DOC-values are not DOC-system-blank corrected.

Prelimnary Results

One DOC-massbalances experiment with some interesting aspects will be disscussed. The massbalances-experiment of DOC were established for Station MA9 # 10, wich was mixed Water from the surface plume area of the Rhone-estuary. The processed Volume was 105 l. The initial concentration of DOC measured by the IONIC 555 was 187 umol C/l. Massbalances calculations indicate that most of the DOC in the initial water sample was accounted for in the ultrafiltered concentrates > 8000 dalton and 300 - 8000 dalton and ultrafiltrates <300 dalton **Tab. 1**. Contamination and processing losses were minimal **Table.1**. 4.5 % of the total DOC were in the > 8000 dalton fraction, 24.7 % in the 300-8000 dalton fraction and finaly most of the total DOC 66 % were in the < 300 dalton fraction. The results from the Shimadzu and Ionics instrument show a good relative agreement in the different fractions but at absolute values there are differences. The greatest differences will be observed in the 300-8000 dalton fraction **Tab.1**. At this point we can not precisly say, that the lower values reflect the incomplete oxidation of the organic

material. More research into furnace design and the whole combustion train will be performed.

A very interesting subject about the different fractions was given by David Price (Plymouth Marine Laboratorie). He measured the photochemical production of H_2O_2 at the same time rate in the different molecularsize fractions and found the highest photochemical production in the 300-8000 dalton fraction followed by the >8000 dalton, the intial DOC sample and the < 300 dalton fraction. Possibly we obtain some informations using different analytical techniques regarding the photochemical sources of H_2O_2 at the Laboratories in Hamburg.

Appendix

List of samples for ultrafiltration

Station		
MA1-19	340m	30l
MA1-24	74m	30l
MA9- 9	3m	30l
MA9#10	surf.	120l

List of samples for aminoacids and DOC

Station		
MA1- 6	12 depth	deep
MA1- 7	12 depth	shallow
MA1-19	8 depth	deep
MA1-25	12 depth	shallow
MA1-26	12 depth	deep
MA2- 1	12 depth	shallow
MA2- 2	12 depth	deep
MA3- 6	12 depth	deep
MA3- 7	12 depth	shallow
MA4- 1	12 depth	shallow
MA4- 2	12 depth	deep
MA5- 6	12 depth	deep
MA5- 7	12 depth	shallow
MA6- 1	12 depth	deep
MA7- 6	9 depth	shallow

MA8- 1	11 depth	shallow
MA9- 7	6 depth	shallow
MA9- 8	6 depth	shallow
MC1- 1	12 depth	
MC2- 1	12 depth	
MC3- 1	12 depth	
MC4- 1	12 depth	
MD1- 6	12 depth	shallow
ME1- 1	6 depth	shallow
ME2- 1	6 depth	shallow
MF1- 1	4 depth	deep
MF1- 2	12 depth	shallow
MF3- 1	12 depth	shallow
MP1-25	mapping	25 samples
Rhone sampling	8 samples	

Table 1

DOC-massbalances by ultrafiltration with different HTCO-Analyser on Station MA 9 # 10

		IONICS 555			SHIMADZU TOC-5000		
	Vol (l)	DOC (µmol/l)	DOC (µmol)	C (%)	DOC (µmol/l)	DOC (µmoles)	C (%)
Total	105	187	19635	100	109	11445	100
>8000 D	1.98	445	881.1	4.5	303	599.9	5.2
300-8000 D	3.92	1239	4856.9	24.7	735	2881.2	25.2
< 300 D	94	138	12972	66.1	71	6674	58.3
		Recovery = 95.3 %			Recovery = 88.7 %		

6.2.7 Ian Bellan

EROS 2000 CRUISE - JULY 1993

U.O.R. AND U.O.R. INSTRUMENTS OPERATION

Ian Bellan

Plymouth Marine Laboratory

Continuing from the first leg of the cruise, 16 more U.O.R. tows were successfully completed. The undulating depths being adjusted to inshore and deep waters.

Eleven profiles were deployed on the CTD frame with the U.O.R. instruments for light data and intercalibration of the other sensors

Eight vertical profiles in the Rhone estuary were performed from the zodiac using the U.O.R instruments.

UOR VERTICAL PROFILE LIST
Table 1

No	Time GMT	Event	Lat (N)	Long (W)	Tow time	Tow depth	No UNDS	Depth range	Speed (knots)	Comments	Data
2.7.93 D793P01	19.09 19.34	In Out	35 57.2	6 15.7	25M	200		200		On CTD with FFF Cond Full Scale	1Sec LO D79354M1 A3, A4,B1, B4
3.7.93 D793P02	09.09 09.44	In Out	35 58.14	5 43.9	35M			200		Cont O.K. CTD + FFF	"
4.7.93 D793P03	14.21 14.57	In Out	36 01.0	5 22.69	36M			200		ST D5/3 CTD + FFF	"
4.7.93 D793PO4	22.02 22.38	In Out	35 59.67	4 04.53	36M			200		ST D7 CTD + FFF	"
6.7.93 D793PO5	19.23 20.01	In Out	37 59.5	1 58.7E	46M			200		ST D8 CTD + FFF	"
7.7.93 D793PO6	14 42 15.12	In Out	38 41.15	14 41.12E	30M			200		ST D9/2 CTD + FFF	"
9.7.93 D793PO7	06.23 06.55	In Out	37 49.5	11 14.8E	32M			200		ST D10/2 Change sensor cylinder CTD + FFF	1 Sec D79334M1 LO A3, A4, B3
9.7.93 D793P08	11.16 11.59	In Out	37 44.0	11 27.1E	43M			200		ST D11/.1 CTD + FFF	"
9.7.93 D793PO9	19.09 19.36	In Out	37 44.0	11 26.8E	27M			200		Dark D11/4 CTD + FFF	"
10.7.93 D793P10	07.41 08.10	In Out	36 40.5	12 19.0E	29M			200		ST D14/1 Prof. not more than 200M CTD + FFF	"
10.7.93 D793P11	16.58 17.43	In Out	36 40.5	12 19.2E	45M			200		ST 14/4 CTD + FFF	"
11.7.93 D793P12	07.21 07.51	In Out	37 17.2	11 58.18E	30M					ST 12A/2 CTD + FFF	"

UOR PROFILE LIST
Table 1

Profile	Time GMT	Event	Lat (N)	Long (E)	Tow time	Tow length	No UNDS	Depth range	Speed (knots)	Comments	Data
11.7.93 D793P13	11.35 12.10	In Out	37 34.11	11 36.1E	35M			200		ST D12/1 CTD + FFF	1Sec LO D79334M1 A3, A4, B1, B2
13.7.93 D793P14	01.53 02.29	In Out	40 00.0	6 00.0E	36M			200		ST 15/2 CTD + FFF	"
13.7.93 D793P15	13.53 14.29	In Out	41 00.0	6.00.1	36M			200		ST 16/1 CTD + FFF	"
14.7.93 D793P16	07.10 07.40	In Out	40 55.8	5 53.4E	30M			200		ST 16/ calibration: CTD + FFF	" All light facing up
18.7.93 D793P17	08.05 08.37	In Out	40 57.6	6 02.1E	32M			200		Second Leg STN MA1 - 7 Check depth calibration	1 Sec D79354M A3, A4, B3, B4 D.O.
18.7.93 D793P18	17.50 18.22	In Out	40 53.8	6 02.75E	32			200		On CTD MA1 -13	"
20.7.93 D793P19	10.03 10.43	In Out	40 45.8	6 06.8E	40M			200		On CTD MA1-25	"
22.7.93 D793P20	09.46 10.08	In Out	43 17.6	4 48.3E	22M			200		On CTD MA9 - 7	"
22.7.93 D79321	11.35 11.56	In Out	43 17.3	4 53.4E	22M			200		On CTD MA9 -8	"

UOR TOW LIST
Table 1

Tow No	Time	Event	Lat(N)	Long W.E.	Tow Time	No UNDS	Depth range	Speed (knots)	Comments	Data
2.7.93 D79301	11.14	In	36 00.2	5 21.2	5H				Very slow winch Sun	4 Sec L.O. D79332M
	16.41	Out	35 58.6	6 10.4	28M	26	15-85	11		A1, A, 2 B1, B2 D.O.
4.7.93 D79302	15.10	In	36 01.3	5 22.3	5H 50M	37	15.85	11	Slow winch Sun	4 Sec LO D793321 A1, A2 B1, B2 D.O.
	21.00	Out	35 59.5	4 01.4						
5.7.93 D79303	03.30	In	35 57.0	4 03.4	13H	64	20-90	11	Winch improved fog for 4 hours No UND	4 Sec LO D793321
	17.20	Out	36 48.5	01 46.4	50M		(115)	5.5 11	Hit bottom @ 90m ship cut corner 2 hrs	A1, A2 B1, B2 D.O. CHS Block
5.7.93 6.7.93 D79304	19.12 10.38	In Out	36 57.1 37 59.0	1 23.4 1 56.6	15H 26M	104	20-95	12.3	Dark Sun	4 Sec LO D793321 A1, A2 B1, B2 D.O.
6.7.93 7.7.93 D97305	22.59 11.17	In Out	37 59.7 38 41.5	2 00.0 3 19.06	12H 18M	77	30-110	12.3 11.7	Dark	4 Sec LO D79332M A1, A2 B1, B2 D.O.
7.7.93 8.7.93 D79306	17.55 10.42	In Out	38 42.2 38 40.2	4 39.6 8 17.2	16H 47M	102	30-105		725 UOF Wire Sun Dark Hazy sun	4 Sec LO D79332M A1, A2 B1, B2 D.O. 93% used
8.7.93 9.7.93 D79307	1.15 01.45	In Out	38 37.9 37 57.4	8 22.8 11 09.3	14H 30M	92	30-110	1.2 10.6 11	Sun	4 Sec LO D79332M A1, A2 B1, B2
12.7.93 D79308	808.04 22.10	In Out	38 36.04 40 00.2	8 18.8E 6 00.1E	14H 12M	79	30.110	11	Sun	D.O. 80%

UOR TOW LIST

Table 1

Tow No	Time GMT	Event	Lat(s)	Long (e)	Tow time	Tow length	No UNDS	Depth range	Speed (knots)	Comments	Data
13.7.93 D79309	06.07 13.15	In Out	40 00.0 41 00.8	06 00.2 05 59.6	7H 8M		30	30-115	10 9 8	Heavy swell Sun Damaged U.O.R See book	4 Sec D79332M1
14.7.93 D79130	12.07 13.46	In Out	40 56.4 41 06.1	5 53.5 6 02.4	1H 39M		9	5-160	2 11 2	Sun All L/meters Facing up	4 Sec D79332M1 A1, A2, B1 D.O.
17.7.93 D79311 22	17.49 22.20	In Out	41 38.7	6 22.1	4H 31M		29	37-114	10	12" Wings Sun	4 Sec D79332M A1,A2, B1, B2 D.O.
20.7.93 D79311	20.02 12.42	In Out	40 44.2 42 30.7	6 09.8E 5 08.4E	16H 40		26	20-100	10.5 8 6	12" Wings ships speed too slow 16 Hours limit of batteries	4 Sec D79332M A1, A2, B1, B2 D.O
21.7.93 D79313	15.31 18.06	In Out	42 52.4 43 15	5 01.07 4 52	2H 35M		21	5-63	10.3	12" Wings Sun	4 Sec "
23.7.93 D79314	22.02 05.01	In Out	43 09.9 43 17.04	5 01.9E 47.7E	6H 59H		94	2-56	11 10.5 9	8" Wings	4 Sec "
23.7.93 D79315	07.59 17.35	In Out	43 12.2 41 41.96	4 52.9E 5 36.4E	9H 36M		69	14-94	10.5	12" Wings Sun	4 Sec "
24.7.93 D79316 25.7.93	19.30 04.43	In Out	42 09.7 41 58.5	5 22.8 3 38.9	9H 13M		63	12.94	10.5	12" Wings through night	4 Sec "

UOR TOW LIST
Table 1

Tow No	Time GMT	Event	Lat (S)	Long W)	Tow time	Tow lenght	No UNDS	Depth range	Speed (knots)	Comments	Data
25.793	06.46	In	42 00.1	3 41.9E	2H					Cloudy	4 Sec D79332M1
D79317	0.945	Out	42 17.8	3 58.8E	59M		18	20.94	9	12" Wings	A1,A2, B1 B2 D.O
25.7.93	11.38	In	42 17.8	3 57.3	2H					12" Wings	"
D79318	14.31	Out	42 38.0	4 14.0	52M		18	18-91	10.7	Sun	
25.7.93	16.04	In	42 36.9	4 12.4E	2H		17	17.95	10.5	12" Wings	"
D79319	18.51	Out	42 56.4	4 32.5E	49M					Thin cloud	
26.7.93	20.16	In	42 40.5	5 08.6E	4H					12" Wings	"
D79320 27.7.93	01.01	Out	42.44M	6 02.4E	45M		29	17.95	10.0	Dark	
27.7.93	08.42	In	42 46.1	5 56.65	2H		14	17.95	10.5	12" Wings	"
D79321	11.10	Out	42 56.5	5 33.5	28M					Sun Submarines?	
27.7.93	13.29	In	42 55.6							12" Wings	"
D79322	16.00	Out	43 07.6	5 09.11	?		15	17.95	10	Sun	
27.7.93	17.02	In	43 07.6	5 09.9			12	17-95	10.5	12" Wings	"
D79323	19.12	Out	43 15.02	4 54.395						Sun	

UOR TOW LIST
Table 1

Tow No	Time GMT	Event	Lat (N)	Long (E)	Tow time	Tow length	No UNDS	Depth range	Speed (knots)	Comments	Data
29.7.93 D79324	11.52 12.22	In Out	43 18.9 43 17.3	4 48.3 4 45.2	30M		4	1-30	8	No wings Ship fouled fishing gear	4 Sec D79332M1 A1, A2, B1, B2 D.O.
29.7.93 D79325	13.50 15.18	In Out	43 16.2 43 16.7	4 41.7 4 23.8	1H 29M		21	2-42	12	No wings Sun	4 Sec D79332M A1, A2, B1, B2 D.O.
29.7.93 D79326	16.03 18.27	In Out	43 18.6 43 21.9	4 26.2 4 55.8	2H 24M		36	2-42	12	No wings Sun Final tow	4 Sec D79332M A1, A2, B1, B2 D.O.

UOR TOW VERTICAL PROFILE LIST
Table 2

Profile No	Date	Time	G.M.T	Event	Lat.	Long.	Depth	Comment	Data time
D793P22	23.7.93	33M	17.52 18.25	In Out	41 42.0	5 38.4E	200	On CTD STN MA2-1	1 Sec D793334M A3, A4, B3, B4 D.O.
D79323	24.7.93	35M	10.51 11.26	In Out	41 09.8	5 23.3E	200	On CTD STN MA3-6/7	"
D793P24	24.7.93	39M	14.03 14.42	In Out	42 26.6	5 14.13E	200	On CTD STN MA4-1	"
D793P25	26.7.93	37M	11.59 12.36	In Out	42 41.2	5 05.4	200	On CTD	"
D793P26	28.7.93	27M	08.01 08.28	In Out	43 05.2	4 56.3E	200	On CTD STN MA7-6	"
D793P27	29.7.93	5M	08.53 08.58	In Out	In	Rhone	10	From Zodiac	1 Sec + PAR 683 D.O
D793P28	29.7.93	4M	09.08 09.12	In Out	In	Rhone	10	From Zodiac	"
D793P29	29.7.93	5M	09.24 09.29	In Out	In	Rhone	10	From Zodiac	"
D793P30	29.7.93	4M	10.30 10.34	In Out	In	Rhone	10	From Zodiac	"
D793P31	29.7.93	4M	10.42 10.46	In Out	In	Rhone	10	From Zodiac	"
D793P32	29.7.93	4	10.50 10.54	In Out	In	Rhone	10	From Zodiac	1 Sec PAR/683 D.O.
D793P33	29.7.93	3	10.56 10.59	In Out	In	Rhone	10	From Zodiac	"
D793P34	29.7.93	6	11.01 11.07	In Out	In	Rhone	10	From Zodiac	"
D793P35	31.7.93	24			42 50.2	3 46.5		On CTD	1 Sec D79334M1 A3, A4 B3, B4

6.2.8 Jordi Dachs Marginet

Jordi Dachs Marginet
Environmental Chemistry Department
C.I.D, C.S.I.C, Jordi Girona 18 08034
Barcelona, Spain

The samples which have been taken are:

- water samples at MD and all MA stations.
- filters from stand alone pumps (SAP) at the stations MA1, MA9 and MD.

Two diferent kinds of research work are going to be carried out with the samples which have been taken during Discovery cruise (July 1993):

1. The study of the ocurrence of DMS in the Western Mediterranean. So water samples from rossete bottles have been taken and filtered. HCl solution has been added and after that the samples have been freezed, in order to analyse them by GC-FPD, later, in the laboratory.

2. The second research objective is to study the ocurrence, sources and fate of priority organic pollutants and biomarkers in the water column in the Western Mediterranean. It will be carried out with the filters from SAPs, which will be extracted by supercritical fluid extraction. After that a large range of organic compounds (PAHs, PCBs, biomarkers, etc) will be quantified by GC-MS and/or GC-ECD and/or GC-FID. This work will allow us to compare the ocurrence of organic compounds in marine particulate matter between the near-Rhone station (MA9), and others far away from shore (station MA1). The vertical profiles of particulate matter in stations MA1 and MD are going to give us information not only about the ocurrence, but also on the processes (adsorption, biotic processes, etc) which control the behaviour and fate of organic compounds in the marine environment.

6.2.9 Mireille Pujo-Pay

ANALYSIS OF ORGANIC MATTER (NITROGEN AND PHOSPHORUS)

PUJO-PAY Mireille,
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Faculté de Luminy, Case 901,
13288 Marseille cedex 09 - FRANCE

Characteristics of the different areas studied (oligotrophic, mesotrophic and eutrophic)

The vertical distributions of particulate organic nitrogen (PON), phosphorus (POP) , dissolved organic nitrogen (DON) and phosphorus (DOP) established in parallel with the vertical distributions of the chlorophyll (total chlorohyll), allows the characterisation of different areas.

Comparisons between mineral N/P ratio and organic N/P ratio will be established and both compared to the accepted Redfield ratio (N/P=16).
In order to complete the studies on the dissolved organic nitrogen, some incubations have been performed on the deck.

METHODS

Particulate and dissolved organic matter are mineralised by persulfate digestion (Pujo-Pay and Raimbault, submitted), and analysed on an technicon autoanalyser.
These distributions, particulary PON and POP,will be compared with the distributions of chlorophyll measured with the methanol technic on a fluorimeter.

6.2.10 Nathalie Simon

Eros preliminary report, 31/07/93
Nathalie Simon
Station Biologique de Roscoff
F-29680 Roscoff

Distribution of the photosynthetic picoplanktonic cells- Characterisation of the picoeukaryotic populations

The vertical distribution of the Prochlorococcus, Cyanobacteria and picoeukaryotes will be investigated, offshore and inshore, in the vicinity of the Rhone river. Attention will be paid to the picoeukaryotic populations which were shown to be important componants of the mediterranean picoplanktonic community during previous EROS cruise. They were particulary abondant, offshore, in the chlorophyll maximum.

1. The picoplanktonic community
Samples were collected along the different radials (MA, ME, MD, MF), and in the Rhone plume. These samples will be analysed with flow cytometry; The parameters to be mesured incude cell numbers for Prochlorophytes,Cyanobacteria and picoeukaryotes, forward and right angle light scatter, orange (phycoerythrin) and red (chlorophyll) fluorescence.

2. Characterisation of the picoeukaryotic community
Samples were taken in the surface waters (5 or 10 m) and around the chorophyll maximum in stations MA1, MA3, MA5, MA7 and MD1 in order to investigate the taxonomic composition of the community using classical methods and molecular techniques.

Classical methods include:
Isolation of strains from MA1 and MD1: prefiltered sea water samples (<3; 2; 0.6 µm) enriched with different medium were incubated on the deck. Eukaryotic cells will be selected either by filtration, antibiotic treatement or cell sorting for further identification.
Preservation of concentrated (hollow fiber ultrafiltration) and non concentrated samples for microscopy and transmission electron microscopy.

The samples for molecular taxonomic studies include:
Paraformaldehyde preserved samples for further in situ hybridization with fluorescent oligonucleotide probes targeted to taxonomic groups. Fluorescent targeted cells will be detected by flow cytometry.
Frozen Durapore filters: The inferior to 5µm fraction of sea water was harvested on 0.2µm Durapore filters for further extraction of DNA, amplification of 18S rRNA and sequencing. The sequences will be

compared to rRNA sequences from data bases in order to resolve the taxonomic position of the sequenced organism.

6.2.11 N.J.P. Owens

Discovery 203 cruise report.

N.J.P. Owens - Plymouth Marine Laboratory.

Phytoplankton nitrogen assimilation.

Objectives:

1) To measure the rates of nitrogen assimilation by the phytoplankton community in a range of environments of contrasting nutrient status.

2) To carry out the study simultaneously with phytoplankton production measurements.

Methods & work carried out at sea:

Nitrogen assimilation was measured by following the incorporation of 15N labelled substrates into the phytoplankton during *in-situ* incubations. Seven incubations were successfully carried out at six stations (see Table 1, and figure 1).

Pre-dawn CTD casts were made to collect water from six depths from the upper 100m (depths selected varied for each incubation depending upon the specific conditions encountered - see Table 2). After pooling the water, which provided a common sample for all the production measurements, 4 x 2.4 l samples at each depth were amended with 15N substrates. Nitrogen was added as urea, ammonium and nitrate; a dark nitrate incubation was also carried out. Because of the ability to measure nano-molar concentrations of ambient nitrate and ammonium, 15N was added at approximately 10% addition. 15N Urea was added at the same concentration as ammonium.

Incubations were commenced at dawn with the deployment of a free-floating incubation rig. The rig was recovered at dusk on five occasions, and samples were incubated during the dark period at approximately the ambient temperature (+/- 2C). Two incubations were carried out for the full 24h period *in situ*. PAR measurements were made throughout the incubation period, and at least one vertical light profile around local noon.

Incubations were terminated by filtration onto ashed GF/F filters. Samples were divided into two fractions by pre-filtration of a sub-sample through 5um nuclepore filters. Samples were frozen, and will be analysed by mass-spectrometry on return to Plymouth.

Results & assessment of achievements:

No results are available for the rates of nitrogen assimilation. However, an initial assessment indicates that the objectives will be fully attained. Preliminary indications from the oxygen production group suggest a wide range of production, with interesting relative gross/net production rates (see oxygen group report). The desired range of trophic conditions were investigated, with the station positions consistent with the zones of productivity identified by the production group following the Plymouth workshop.

Overall, a highly successful cruise. All rig deployments and recoveries were successful, and handled with the expert help and professionalism from the bosun and crew that one is all too ready to take for granted, but when thought about leaves nothing to be desired.

I cannot let the opportunity pass of this last cruise report as a NERC employee to thank all my seagoing friends from both the lab. and on the ships for helping to make my seagoing days the most memorable and enjoyable of my professional life to date. Many of the philosophies, hopes, ideas and thoughts about life, and the oceans, I have developed over the years have had their origins at sea, and have been shaped in unquantifiable ways by those special people who go to sea for a living - even for a short period, and truly know the meaning of the works *"great waters"*. To them all, present and past, I extend my most heartfelt thanks - you will never know what you have meant to me, and I wish you all smooth seas and safe havens.

Table 1. 15N incubations carried out.

Station	CTD casts	Date	Comments
Rig #1. MA1	MA1 2,3,4	18/7/93	Dawn-dawn
Rig #2. MA1	MA1 21,22,23	20/7/93	dusk recovery
Rig #3. MA9	MA9 3,4,5	22/7/93	dusk recovery
Rig #4. MA3	MA3 1,2,3	24/7/93	dusk recovery
Rig #5. MA5	MA5 1,2,3	26/7/93	dusk recovery
Rig #6. MA7	MA7 1,2,3	28/7/93	dusk recovery
Rig #7. MD1	MD1 1,2,3	30/7/93	Dawn-dawn

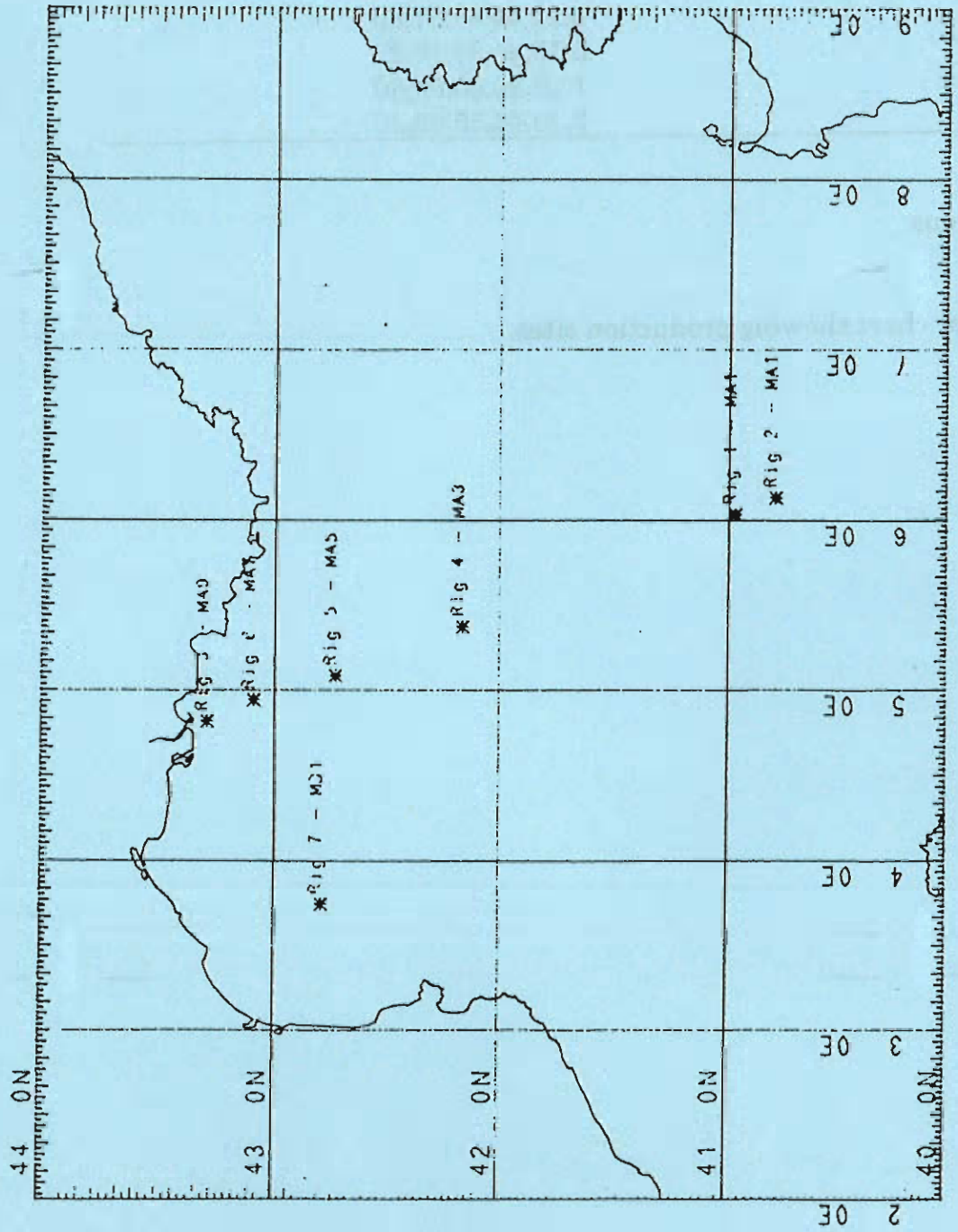
Table 2. Incubation Depths.

Rig #	Depths (m)
1	10,15,25,50,65,95
2	5,10,20,50,75,90
3	1,7,10,15,20,40
4	5,20,40,50,57,80
5	5,15,20,30,46,80
6	1,10,20,40,60,80
7	5,20,40,50,60,80

N.J.P. Owens
1/8/93.

See over for chart showing production sites.

Discovery 203 Production Sites



6.2.12 Pascal Conan

Measurement of the primary production with the 14C method

CONAN Pascal
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OBJECTIVES

The principle aim of this cruise was to obtain more data on the total primary production in contrasting regions of the Northwestern Mediterranean Sea, ie the coastal eutrophic system dominated by the Rhône input and the offshore oligotrophic system.

We also aimed to intercalibrate two distinct methods of 14C measurement, that is to say the classic method and a new autonom deployment system called LET-GO.

It was also hope that our 14C method be critically evaluated against two others methodsof primary production measurement.

MATERIALS AND METHODS

Classic rig

Three hours before sunrise, 60 liters samples of seawater were collected at six different depths. Sub samples were taken by each the three techniques employed namely 14C uptake (CONAN Pascal), 15N uptake (OWENS Nick) and oxygen production (WILLIAM P. et al).
For 14C method, six replicate 250 ml bottles were filled :

+ 3 replicates for clear incubation
+ 1 for black fixation and respiration evaluation
+ 1 for T0 and so immediate fixation of 14C
+ 1 for chlorophyll determination

All of the replicates except the chlorophyll sample were inoculated with 1 ml of a radioactive 14C solution.
The bottles are attached to the rig in the sea to commence a 24 hours incubation period to estimate net total primary production.

LET-GO rig

The LET-GO system is simultaneously deployed and the two rigs linked securely together. This system is then positioned in the surface water and sinks under gravity sampling 15 discrete pre-determined depths. The 1 ml of the 14C radioactive solution was injected through the influence of gravity when the weighted rig reaches its bottom depth.

After 24 hours incubation period, both rigs are recovered and samples immediately filtered onto GFF filters. These filters are then placed in scintillation vials and stored at ambient temperature until counting.

Others methods

Replicate samples for oxygen and 15N methods were placed on the same rigs, for the same incubation period, for the purpose of intercomparaison.

RESULTS

In total seven production stations were studied, essentially in oligotrphic waters but in eutrophic and mesotrophic systems too.However due to the absence of an on board liquid scintillation counter, samples were not measured immediately but stored for post cruise laboratory analysis.

Unfortunately the LET-GO system was lost on the fourth station an consequently only three comparative rig deployments were possible.

During this cruise, we also realised 2 time series production of about 72 hours each, by incubation on the boat deck, using surface Sea water samples and a 50 % light screen.

The results of these studies will be correlated with the physical and chemical aspects of the system through nutrients (WOODWARD Malcom), organic matter and chlorophyll (PUJO-PAY Mireille and CONAN Pascal) data integration.

Moreover, these results are compatible with my doctorate researches which are concerned with the study of the seasonal variations of the primary production and chlorophyll biomass in the Liguro-Provencal Catalan current (LPCC) along a transect offshore Marseille in the Northwestern Mediterranean basin, integrated in the chemical and physical systems.

6.2.13 Ray Barlow and Denise Cummings

EROS 2000 CRUISE - JULY 1993

PIGMENT BIOGEOCHEMISTRY

Ray Barlow and Denise Cummings
Plymouth Marine Laboratory

Objectives

1) Investigate the vertical and horizontal distribution of chlorophyll and carotenoid pigment biomarkers in order to determine the chemotaxonomic composition of the phytoplankton community in the western Mediterranean in relation to environmental variability.

2) Estimate fluxes of sedimenting phytogenic material from measurements of chlorophylls and phaeopigments in sediment trap and *in situ* stand alone filtration pump samples.

Methods

1) Samples from 6-12 depths at 15 stations were taken during Leg 1 in addition to 58 underway surface samples for comparison with the UOR data.

2) During Leg 2, samples were taken in the upper 200m from 22 biogeochemistry CTD casts at the following stations: MA1 (3 casts), MA2, MA3, MA4, MA5, MA6, MA7, MA8, MA9 (2 casts), MC1, MC2, MC3, MC4, MD1, ME1, ME2, MF1, MF2, MF3.

3) Further samples were drawn at 26 stations during the Rhone plume mapping exercise and at 8 stations between the Rouston buoy and up the Rhone river to 2 km beyond the Canal du Fos.

4) Samples were also drawn from sediment traps deployed at stations MA1 and MD1 (see Carlos Miquel's report) and from all *in situ* stand alone pump deployments (see Tim Fileman's report).

5) Analysis for pigments was performed by reversed phase high pressure liquid chromatography using absorbance detection for chlorophylls and carotenoids and fluorescence detection for phaeopigments.

Results

A new reversed phase HPLC technique, incorporating a C-8 chromatography column, was used during this cruise and proved to be successful in separating and quantifying some 13 chlorophyll and

carotenoid pigments and 4 to 5 chlorophyll breakdown products. In particular, this new method allowed us to separate divinyl chlorophyll *a* from chlorophyll *a*, thus confirming the presence of prochlorophyte picoplankton in the water column. Other important biomarker pigments that we detected included 19'-hexanoyloxyfucoxanthin (prymnesiophytes), fucoxanthin (diatoms), 19'-butanoyloxyfucoxanthin (chrysophytes), peridinin (dinoflagellates), zeaxanthin (cyanobacteria and prochlorophytes) and chlorophyll *b* (green algae). Further pigments that were identified on the chromatograms included chlorophyll c_3, chlorophyll c_1c_2, diadinoxanthin and a and b carotenes.

A preliminary observation of the data indicated that the pigment concentrations were low at the oligotrophic offshore stations and increased on the shelf of the Gulf of Lions in the plume of the Rhone river. An example of some of the pigment profiles obtained at the oligotrophic station MA1 is presented in Fig.1. Low concentrations of chlorophyll *a* were measured in the upper 20m (50 ng. l^{-1}), but these levels increased with depth to give a subsurface chlorophyll maximum of 900 ng.l^{-1} at 70m (Fig.1A). Deeper in the water column, chlorophyll *a* concentrations decreased rapidly and were very low (10 ng.l^{-1}) below 120m. The main accessory pigments in the top 20-40m were 19'-hexanoyloxyfucoxanyhin (Fig.1B) and zeaxanthin (Fig.1C), while at the chlorophyll maximum 19'-hexanoyloxyfucoxanthin and fucoxanthin were the most prominent accessory pigments (Fig.1B). The highest concentrations of divinyl chlorophyll *a* (25 ng.l^{-1}) and peridinin (50 ng.l^{-1}) were also measured at the depth of the chlorophyll maximum at 70m (Fig.1B,C) and chlorophyll *b* levels increased with depth to reach a maximum at 60m (90 ng.l^{-1}) (Fig.1C). The highest 19'-butanoyloxyfucoxanthin concentrations (100 ng.l^{-1}) were measured at 80m (Fig.1B). Below the chlorophyll maximum, the levels of all pigments decreased rapidly with depth and it is interesting to note that the concentrations of 19'-butanoyloxyfucoxanthin were similar to those of 19'-hexanoyloxyfucoxanthin between 90 and 200m. These results suggested that in the upper 20-40m, prymnesiophytes and cyanobacteria were the main components of the phytobiomass, while prymnesiophytes and diatoms were the most important at the chlorophyll maximum. Below the chlorophyll maximum, prymnesiophytes and chrysophytes seemed to be the most prominent.

Acknowledgements

Sincere thanks to Dr R.F.C. Mantoura for the efficient and smooth organisation of a most enjoyable cruise; Mr T. Fileman for collection of samples on Leg 1; Mr M Woodward for logistics organisation; the officers and crew of RRS *Discovery* for their competent assistance during the cruise.

(see over for figure 1)

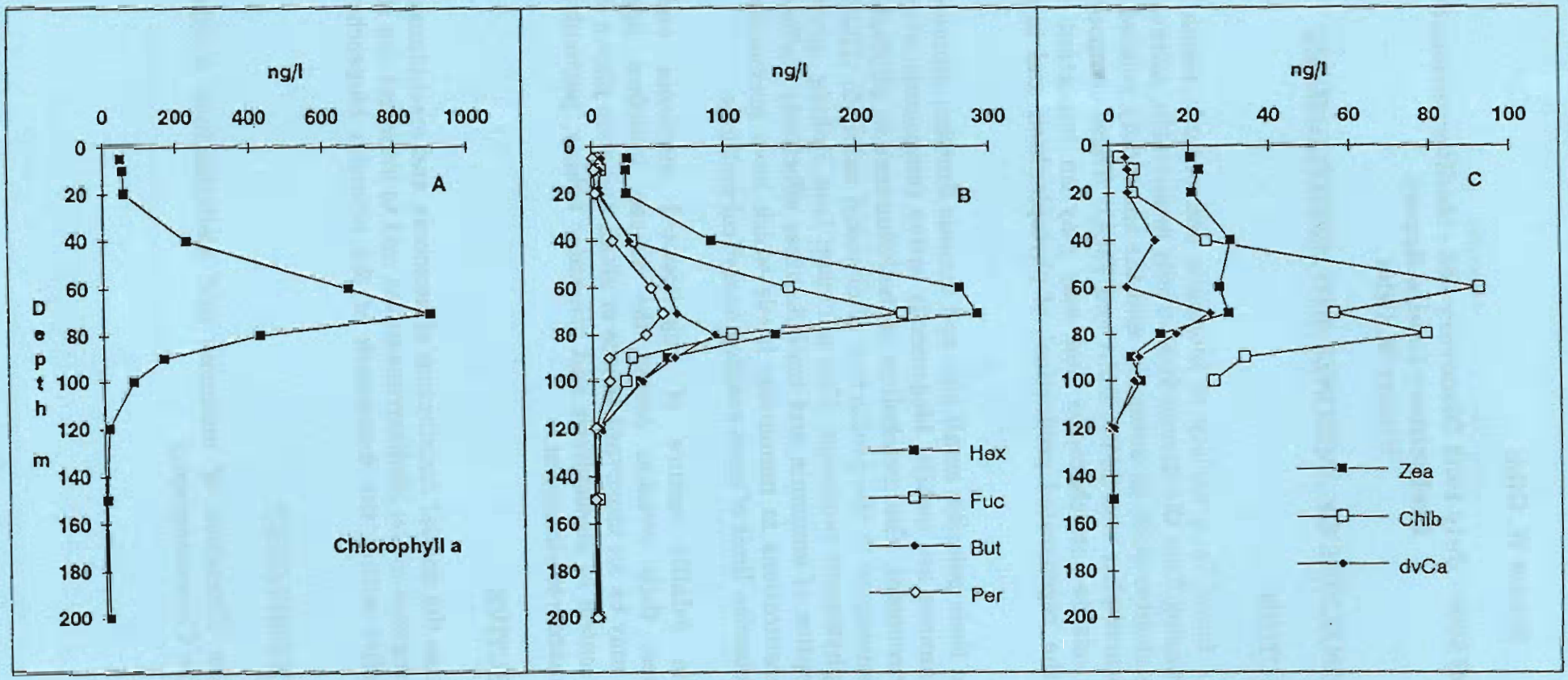


Fig.1 Vertical profiles of pigment concentrations at station MA1 (cast MA1-7). Pigment identities are: Hex-19'-hexanoyloxyfucoxanthin; Fuc-fucoxanthin; But-19'butanoyloxyfucoxanthin; Per-peridinin; Zea-zeaxanthin; Chlb-chlorophyll b; dvCa-divinyl chlorophyll a

6.2.14 Stuart W. Gibb

EROS 2000 - July 1993 Discovery 203 - Mediterranean Sea
Preliminary Cruise Report
Stuart W. Gibb

ANALYSIS OF AMMONIA AND METHYLAMINES

INTRODUCTION

Nitrogen is found in a variety of inorganic and organic forms in oxic seawater ranging from the thermodynamically most stable, nitrate to the reduced catabolites such as ammonia and the chemically related mono-, di-, and tri-methylamines (MMA,DMA and TMA). These compounds are basic and volatile in character and may play an important role in supplying the 'regenerated production', of phytoplankton and to marine bacteria.

By virtue of their polarity, small size and osmotic function ammonia and the methylamines are mobile, biogenically active compounds within the marine environment. The metabolism of methylamines in phytoplankton is directly analogous to the production of dimethyl sulphide (DMS) from DMSP, its phytogenic precursor. This microbial loop, linking production and consumption of ammonia and methylamines effectively buffers their aquatic concentrations to nanomolar levels which have previously been below the detection limit of most existing analytical methods.

Due to the volatile nature of unprotonated ammonia and the methylamines, their evasion across the air-sea interface into the atmosphere may be an important source of alkali and may play a crucial role in the control of atmospheric and rainwater acidity, particularly in the remote marine environment.

CORE OBJECTIVE

To characterise the spatial distribution of ammonia and methylamines in contrasting regimes of the Mediterranean sea and to interpret the results of these studies within the framework of the nitrogen biogeochemical cycle.

TECHNIQUE EMPLOYED

Flow Injection Extraction of ammonia and methylamines coupled to suppressed Ion Chromatography

STUDIES CARRIED OUT

*Aqueous phase concentration measurements were carried out for:

a.) depth profiles in oligotrophic, mesotrophic and eutrophic water systems
b.) surface waters of the Rhone plume
c.) surface water samples collected along the Rhone estuary

*Gas phase samples were collected through a simple acid trapping technique in an attempt to ascertain the levels of ammonia and methylamines in the lower atmosphere. Although rather basic it was hoped that results from this study help indicate the direction and magnitude exchange of these species across the air-sea interface.

* Excretion studies were also carried out for zooplankton netted in the upper water column during their night time vertical migration. Although only semi-quantitative in character it was hoped that such time series based experiments would give a finger print of the dominant production mechanism of catabolic methylamines.

PRELIMINARY RESULTS

Results for two contrasting stations MA2 (oligotrophic) and MA9 (eutrophic) are summarised below to give an indication of the concentration of ammonia and methylamines determined.Highest concentrations of ammonia were observed in the surface waters of the Rhone estuary whilst methylamine concentrations were found to be greatest in the coastal estuary plume mixing zone.

	Aqueous concentration (nM)			
Station	Ammonia	MMA	DMA	TMA
MA2	22-54	0-7.5	1.7-3.4	0-6
MA9	0-638	0-43	3.0-13.5	6.6-10.0

The low concentrations of ammonia and methylamines observed are in line with levels of other nutrients measured and in the case of ammonia and methylamines may largely be attributed to the relatively oxic conditions of all the samples studies which dictates that their formation is, thermodynamically at least, unfavourable

POST CRUISE WORK

* Analysis of trapped atmospheric samples
* Analysis of diffused seawater extracts
* Data processing and correlation
* Interpretation of results within the context of the marine nitrogen cycle

6.2.15 Tim Fileman

Cruise Report
EROS - RRS Discovery 203

Water Column Particulate Biogeochemistry

T. W. Fileman
Plymouth Marine Laboratory

Objectives

Leg 1

1. To asses the fate and fluxes of sedimenting organic material using large volume in-situ pumping. In particular to measure levels of particulate organic carbon (POC) and nitrogen (PON), pigments, amino acids, carbohydrates, lipid biomarkers and hydrocarbons.

A depth profile was required in the Straits of Gibraltar and Sicilly.

2. To provide a SAP service for the trace metal team. See reports of Lei Chou and Nick Morley.

Leg 2

1. To asses the fate and fluxes of sedimenting organic material using large volume in-situ pumping. In particular to measure levels of particulate organic carbon (POC) and nitrogen (PON), pigments, amino acids, carbohydrates, lipid biomarkers and hydrocarbons.

Initial objective was to sample 6 stations along the MA line towards the Rhone mouth. This was revised later due to the loss of pumps on leg 1.

2. Collection of SAP samples for Terry Hamilton, IAEA, Monaco. Particulate formation and export rates of suspended and sinking particles will be measured using nuclide/carbon ratios. This will allow quantification of the flux of organic material through the water column.

Sampling Programme (revised)

1. Biogeochemistry depth profile in Straits of Gibraltar, 4 depths minimum.
2. Biogeochemistry depth profile in Straits of Sicilly, 4 depths minimum.
3. Biogeochemistry and radionuclide depth profile at station MA1.
4. Biogeochemistry and radionuclide depth profile at station MD1.
5. Biogeochemistry depth profile at station MA9.

Methods

Samples of suspended and sedimenting particulates for organic biogeochemical analysis were collected on ashed 293mm GF/F filters. Filters were quantitatively subdivided for later analysis. Particulates for radionuclides were collected on 293mm 0.45µm Asypor filters. Dissolved radionuclides were scavenged from the Asypor filtrate using two MnO_2 coated filter cartridges in series.

Discussion & Acknowledgments

Unfortunately during the first SAPs deployment at station D3 on leg1 one SAP was lost and another was damaged. This posed serious problems for our sampling programme, which had to be reduced. However, apart from some minor problems the rest of the SAPing went well. Table 1 shows all the SAP deployments.

A big THANKYOU to the RVS boys and the ship's officers and crew for all their help and support.

Equipment Loss Report

Date of loss: 3/7/93
Time 04:36 GMT
Station D3
Position: 35 56.4N 5 46.2W

Station D3 is on the west side of the Straits of Gibraltar. The depth given was 280 metres. Four SAPs were deployed at 40, 80, 120 and 160 metres. A pinger was not used as it was considered that we had an adequate safety margin. A long delay time of 1.5 hours was set as this was the first SAP deployment of the cruise. Pump time was set to 1 hour. At approximately 07:05 GMT I was alerted by Colin Day (RVS Mech.) that the depth was down to 107 metres. We checked the echo sounder to confirm. The bridge were alerted and recovery attempted.

One SAP was recovered and it became apparent that the wire was firmly stuck on the bottom. When it was finally freed one further SAP was recovered intact. A third was recovered damaged, the filter housing and flow metre were missing and the pump impeller housing was damaged. The fourth (PML) SAP was missing. The final depth taken during recovery was 87 metres.

Thankyou once again to the RVS boys and the officers and crew of Discovery for their skill and ingenuity, without which we would not have recovered any SAPs at all.

Table 1: SAP log for EROS - Discovery 203 cruise.

Cast #	Date	Time Out GMT	Stn #	Lat	Lon	Pump Time	Filter	Depth	Scavenger In 1 Out 2		Volume Pumped	Subsample 22mm	Subsample 59mm	Comments
1	3/7/93	4:36	D3	35 57.3N	5 47.4E	1	GF/F	160						PUMP LOST
1	3/7/93	4:36	D3			1	GF/F	120						PUMP DAMAGED
1	3/7/93	4:36	D3			1	GF/F	80			691.3	4.9	30.6	
1	3/7/93	4:36	D3			1	GF/F	40			568.8	3.5	25.1	
2	3/7/93	17:20	D3	35 57.59N	5 48.02W	1	GF/F	55m from bottom			760.6	4.7	33.6	
2	3/7/93	17:20	D3			1	142mm Nuc	55m from bottom			72.2			
2	3/7/93	17:20	D3			1	293mm Nuc	55m from bottom			429			
3	9/7/93	16:42	D11	37 44.00N	11 27.09E	1	142mm Nuc	550			102.2			PUMPED ON WAY DOWI
3	9/7/93	16:42	D11			1	293mm Nuc	550			575.4			PUMPED ON WAY DOWI
3	9/7/93	16:42	D11			1	GF/F	550			797.9	4.9	35.3	PUMPED ON WAY DOWI
4	9/7/93	21:25	D11	37 44.00N	11 26.9E	0.5	142mm Nuc	23			19.8			
4	9/7/93	21:25	D11			0.5	293mm Nuc	23			142.2			
4	9/7/93	21:25	D11			0.5	GF/F	90			387.6	2.4	17.1	
4	9/7/93	21:25	D11			0.5	GF/F	23			366.7	2.3	16.2	
5	10/7/93		D14	36 40.1N	12 20.4E	1	142mm Nuc	1000			105.6			
5	10/7/93		D14			1	293mm Nuc	1000			661.2			
5	10/7/93		D14			1	142mm Nuc	700			122.1			
5	10/7/93		D14			1	293mm Nuc	700			666.9			
6	10/7/93	18:00	D14	36 40.3N	12 19.2E	1	142mm Nuc	300			107.8			
6	10/7/93	18:00	D14			1	293mm Nuc	300			501.7			
6	10/7/93	18:00	D14			1	142mm Nuc	30			21.7			
6	10/7/93	18:00	D14			1	293mm Nuc	30			169			
7	13/7/93	17:35	D16/MA1	40 59.87N	5 59.8E	1	293mm Nuc	450			578.2			
7	13/7/93	17:35	D16/MA1			1	142mm Nuc	450			107.7			
7	13/7/93	17:35	D16/MA1			1	142mm Nuc	150			84.2			
7	13/7/93	17:35	D16/MA1			1	293mm Nuc	150			464			
8	14/7/93	23:25	D16/MA1	40 57.2N	5 56.2E	1.4	142mm Nuc	2273			160.2			
8	14/7/93	23:25	D16/MA1			2	293mm Nuc	2273			1132.1			
8	14/7/93	23:25	D16/MA1			2	142mm Nuc	1400			203.5			
8	14/7/93	23:25	D16/MA1			1.3	293mm Nuc	1400			851.9			
9	18/7/93	16:01	MA1	40 53.97N	6 01.98E	0.5	GF/F	10			337	2.1	14.9	
9	18/7/93	16:01	MA1			0.5	GF/F	35			370.8	2.3	16.4	
9	18/7/93	16:01	MA1			0.5	Asypor	10	4A1	4A2	226.1			
9	18/7/93	16:01	MA1			0.5	Asypor	35	4B1	4B2	249.2			
10	18/7/93	20:35	MA1	40 53.4N	6 03.0E	0.5	Asypor	50	B1	B2	182			
10	18/7/93	20:35	MA1			0.5	Asypor	70	2O1	2O2	227.1			
10	18/7/93	20:35	MA1			0.5	GF/F	50			234.7	1.4	10.4	
10	18/7/93	20:35	MA1			0.5	GF/F	70			330.7	2.0	14.6	
11	19/7/93	14:05	MA1	40 49.7N	6 04.7E	1	GF/F	300			684.5	4.2	30.3	
11	19/7/93	14:05	MA1			1	Asypor	300	F1	F2	544.3			
11	19/7/93	14:05	MA1			1	GF/F	100			785.2	4.8	34.7	
11	19/7/93	14:05	MA1			1	Asypor	100	H1	H2	555.6			
12	19/7/93	19:05	MA1	40 48.9N	6 06.9E	2	GF/F	1980			640.5	3.9	28.3	
12	19/7/93	19:05	MA1			2	Asypor	1980	A1	A2	1069.6			
12	19/7/93	19:05	MA1			2	GF/F	1100			1615.9	9.9	71.4	
12	19/7/93	19:05	MA1			2	Asypor	1100	C1	C2	879			
13	22/7/93	12:15	MA9	43 17.1N	4 53.5E	0.5	GF/F	30			326.7	2.0	14.4	
13	22/7/93	12:15	MA9			0.5	Asypor	30	G1	G2	206.3			
13	22/7/93	12:15	MA9			0.5	Asypor	8	D1	D2	1.1			DID NOT PUMP
13	22/7/93	12:15	MA9			0.5	GF/F	8			298.2	1.8	13.2	
14	30/7/93	8:00	MD1	43 47.57N	3 45.05E	0.5	Asypor	20	E1	E2	165.4			
14	30/7/93	8:00	MD1			0.5	GF/F	20			271.5	1.7	12.0	
14	30/7/93	8:00	MD1			0.5	Asypor	10	2U1	2U2	16.3			DID NOT PUMP - REPEA
14	30/7/93	8:00	MD1			0.5	GF/F	10			326.8	2.0	14.4	
15	30/7/93	12:04	MD1	42 50.4N	3 45.3E	0.5	Asypor	45	2X1	2X2	198.1			
15	30/7/93	12:04	MD1			0.5	GF/F	45			247.9	1.5	11.0	
15	30/7/93	12:04	MD1			0.5	Asypor	30	2S1	2S2	209			
15	30/7/93	12:04	MD1			0.5	GF/F	30			294.2	1.8	13.0	
16	30/7/93	17:26	MD1	40 50.8N	3 46.4E	0.5	GF/F	75			340.4	2.1	15.0	
16	30/7/93	17:26	MD1			0.5	Asypor	75	H1	H2	256.6			
16	30/7/93	17:26	MD1			0.5	GF/F	60			361	2.2	16.0	
16	30/7/93	17:26	MD1			0.5	Asypor	60	3Y1	3Y2	266.7			
17	30/7/93	21:15	MD1	42 51.24N	3 46.72E	0.5	GF/F	90			273.6	1.7	12.1	
17	30/7/93	21:15	MD1			0.5	Asypor	90	2R1	2R2	224.7			
17	30/7/93	21:15	MD1			0.5	GF/F	10			294.4	1.8	13.0	REPEAT 10M DEPTH
17	30/7/93	21:15	MD1			0.5	Asypor	10	3Z1	3Z2	203.9			REPEAT 10M DEPTH

6.2.16 E.Malcolm S. Woodward

DISCOVERY 203, (EROS 2000) SECOND LEG CRUISE REPORT.

E. MALCOLM S. WOODWARD
PLYMOUTH MARINE LABORATORY

OBJECTIVES.

To investigate the distribution af the major nutrients, nitrate, nitrite, silicate, phosphate, ammonia and urea, in the Gulf of Lions, and to study in detail a transect form an oligotrophic station into the plume region of the River Rhone.
To study the surface concentrations of the nutrients in a detailed survey of the Rhone plume, and the Gulf of Lions.
To make unique data measurements of nanomolar concentrations of ammonia, using a new analysis technique, in the areas where conventional analysis indicates no ammonia, ie; less than the detection limits.

METHODS

The six major nutrient species analysed were:

Nitrate: Nitrite: Phosphate: Silicate: Ammonia and Urea.

These were analysed according to the methods described in 'Nutrient analysis techniques', EMS Woodward, January 1992, Plymouth Marine Laboratory.
A nanomolar ammonia anlysis method was deployed according to the method of Ron.Jones, 1992.
Trace nitrate and nitrite analysis was carried out using a chemiluminescent analysis technique according to Garside, 1983.

RESULTS

Nutrients were analysed for the following CTD stations:

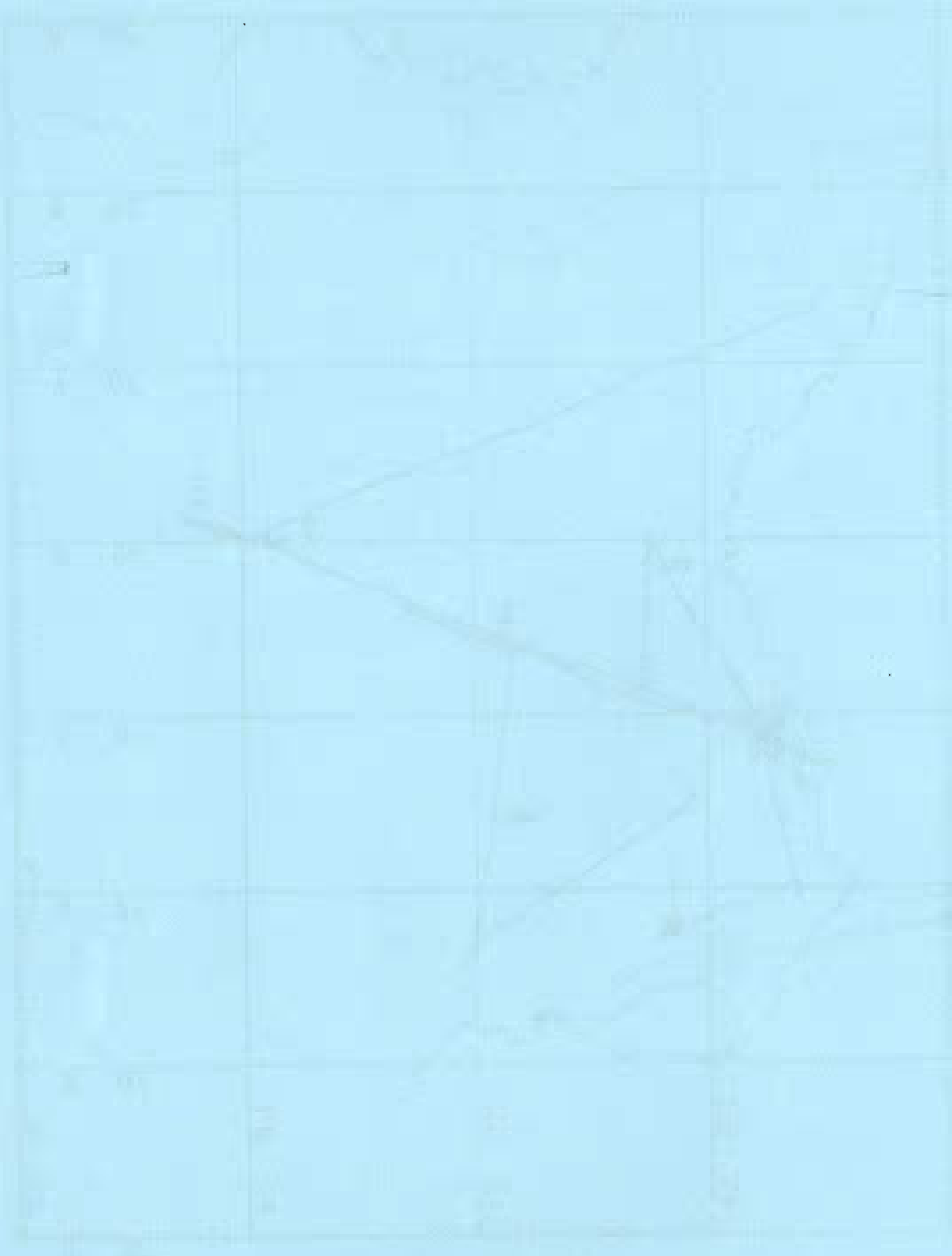
MA1 (6 depths) RIG STATION 1
MA1 (12 depths) DEEP CTD
MA1 (6 depths) RIG 2
MA1 (12 depths) DEEP CTD 2
MA9-7 (6 depths) CTD(Non Plume)
MA2-1 (12 depths) SHALLOW CTD
MA3 (6 depths) RIG 3
MA3-7 (12 depths) SHALLOW CTD
MA4-2 (12 depths) DEEP CTD
MA5-6 (12 depths) DEEP CTD)
MA7 (6 depths) RIG 5
MA8-1 (11 depths) CTD
MD1-6 (12 depths) CTD
CTD Shakedown (9 depths)
MA1 (12 depths) SHALLOW CTD
MA1 (12 depths) SHALLOW CTD 2
MA9 (6 depths) RIG 3
MA9-8 (6 depths) CTD(Plume)
MA2 2 (12 depths) DEEP CTD
MA3-6 (12 depths) DEEP CTD
MA4-1 (12 depths) SHALLOW CTD
MA5 (6 depths) RIG 4
MA5-7 (12 depths) SHALLOW CTD
MA6-1 (12 depths) CTD
MD1 (6 depths) RIG 6

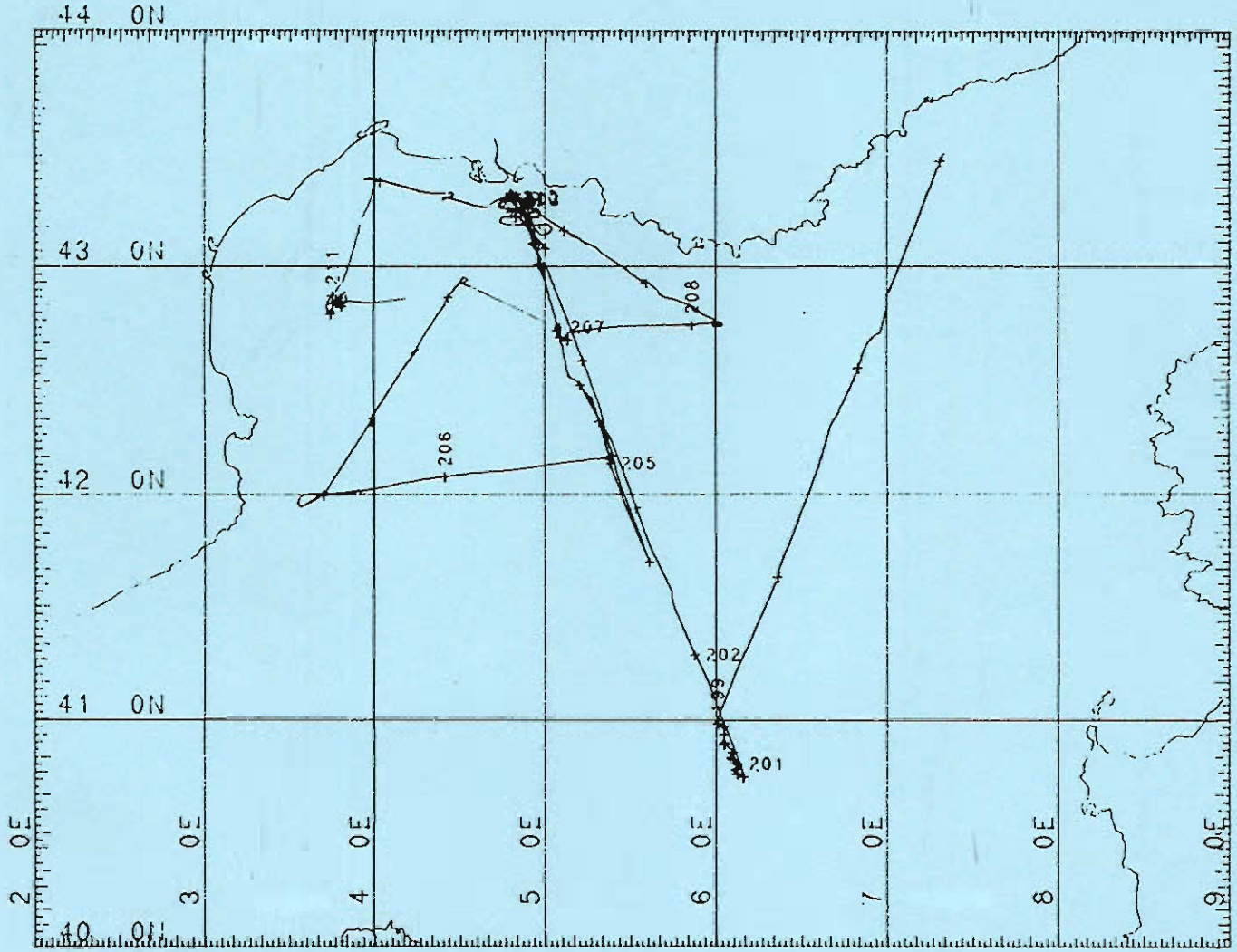
Continuous on-line analysis was carried out for the major nutrients, semi-continuous on-line nanomolar ammonia analysis, and regular discrete nanomolar nitrate and nitrite analyses were carried during the following transects:

17/7/93 (0700) - 18/7/93 (0030)
20/7/93 (1800) - 22/7/93 (0030) MA1 - River Rhone
22/7/93 (2100) - River Rhone Mapping.
25/7/93 (0600) - 26/7/93 (0030)
27/7/93 (0900) - 28/7/93 (0010)
29/7/93 (0945) - 30/7/93 (0100)

RESULTS:
The surface nutrients were as expected severely depleted in the surface waters above the thermocline. With the new nanomolar ammonia analyser I was able to carry out a comprehensive surface survey of ammonia for the whole area covered by the cruise. The ammonia levels were in the region of 20-30 nanomolar offshore, increasing shorewards towards the Rhone. The NOX nanomolar nitrate and nitrite analyser also was used to analyse the nutrient deplete water samples from the oligotrophic offshore region, showing nitrite as low as 5 nanomolar, and nitrate depleted to as little as 12 nanomolar.

6.3 Figures





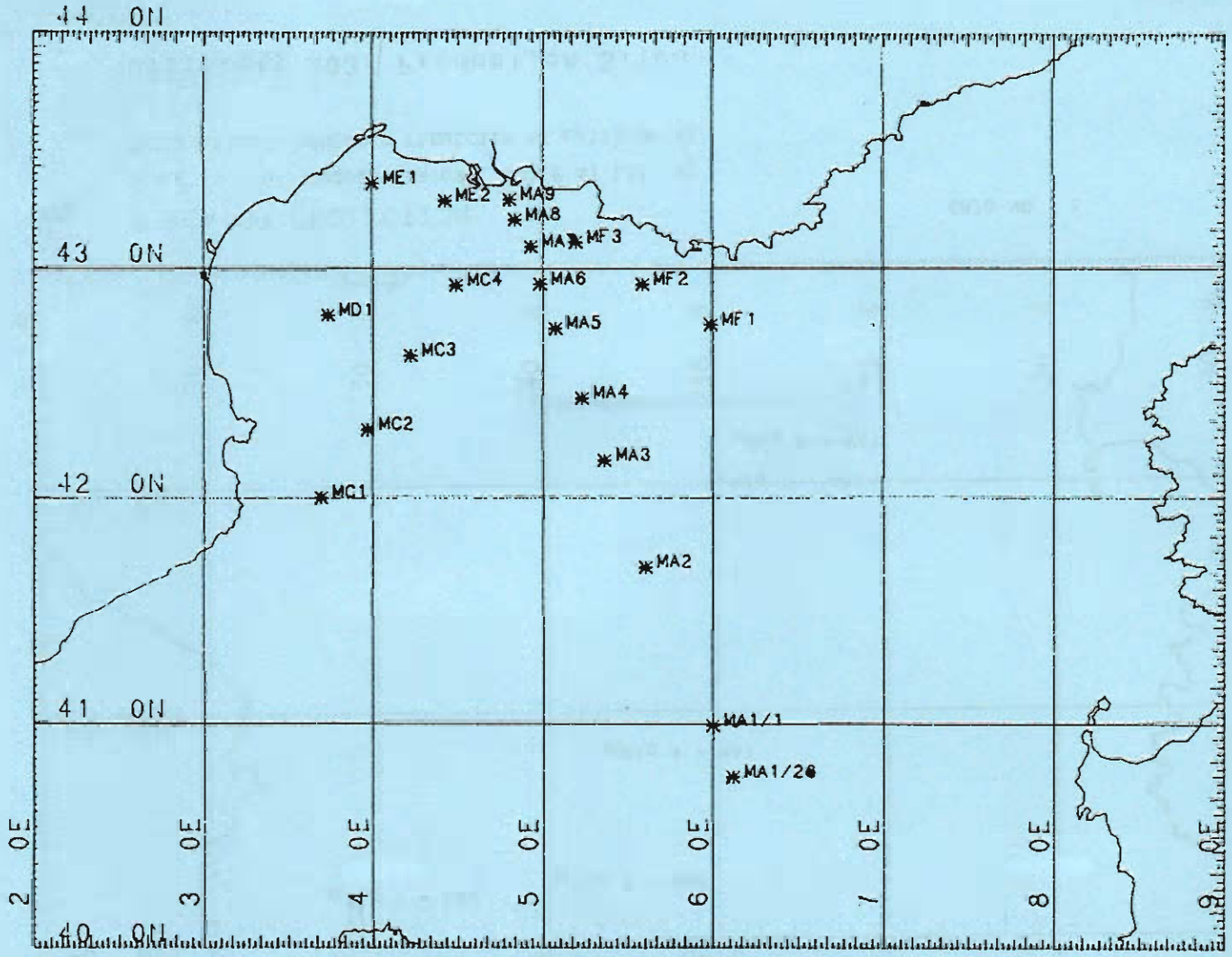
MERCATOR PROJECTION

GRID NO 2

SCALE 1 TO 4000000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 42

Discovery 203/ EROS/ Montoura Ship Track Leg 2



MERCATOR PROJECTION

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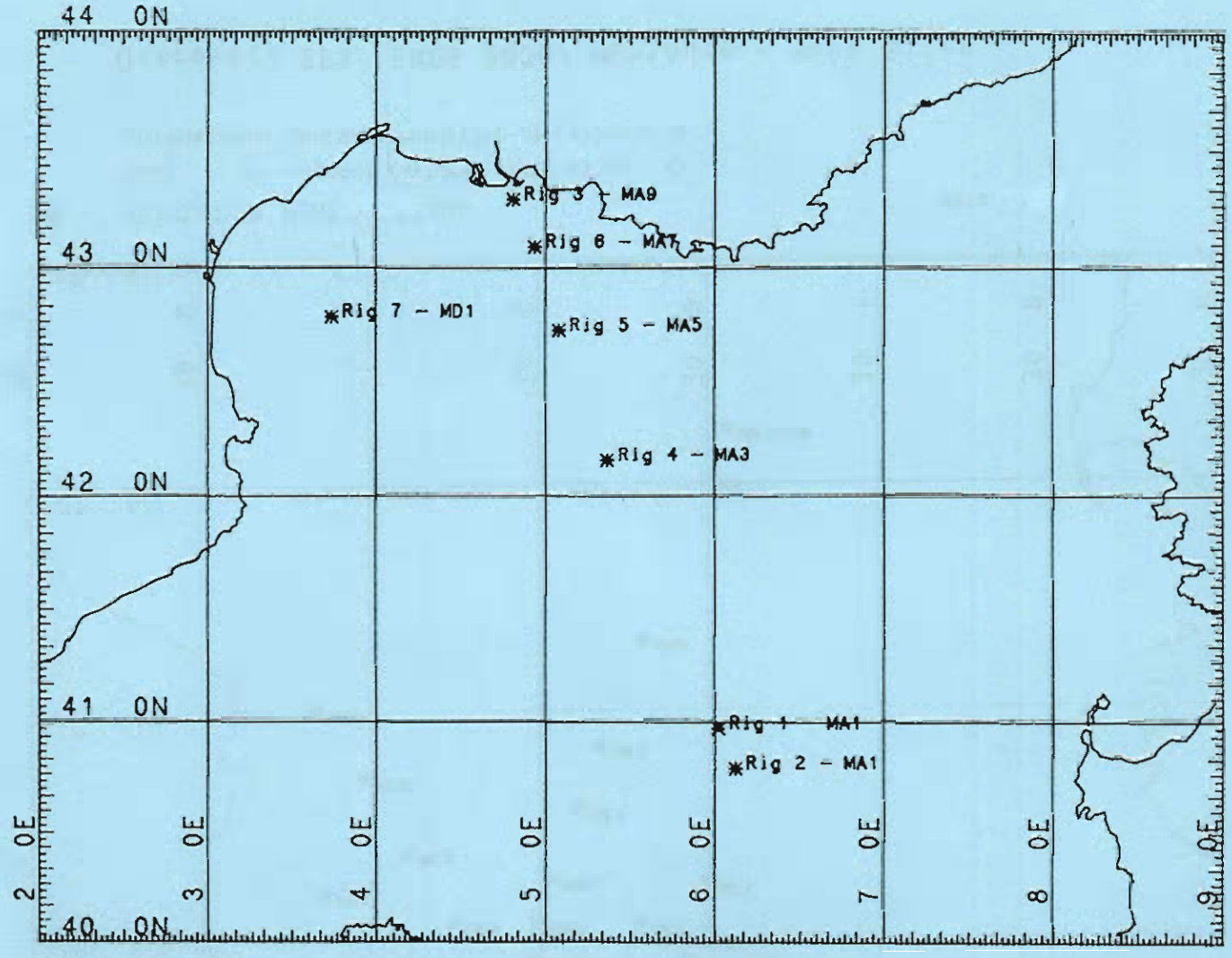
Discovery 203/ EROS 2000/ Manloura – Work Sites



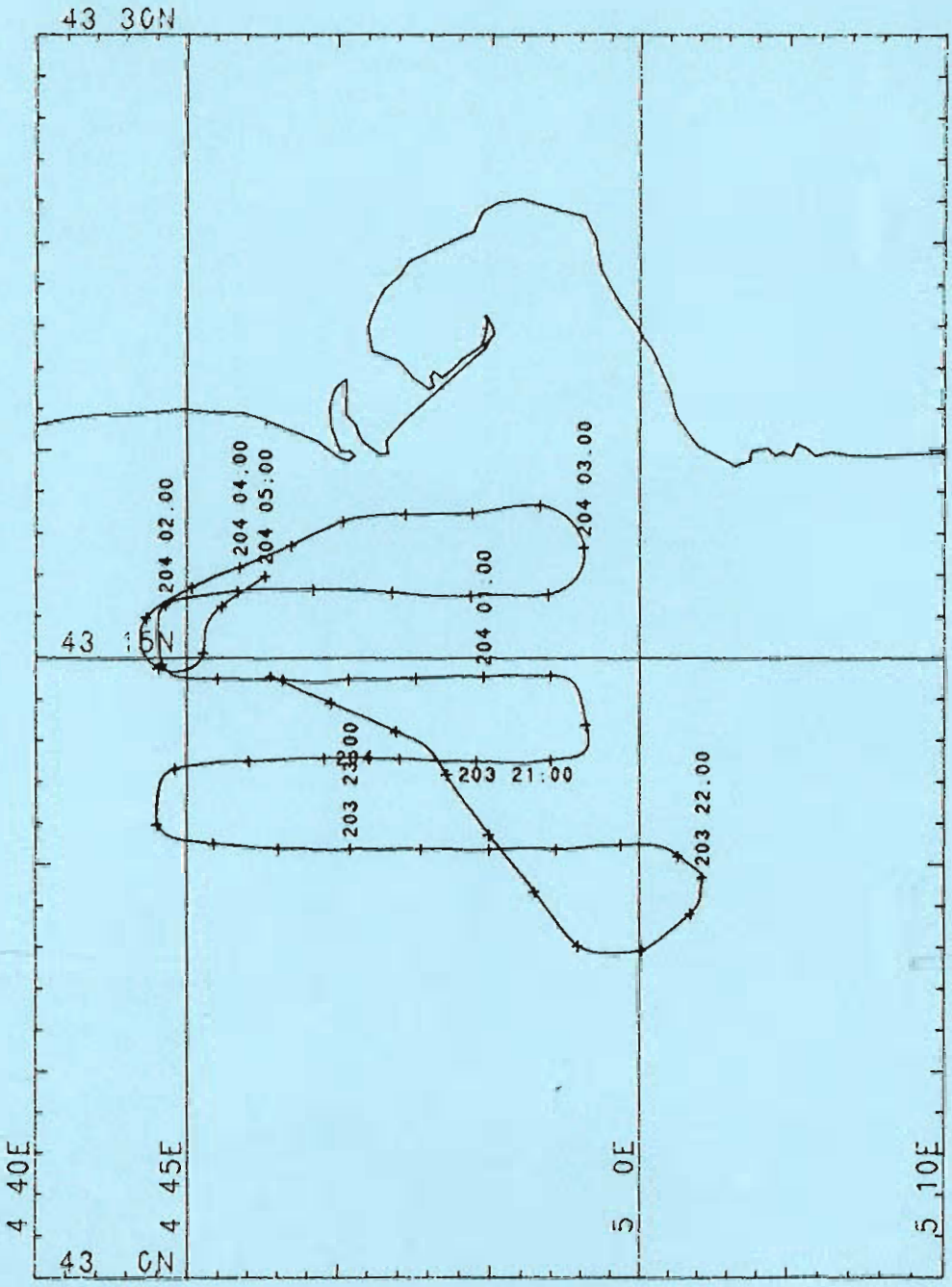
MERCATOR PROJECTION

GRID NO. 2

SCALE 1 TO 4000000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 42

Discovery 203/ Production Sites



MERCATOR PROJECTION

GRID NO. 1

SCALE 1 TO 400000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 43

Plume Survey EROS 2000

7 STATION POSITIONS

7.1 Leg 1

Station Positions
Leg 1

Station	Cast	Date	Lat	Lon	Depth
test		2/7/93	36 0.70N	5 21.01W	859.0
1	1	2/7/93	35 57.18N	6 15.66W	123.0
	2	2/7/93	35 57.49N	6 17.08W	119.0
2	1	2/7/93	35 59.02N	6 4.33W	178.0
3	1	3/7/93	35 57.69N	5 47.82W	275.5
	2	3/7/93	35 58.07N	5 47.86W	322.0
	3	3/7/93	35 57.72N	5 47.84W	274.5
	4	3/7/93	35 57.80N	5 48.39W	278.0
	5	3/7/93	35 57.87N	5 48.04W	330.5
5	1	4/7/93	36 1.08N	5 21.72W	827.0
	2	4/7/93	36 1.03N	5 22.09W	746.0
	3	4/7/93	36 0.92N	5 22.16W	787.0
7	1	4/7/93	35 59.46N	4 4.94W	1327.0
	2	4/7/93	35 59.39N	4 4.88W	1328.0
	3	5/7/93	35 59.38N	4 4.89W	1329.0
8	2	6/7/93	37 59.67N	1 58.78E	2440.0
	3	6/7/93	37 59.91N	1 59.87E	2426.0
	4	6/7/93	37 59.93N	1 59.88E	2425.5
9	1	7/7/93	38 41.70N	4 41.57E	2606.5
	2	7/7/93	38 41.70N	4 41.26E	2606.5
	3	7/7/93	38 41.79N	4 40.63E	840.0
10	1	9/7/93	37 50.09N	11 15.15E	460.0
	2	9/7/93	37 50.01N	11 15.01E	458.0
	3	9/7/93	37 50.09N	11 15.00E	461.0
11	1	9/7/93	37 44.08N	11 27.13E	613.0
	2	9/7/93	37 43.91N	11 26.94E	616.0
	3	9/7/93	37 44.10N	11 27.08E	613.0
	4	9/7/93	37 43.96N	11 26.83E	620.0
	5	9/7/93	37 43.95N	11 27.03E	620.0
14	1	10/7/93	36 40.51N	12 19.09E	1287.5
	2	10/7/93	36 40.48N	12 19.00E	1287.5
	3	10/7/93	36 40.50N	12 19.22E	1288.0
	4	10/7/93	36 40.49N	12 19.17E	1288.0
12	1	11/7/93	37 34.16N	11 36.03E	620.5
	2	11/7/93	37 34.00N	11 36.04E	615.0
	3	11/7/93	37 34.27N	11 35.93E	632.0
	4	11/7/93	37 33.93N	11 35.84E	649.0
12a	1	11/7/93	37 16.81N	11 58.18E	83.0
	2	11/7/93	37 17.08N	11 57.90E	87.0
15	1	12/7/93	39 59.94N	6 0.47E	2782.0
	2	13/7/93	39 59.92N	6 0.07E	2782.0
	3	13/7/93	39 59.90N	6 0.06E	2782.0
16	1	13/7/93	41 0.00N	6 0.07E	2615.0
	2	13/7/93	41 0.05N	6 0.03E	2617.0
	3	13/7/93	40 59.48N	5 58.56E	2615.0
	4	14/7/93	40 55.80N	5 53.29E	2534.0

7.2 Leg 2

Station Positions
Leg 2

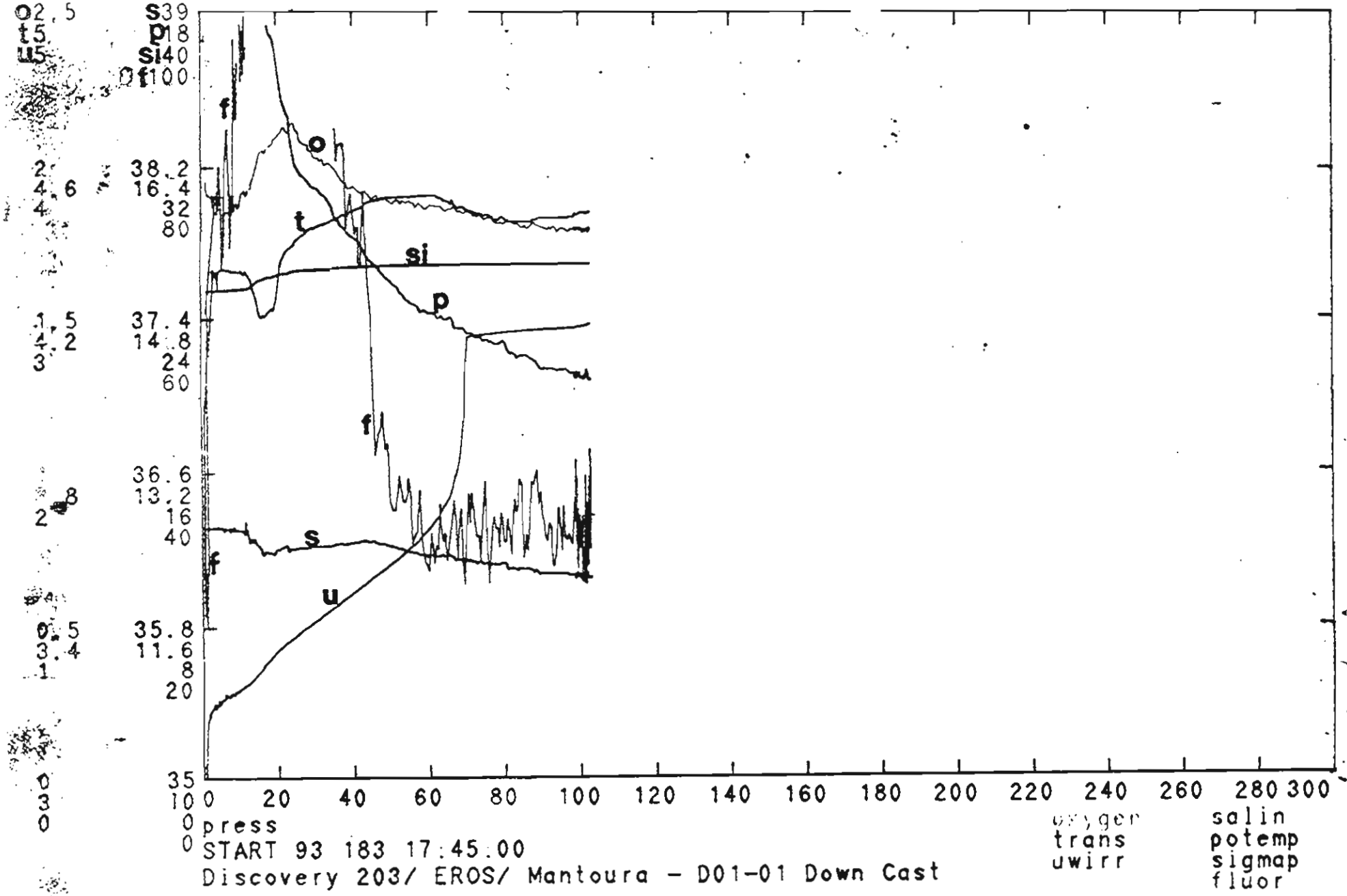
Station	Cast	Date	Lat	Lon	Depth
MA1	01	17/7/93	40 59.46N	6 0.07E	2614.0
	02	18/7/93	40 58.41N	6 1.36E	2618.0
	03	18/7/93	40 58.60N	6 1.32E	2617.0
	04	18/7/93	40 58.72N	6 2.39E	2618.0
	05	18/7/93	40 58.76N	6 1.29E	2618.0
	06	18/7/93	40 58.42N	6 2.11E	2620.0
	07	18/7/93	40 57.56N	6 2.08E	2627.0
	08	18/7/93	40 56.86N	6 2.41E	2626.0
	09	18/7/93	40 56.25N	6 2.77E	2629.0
	10	18/7/93	40 56.86N	6 2.41E	2626.0
	11	18/7/93	40 55.35N	6 2.54E	2633.0
	12	18/7/93	40 55.11N	6 2.54E	2634.0
	13	18/7/93	40 53.87N	6 2.75E	2641.0
	14	18/7/93	40 53.33N	6 2.72E	2646.0
	15				
	16	19/7/93	40 50.36N	6 5.25E	2654.0
	17	19/7/93	40 50.39N	6 5.25E	2654.0
	18	19/7/93	40 49.96N	6 4.98E	2654.0
	19	19/7/93	40 49.82N	6 4.79E	2655.0
	20	19/7/93	40 49.56N	6 5.45E	2658.0
	21	20/7/93	40 47.77N	6 7.45E	2668.0
	22	20/7/93	40 47.60N	6 7.72E	2669.0
	23	20/7/93	40 47.50N	6 7.73E	2669.0
	24	20/7/93	40 46.12N	6 6.79E	2673.0
	25	20/7/93	40 45.77N	6 6.85E	2675.0
	26	20/7/93	40 45.58N	6 7.24E	2675.0
MA9	01	21/7/93	43 17.75N	4 48.61E	59.0
	02	21/7/93	43 17.93N	4 48.70E	59.0
	03	22/7/93	43 17.73N	4 48.74E	59.0
	04	22/7/93	43 17.77N	4 48.48E	59.0
	05	22/7/93	43 17.64N	4 48.77E	60.0
	06	22/7/93	43 16.33N	4 49.80E	80.0
	07	22/7/93	43 17.55N	4 48.79E	62.5
	08	22/7/93	43 17.27N	4 53.47E	71.0
	09	22/7/93	43 16.32N	4 53.08E	80.5
MA2	01	23/7/93	41 41.91N	5 36.45E	2431.5
	02	23/7/93	41 41.53N	5 36.80E	2432.0
MA3	01	24/7/93	42 9.83N	5 22.04E	2287.0
	02	24/7/93	42 9.55N	5 22.26E	2290.0
	03	24/7/93	42 9.46N	5 22.30E	2290.0
	04	24/7/93	42 9.28N	5 22.08E	2291.0
	05	24/7/93	42 9.21N	5 22.03E	2290.0
	06	24/7/93	42 9.53N	5 22.13E	2290.0
	07	24/7/93	42 9.86N	5 23.35E	2291.5
MA4	01	24/7/93	42 26.65N	5 14.14E	2115.0
	02	24/7/93	42 25.74N	5 15.27E	2133.0
MC1	01	25/7/93	42 0.01N	3 41.86E	983.5
MC2	01	25/7/93	42 18.02N	3 58.25E	1350.0
MC3	01	25/7/93	42 37.08N	4 13.52E	741.5
MC4	01	25/7/93	42 55.53N	4 29.77E	480.0
MA5	01	26/7/93	42 44.04N	5 4.81E	1592.0
	02	26/7/93	42 43.85N	5 4.82E	1566.0
	03	26/7/93	42 43.70N	5 4.70E	1501.0

Station Positions
Leg 2 (cont'd)

Station	Cast	Date	Lat	Lon	Depth
MA5	04	26/7/93	42 43.37N	5 4.50E	1418.0
	05	26/7/93	42 42.93N	5 3.97E	1422.0
	06	26/7/93	42 41.69N	5 4.24E	1529.0
	07	26/7/93	42 41.28N	5 5.23E	1566.0
	08	26/7/93	42 41.09N	5 5.17E	1574.0
MF1	01	27/7/93	42 45.03N	5 59.68E	2400.0
	02	27/7/93	42 45.86N	5 59.17E	2392.0
MF2	01	27/7/93	42 55.75N	5 35.57E	1344.0
MF3	01	27/7/93	43 6.78N	5 12.21E	222.0
MA9	10	27/7/93	43 16.59N	4 52.81E	78.5
MA7	01	28/7/93	43 5.52N	4 56.27E	111.0
	02	28/7/93	43 5.34N	4 56.23E	110.5
	03	28/7/93	43 5.57N	4 56.09E	110.0
	04	28/7/93	43 5.65N	4 55.27E	108.5
	05	28/7/93	43 5.46N	4 56.55E	111.5
	06	28/7/93	43 5.24N	4 56.44E	111.0
MA6	01	28/7/93	42 55.84N	4 59.48E	685.0
MA8	01	28/7/93	43 12.46N	4 50.52E	95.0
ME2	01	29/7/93	43 17.38N	4 25.94E	59.0
ME1	01	29/7/93	43 21.77N	4 0.22E	66.5
MD1	01	30/7/93	42 47.49N	3 44.43E	136.5
	02	30/7/93	42 47.80N	3 44.79E	136.5
	03	30/7/93	42 48.15N	3 44.83E	134.0
	04	30/7/93	42 47.94N	3 45.51E	135.0
	05	30/7/93	42 47.22N	3 44.51E	138.5
	06	30/7/93	42 47.45N	3 44.82E	138.0
	07	30/7/93	42 50.64N	3 45.37E	118.5
	08	30/7/93	42 51.20N	3 46.76E	104.5
	09	30/7/93	42 51.44N	3 47.16E	103.0
	10	31/7/93	42 50.52N	3 46.47E	117.0
	11	31/7/93	42 50.07N	3 46.83E	120.5
	12	31/7/93	42 49.84N	3 46.34E	122.0
	13	31/7/93	42 50.25N	3 46.47E	119.0
	14	31/7/93	42 50.66N	3 47.03E	106.5

8 SELECTED VERTICAL CTD / O2/ FLUOR/TR PROFILES

For each station on both leg 1 and 2 ,one complete deep and shallow CTD profiles are shown. Specific profiles obtained for every cast can be found in CTD profile files, in which the data is binned in 1 m intervals for the first 200m , 5 m intervals over the next 300 m etc..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u5
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2
4 .6
4
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0
s39
p18
si40
f100
38.2
16.4
32
80
37.4
14.8
24
60
36.6
13.2
16
40
35.8
11.6
8
20
35
10
0
0
f
o
t
si
p
f
s
f
u
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
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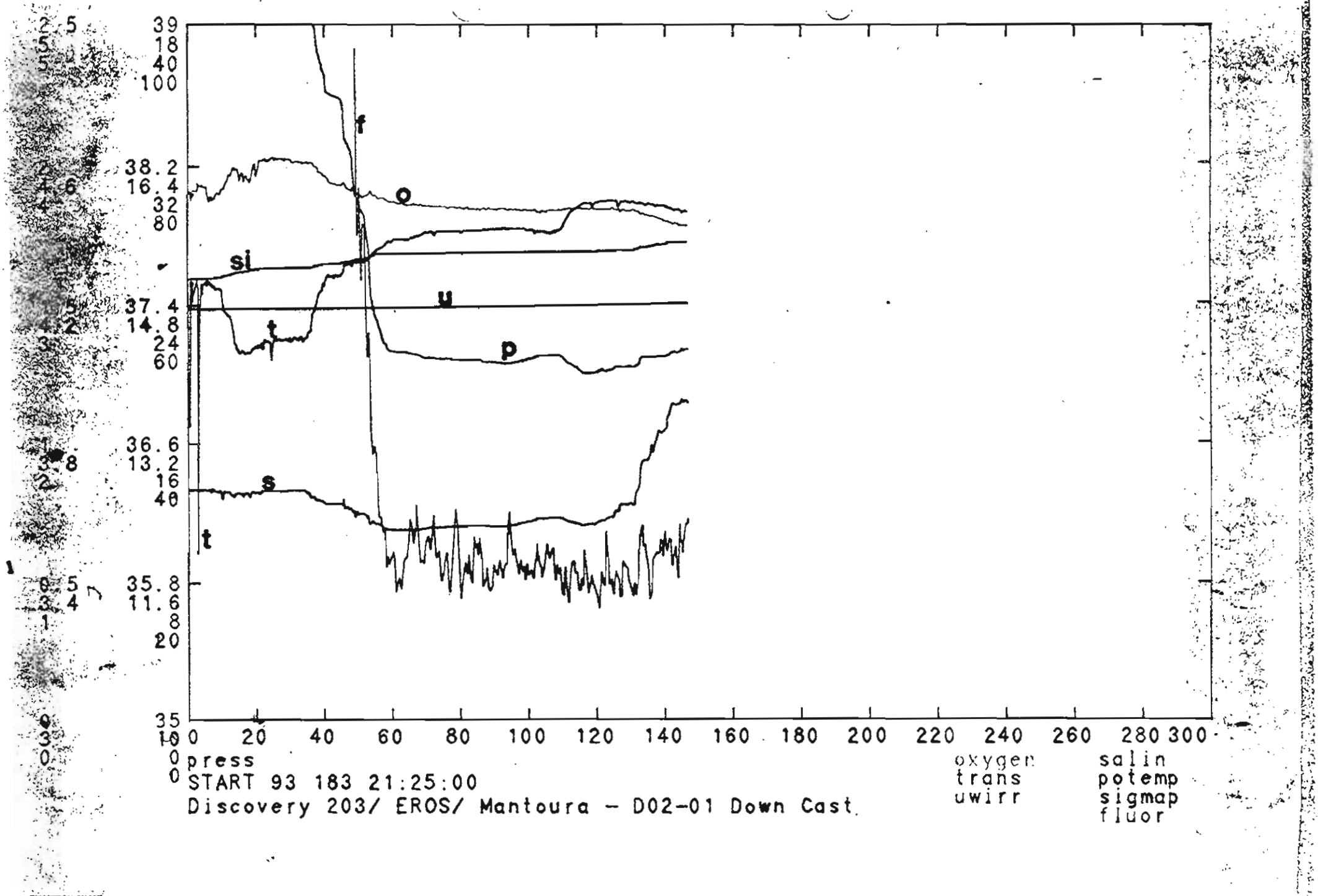
Discovery 203/ EROS/ Mantoura - D01-01 Down Cast
oxygen
trans
uwirr
salin
potemp
sigmap
fluor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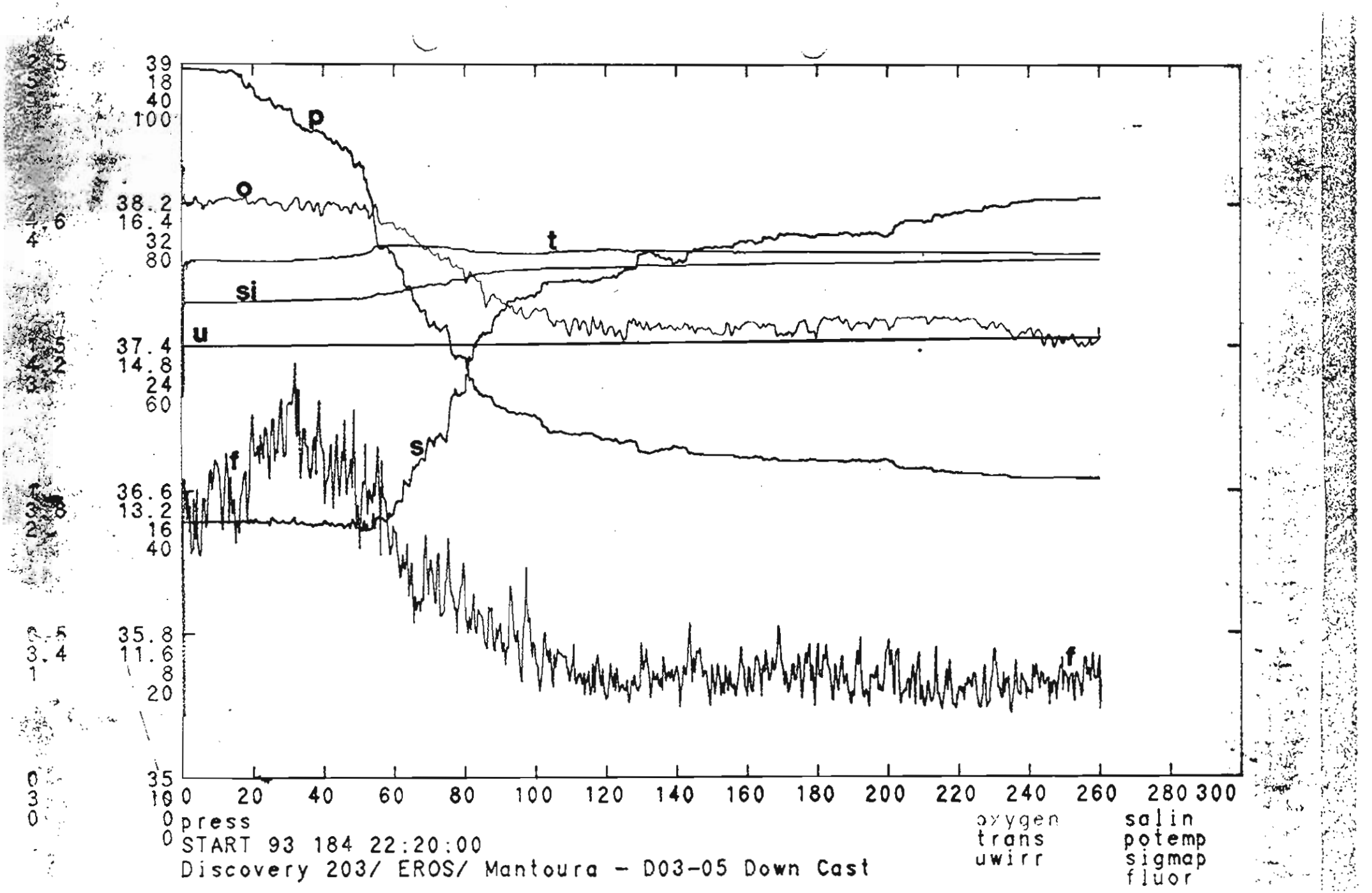
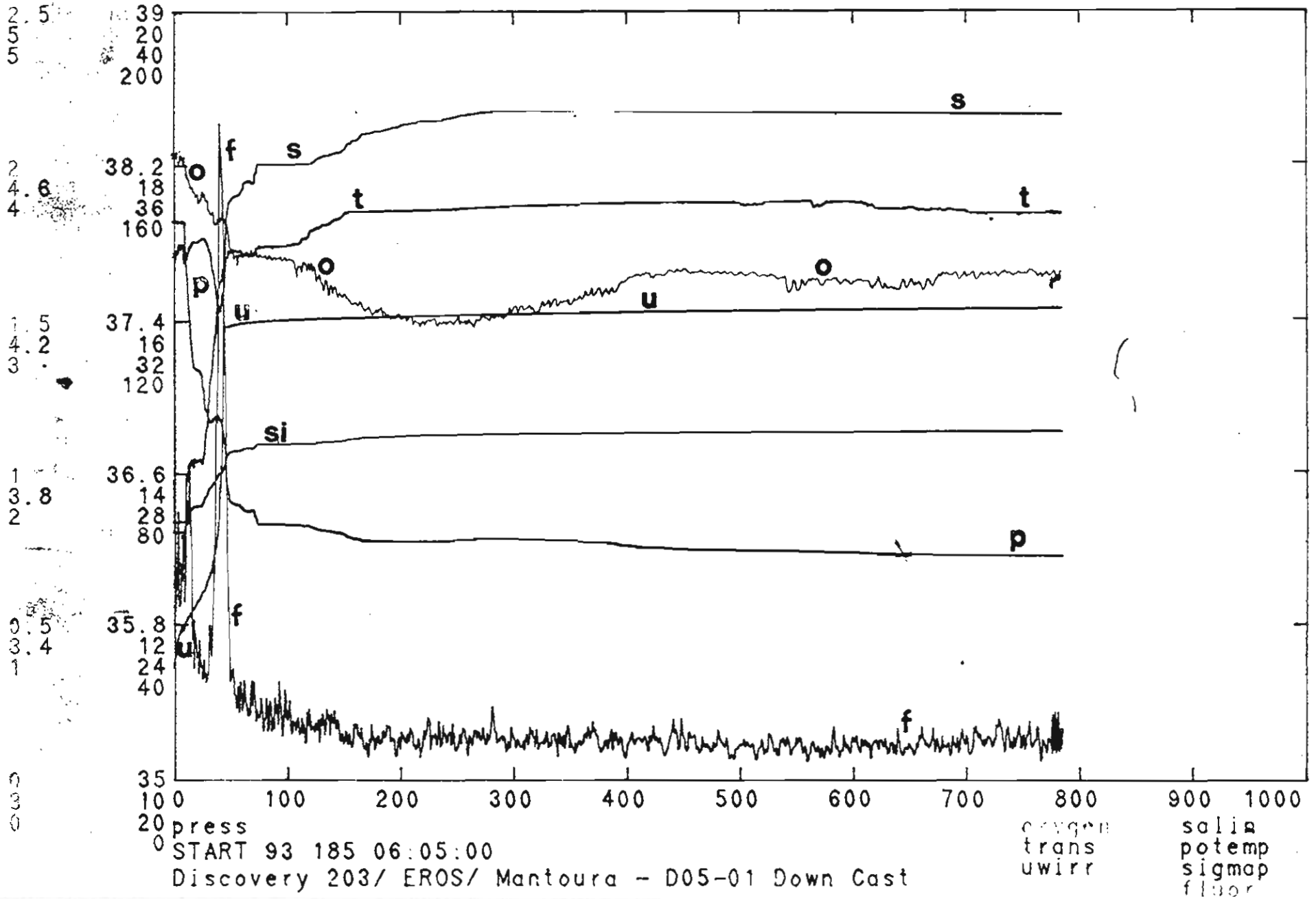
Discovery 203/ EROS/ Mantoura – D02-01 Down Cast
oxygen
trans
uwirr
salin
potemp
sigmap
fluor


39
18
40
100
p
o
38.2
16.4
32
80
t
si
u
37.4
14.8
24
60
f
s
36.6
13.2
16
40
35.8
11.6
8
20
35
10
0
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
press
START 93 184 22:20:00
Discovery 203/ EROS/ Mantoura - D03-05 Down Cast
oxygen
trans
uwirr
salin
potemp
sigmap
fluor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39
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200
38.2
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36
160
37.4
16
32
120
36.6
14
28
80
35.8
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40
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100
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0
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100
200
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600
700
800
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1000
press
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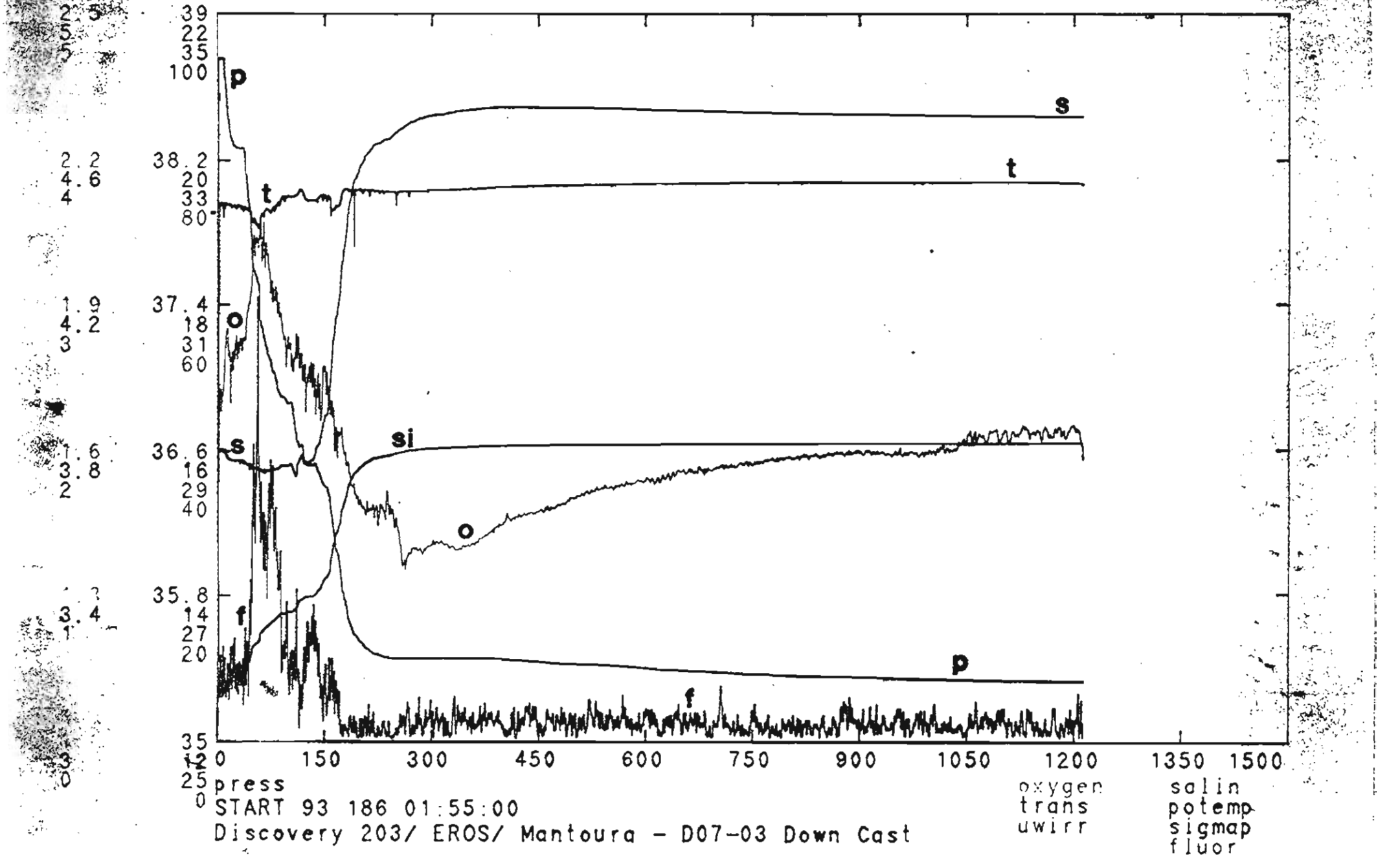
START 93 185 06:05:00
Discovery 203/ EROS/ Mantoura - D05-01 Down Cast
oxygen
trans
uwirr
salin
potemp
sigmap
fluor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1050
1200
1350
1500
press
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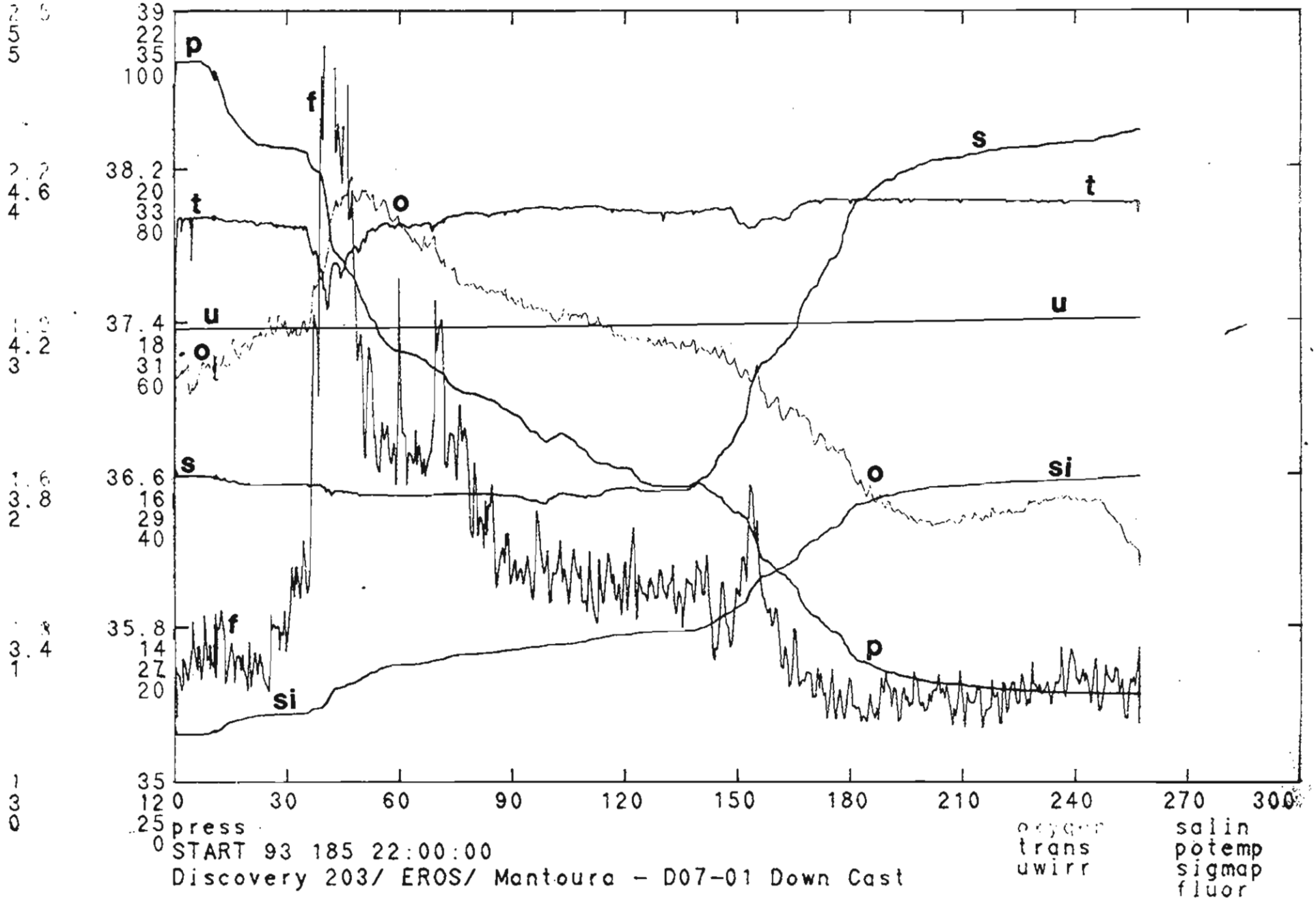
oxygen
trans
uwirr
salin
potemp
sigmap
fluor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240
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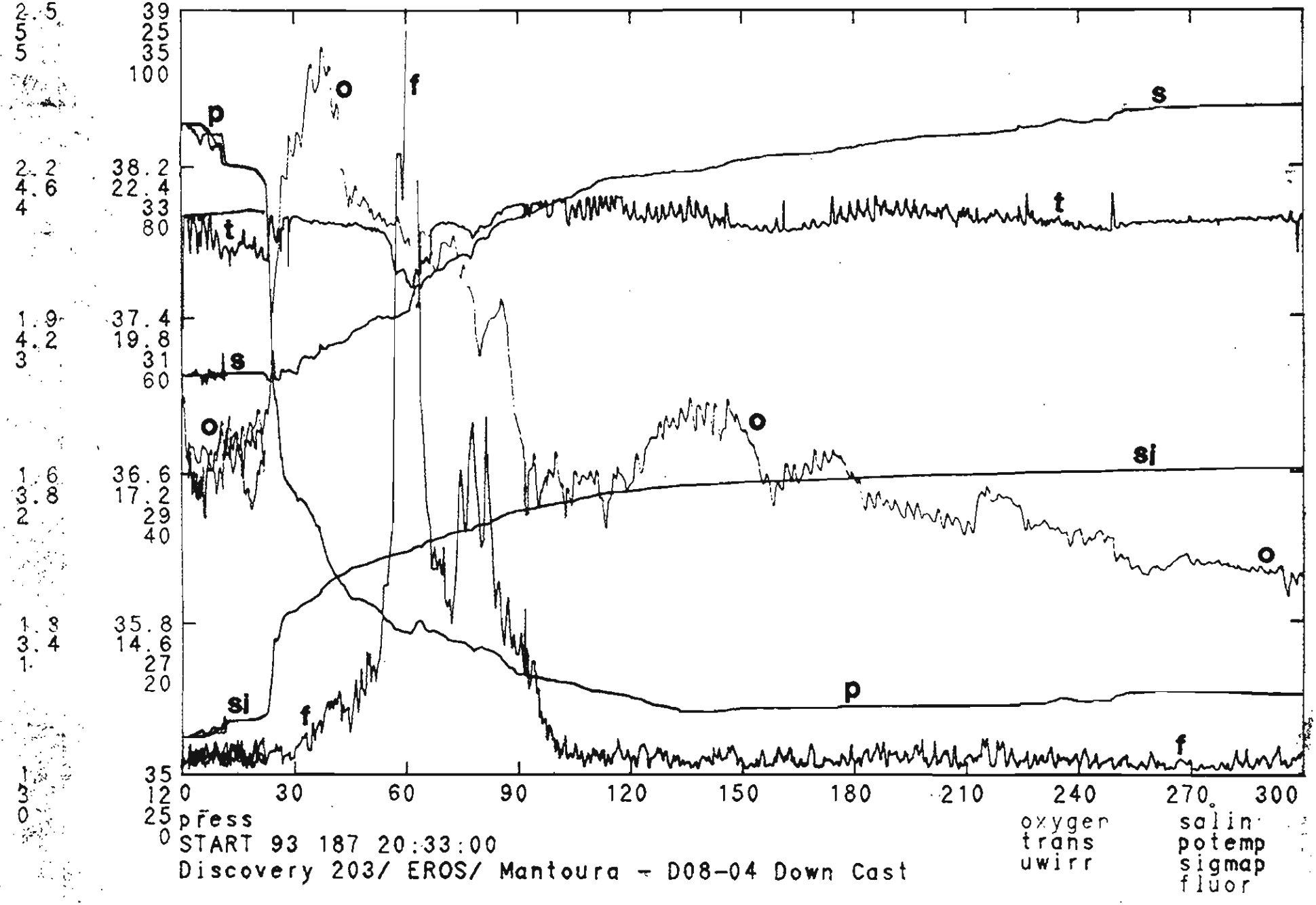
trans
uwirr
salin
potemp
sigmap
fluor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19.8
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35.8
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150
180
210
240
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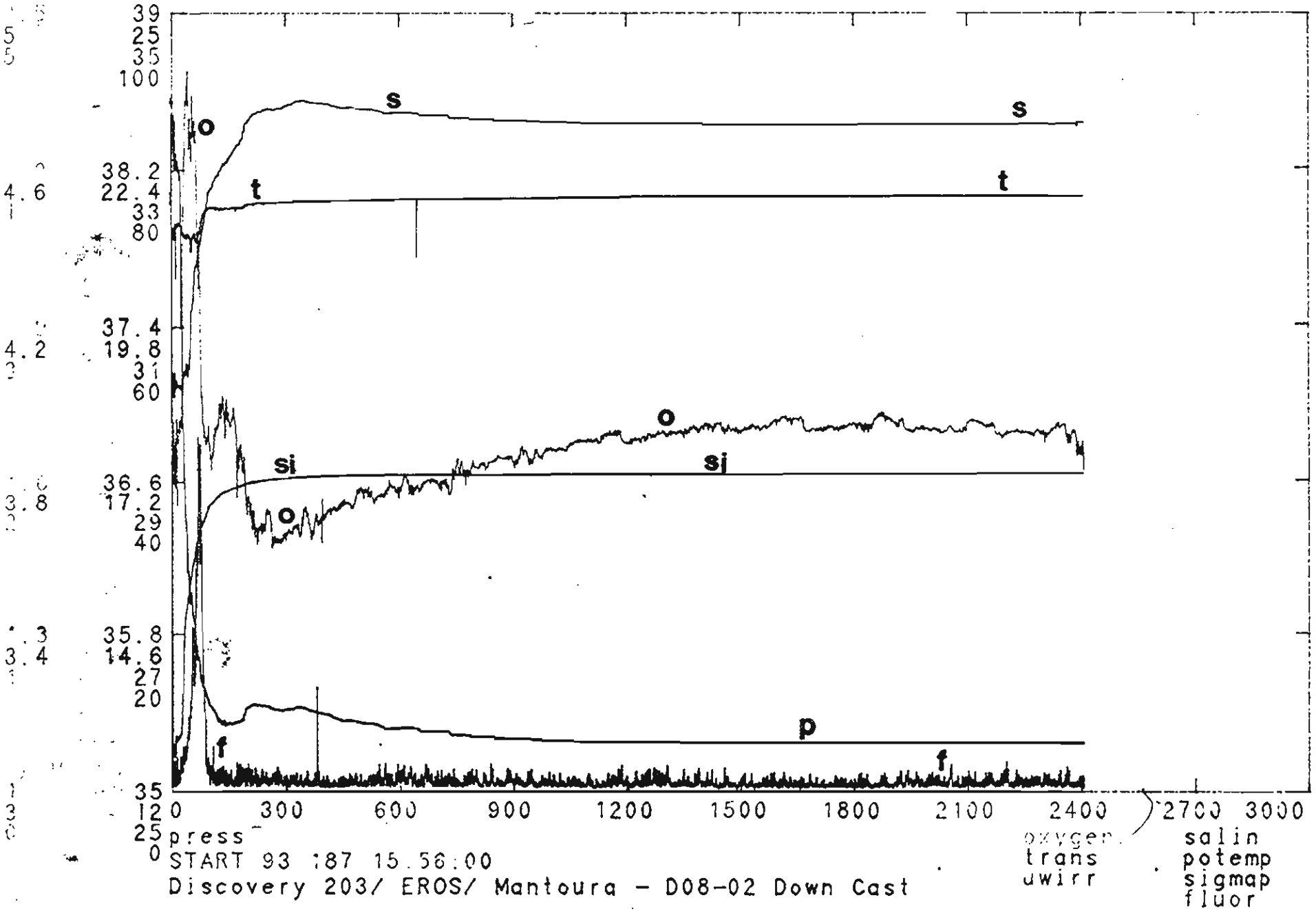
oxyger
trans
uwirr
salin
potemp
sigmap
fluor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oxygen
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uwirr
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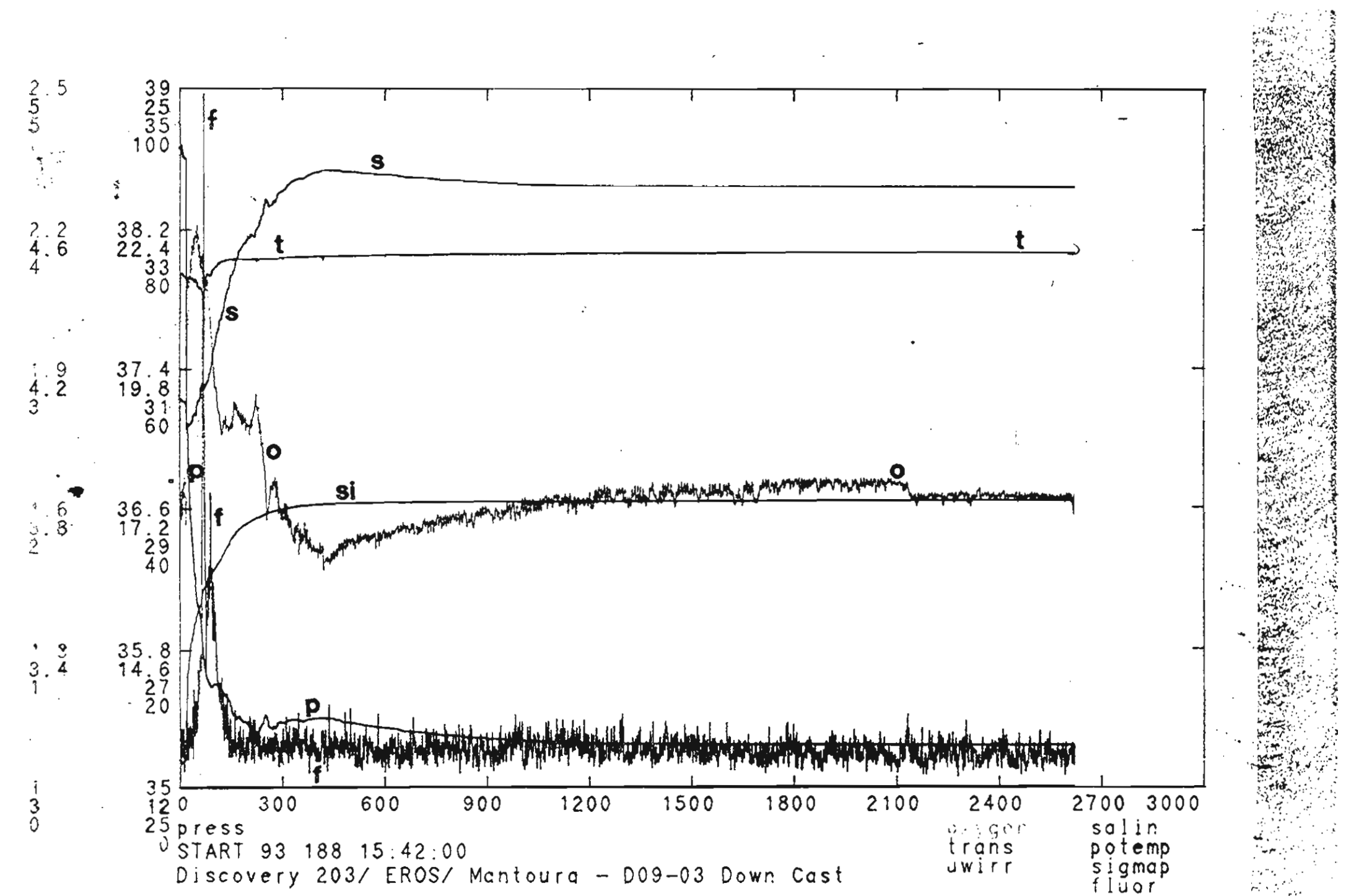
potemp
sigmap
fluor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14.6
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START 93 188 15:42:00
Discovery 203/ EROS/ Mantoura - D09-03 Down Cast
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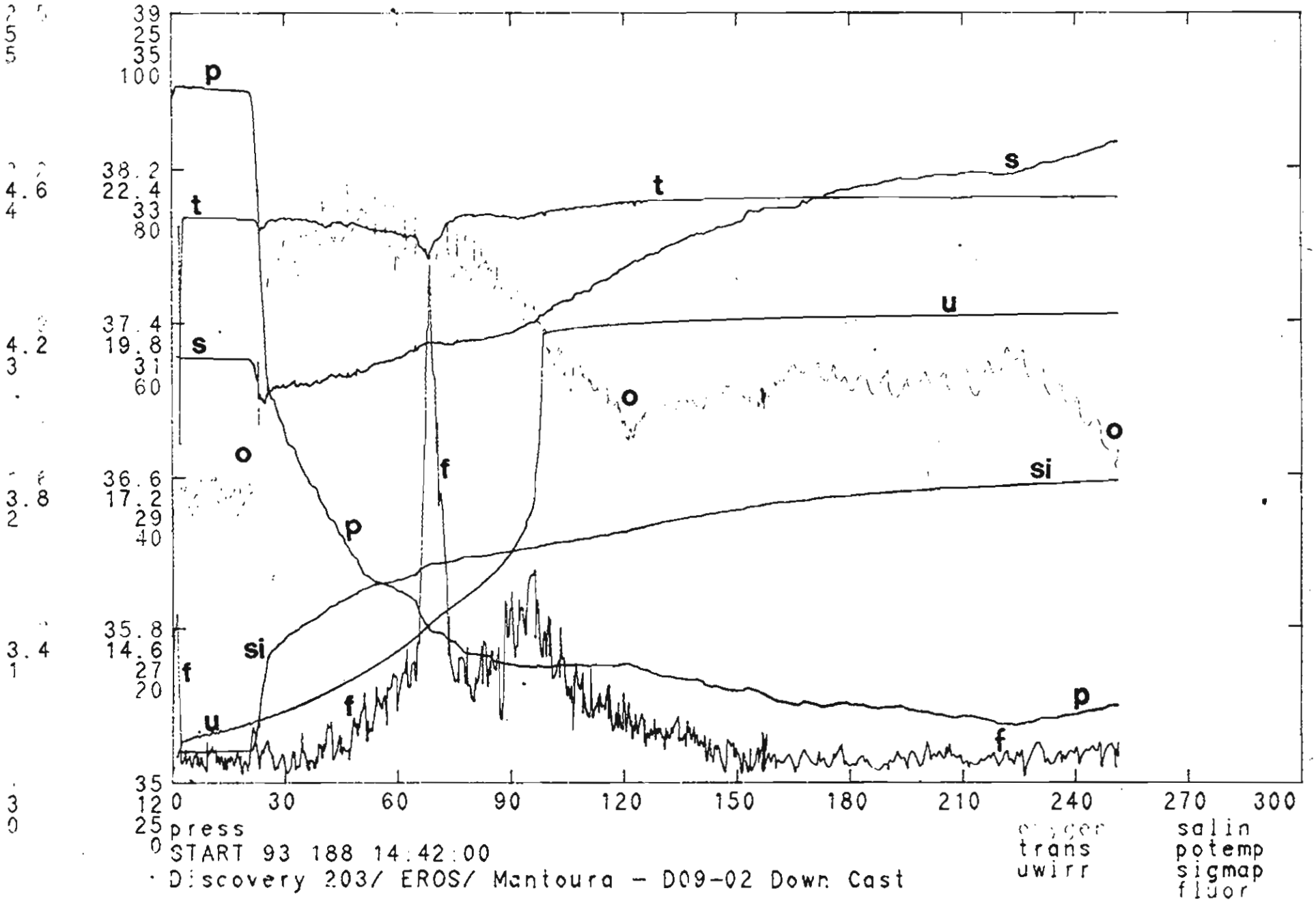
salin
potemp
sigmap
fluor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Discovery 203/ EROS/ Mantoura - D09-02 Down Cast
trans
uwirr
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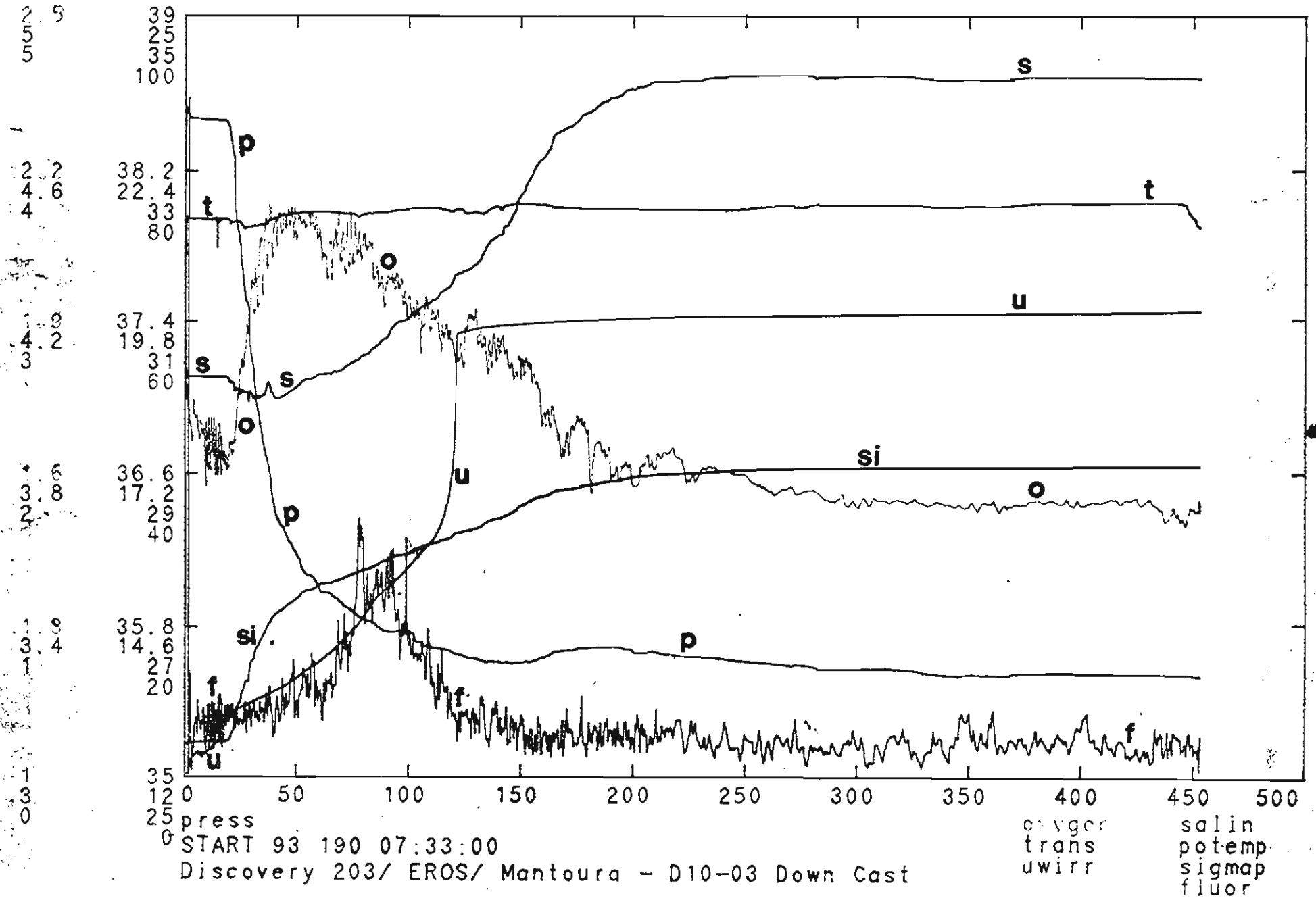
potemp
sigmap
fluor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Discovery 203/ EROS/ Mantoura - D10-03 Down Cast
oxygen
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uwirr
salin
potemp
sigmap
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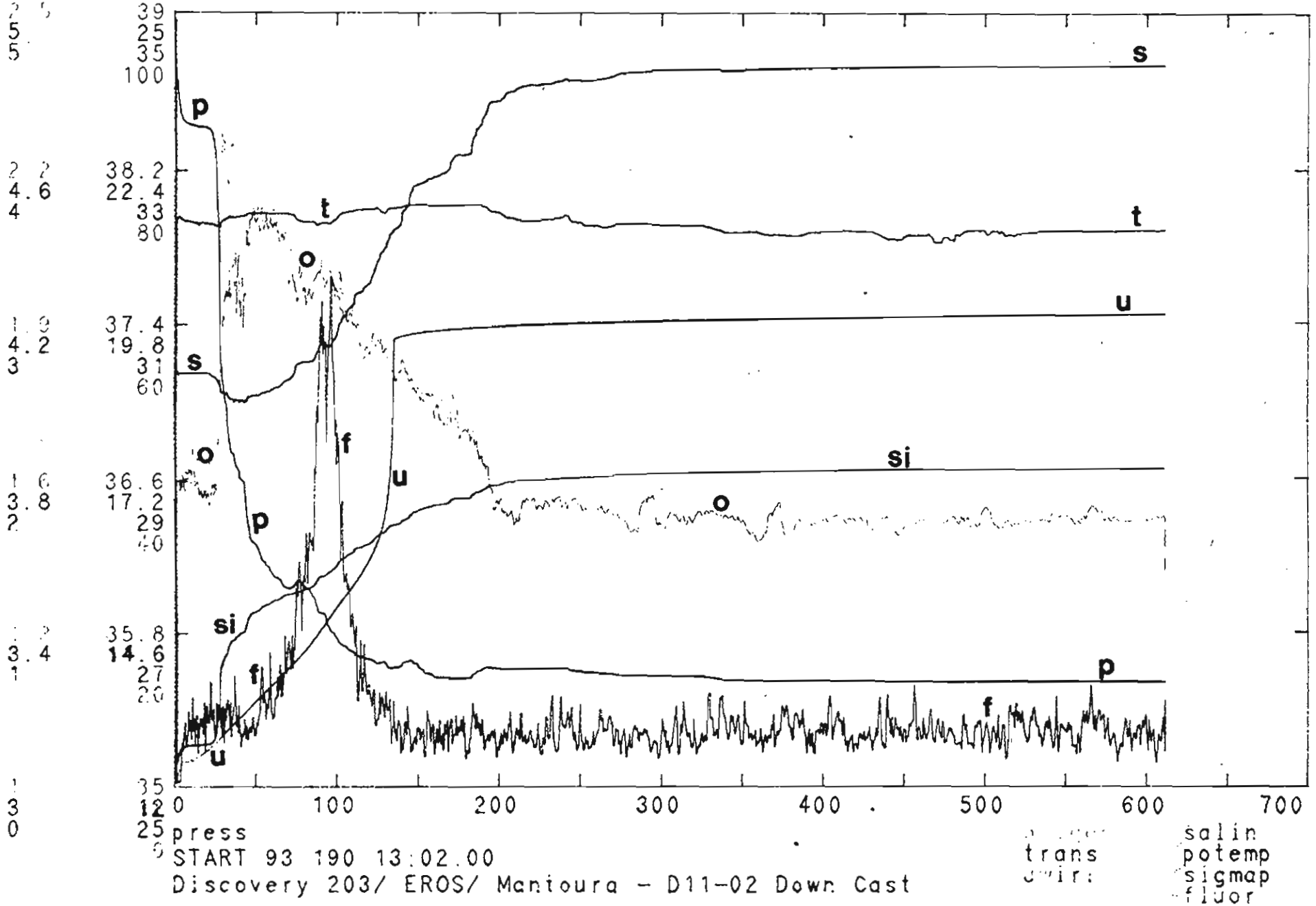
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START 93 190 13:02.00
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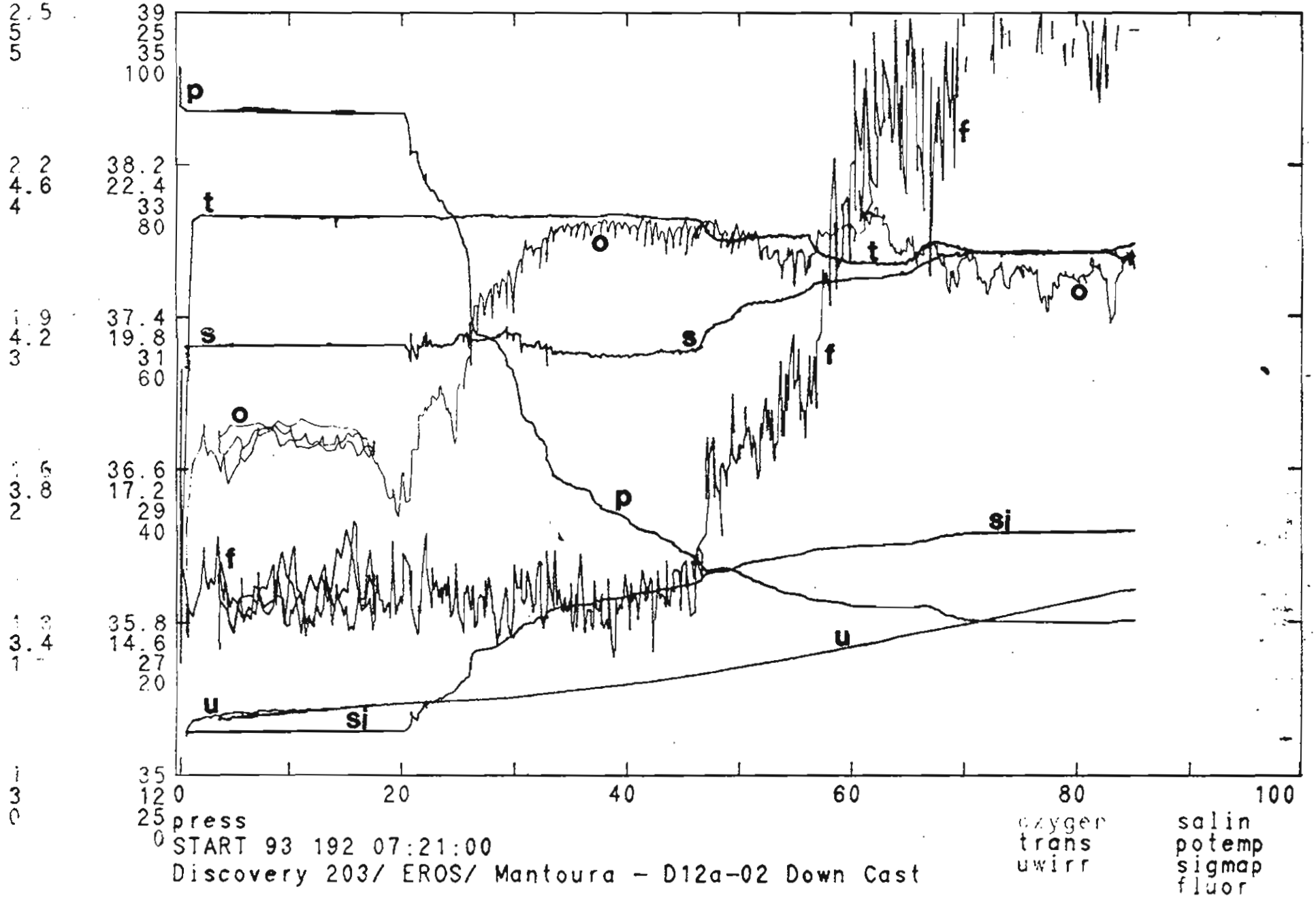
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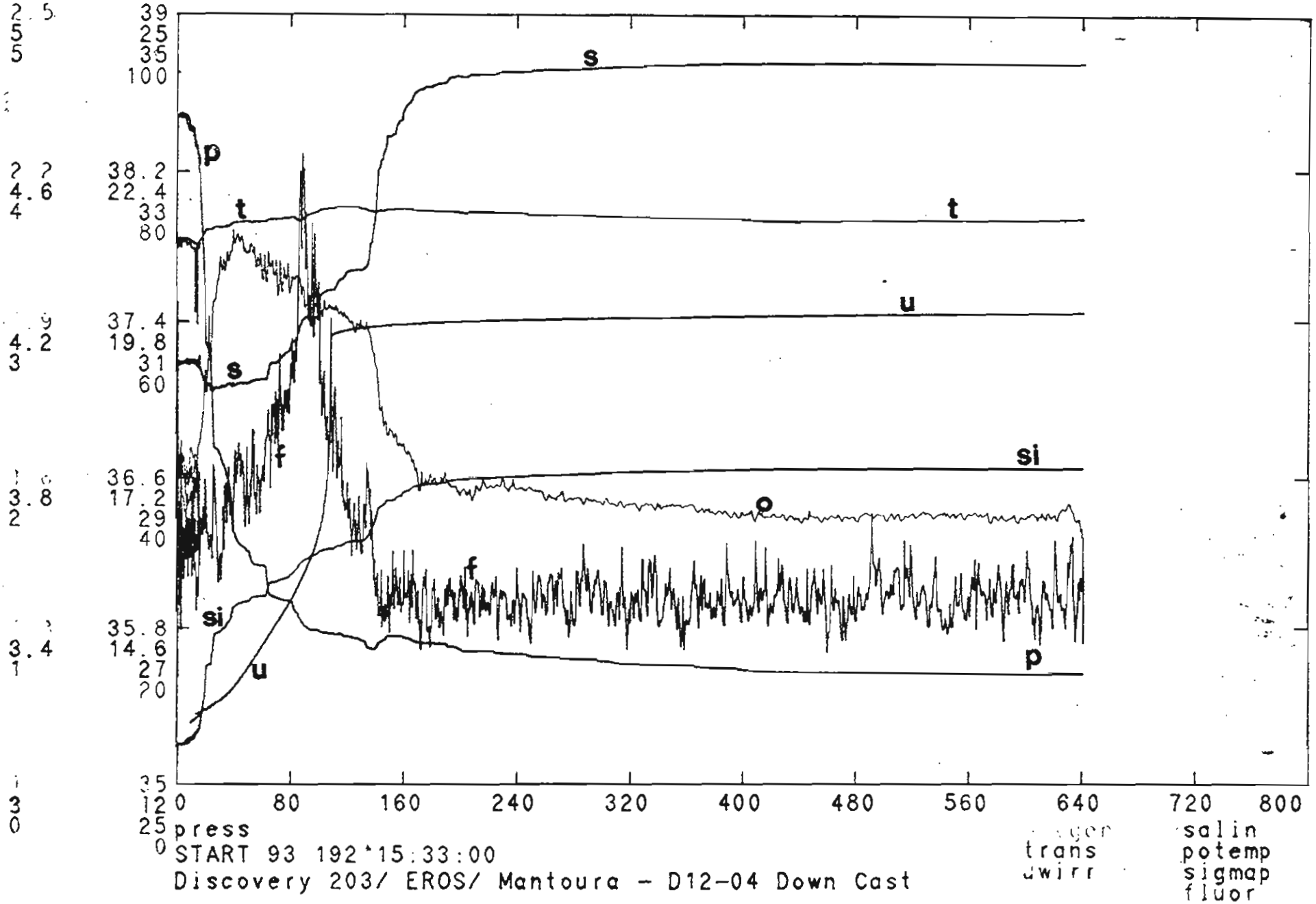
uwirr
salin
potemp
sigmap
fluor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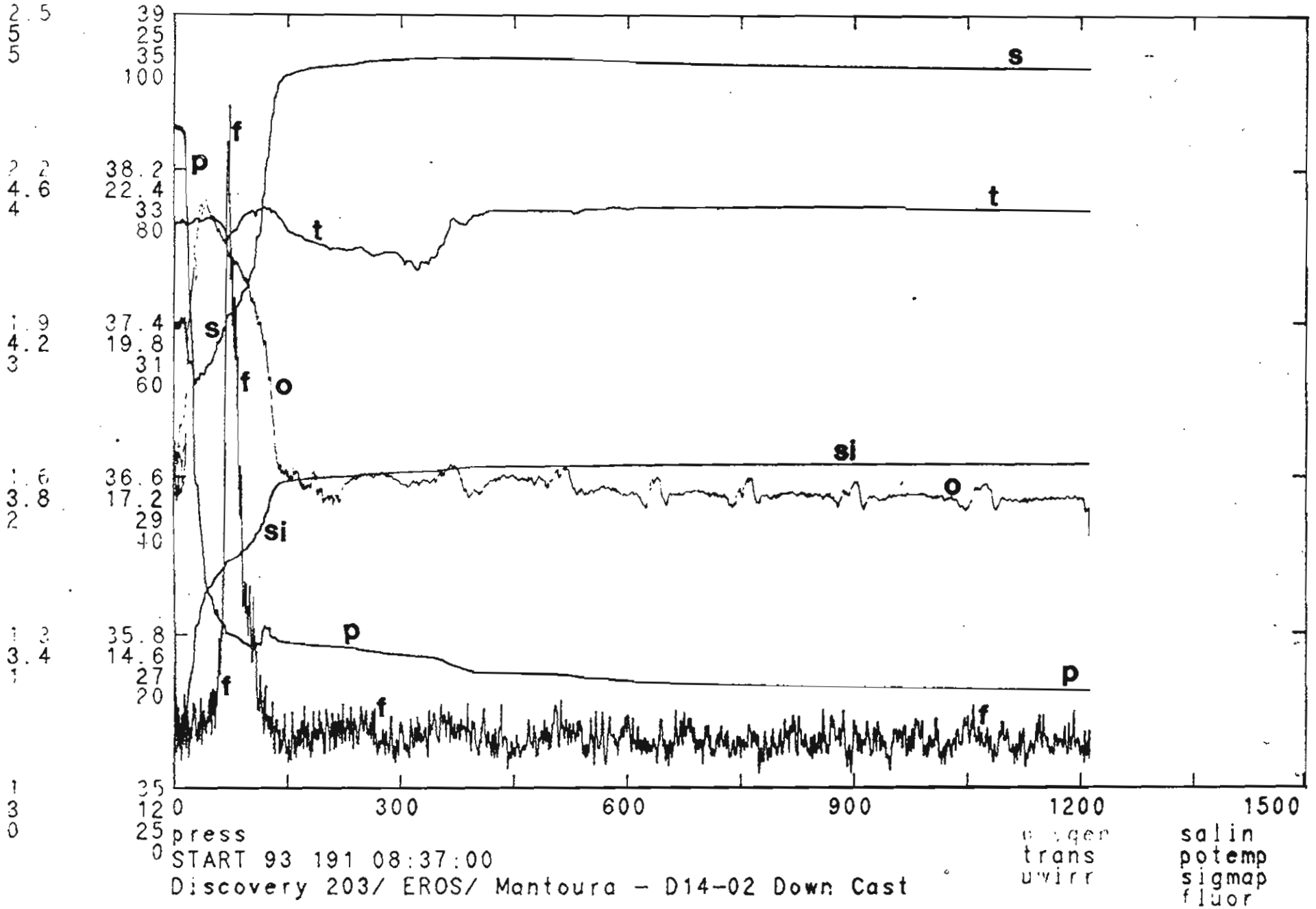
potemp
sigmap
fluor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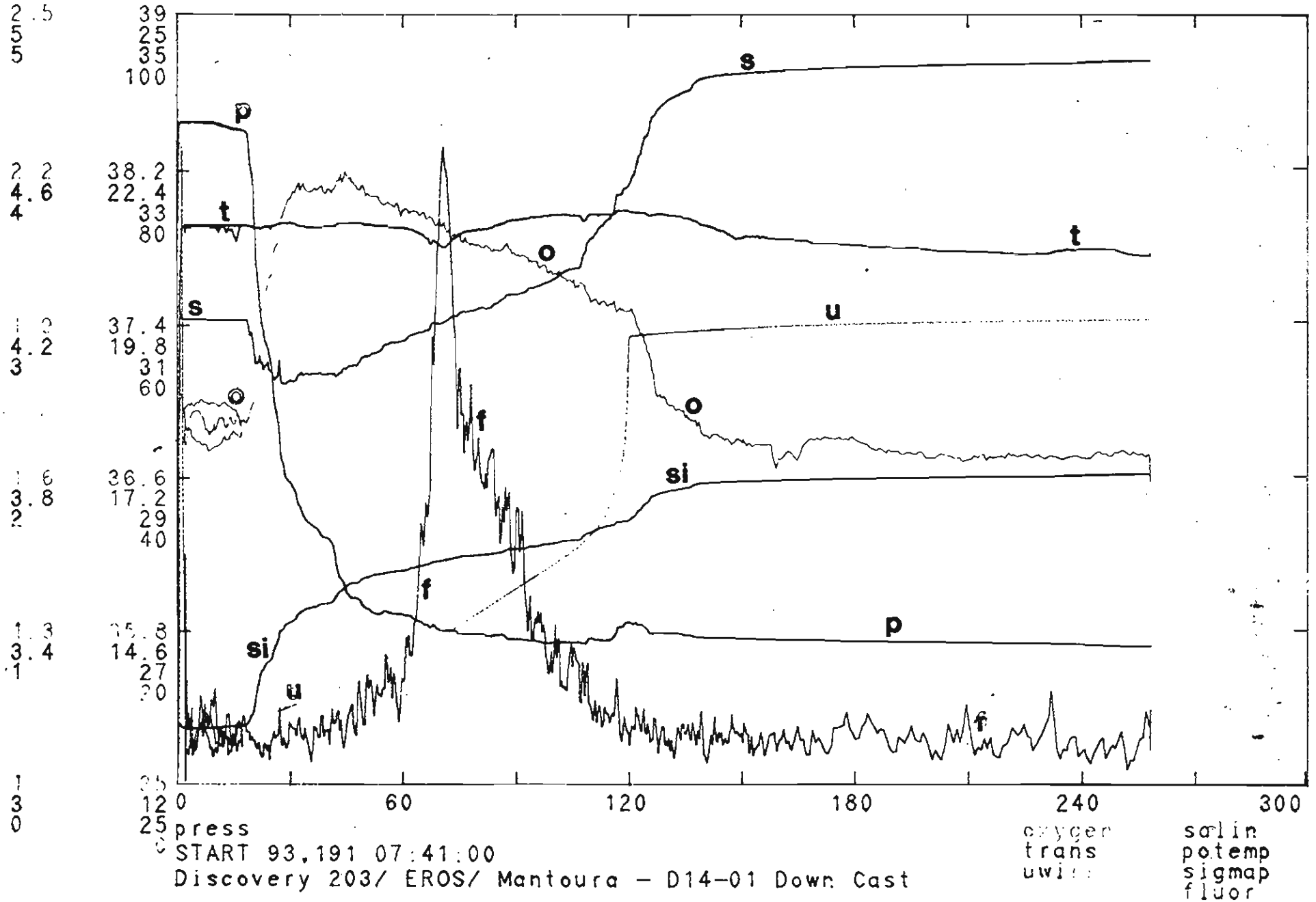
potemp
sigmap
fluor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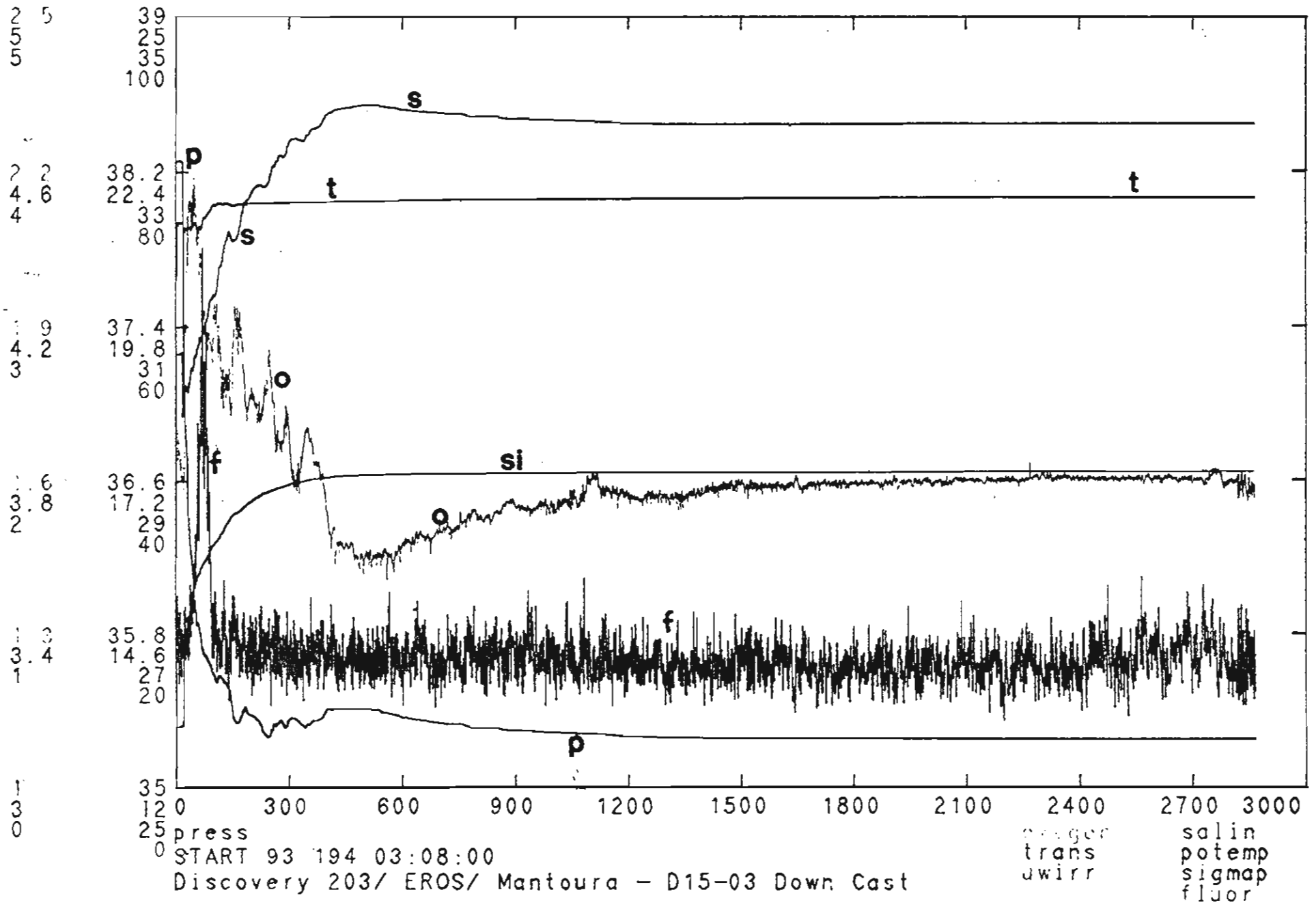
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trans
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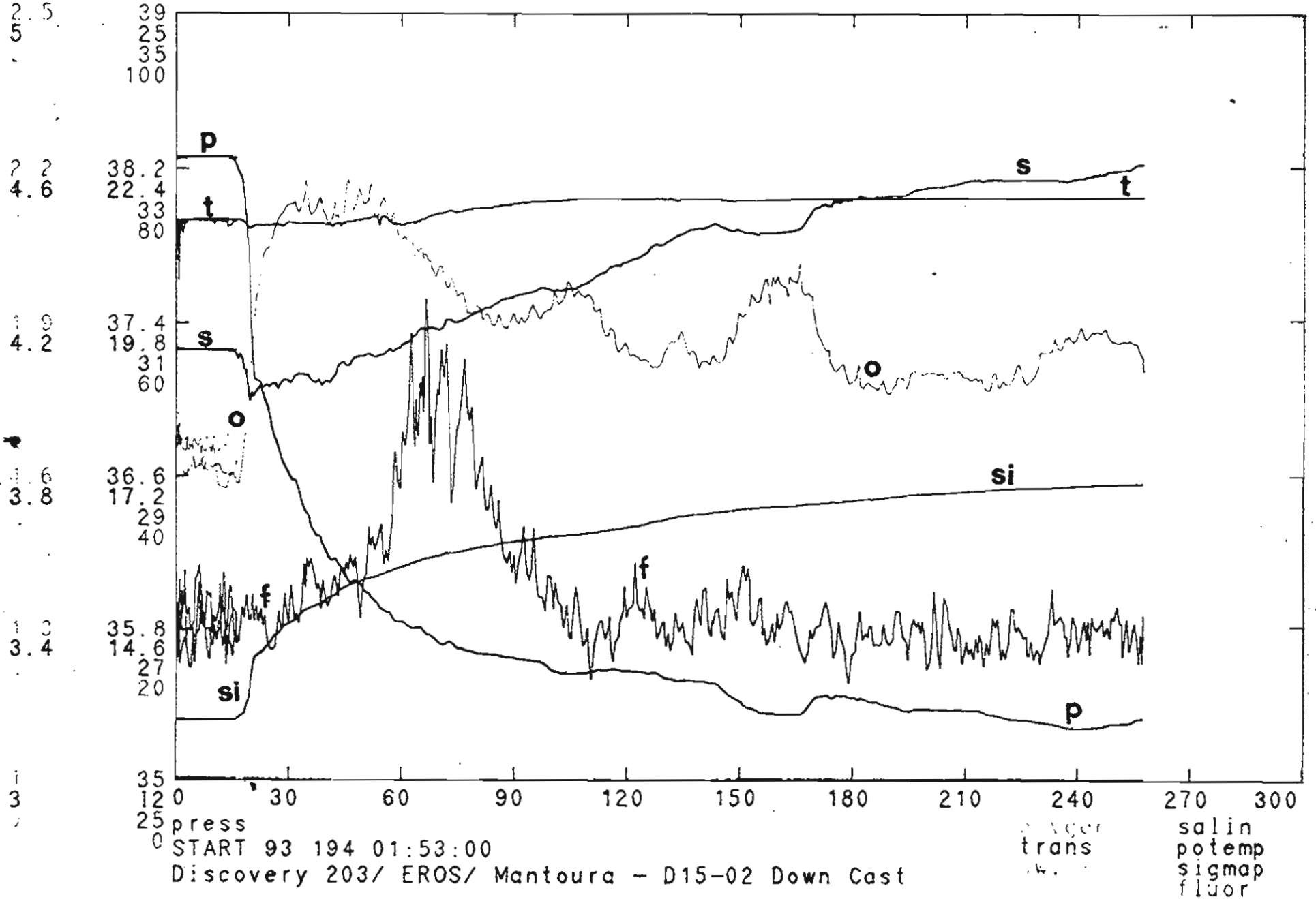
potemp
sigmap
fluor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START 93 194 01:53:00
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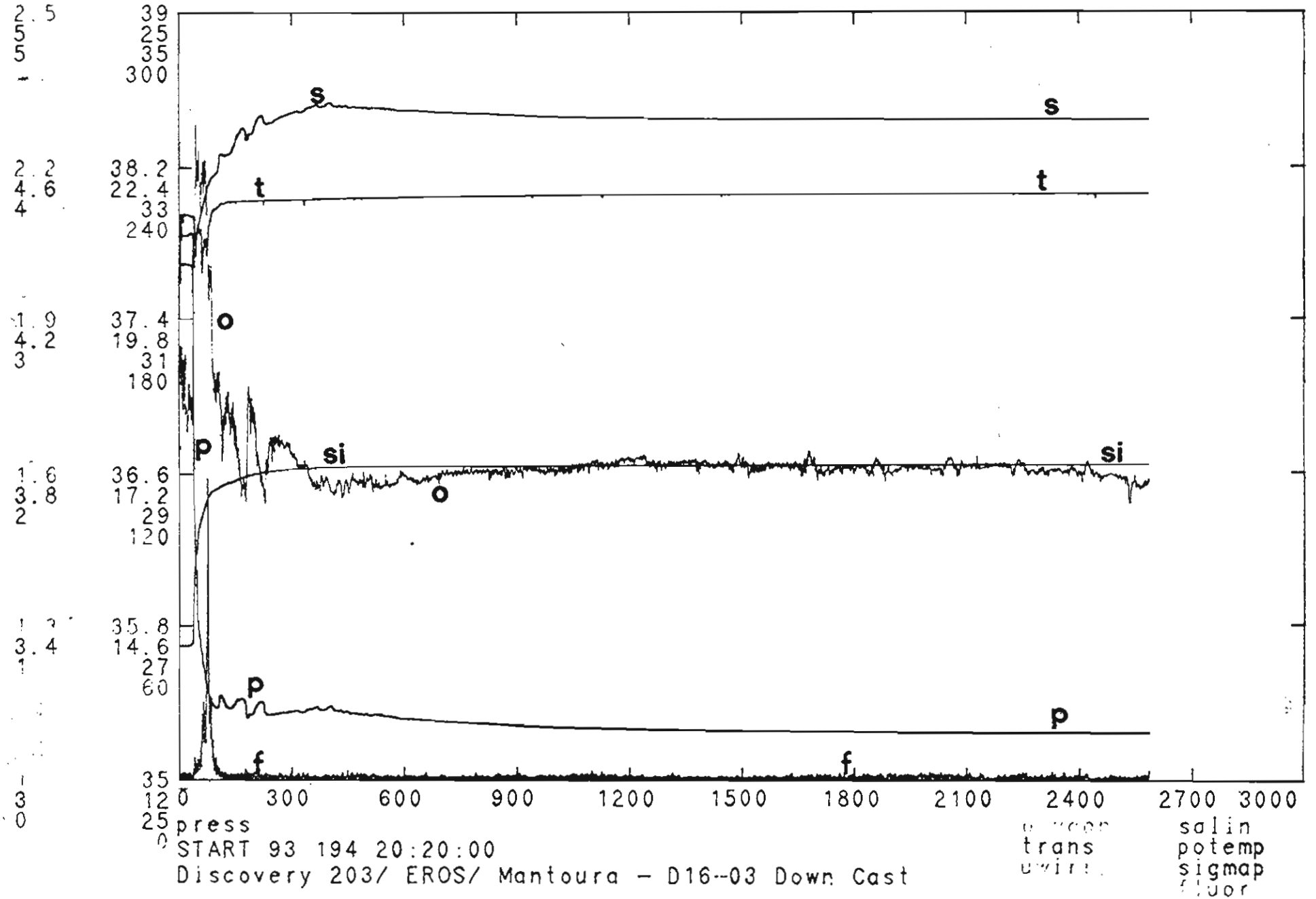
salin
potemp
sigmap
fluor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press
START 93 194 20:20:00
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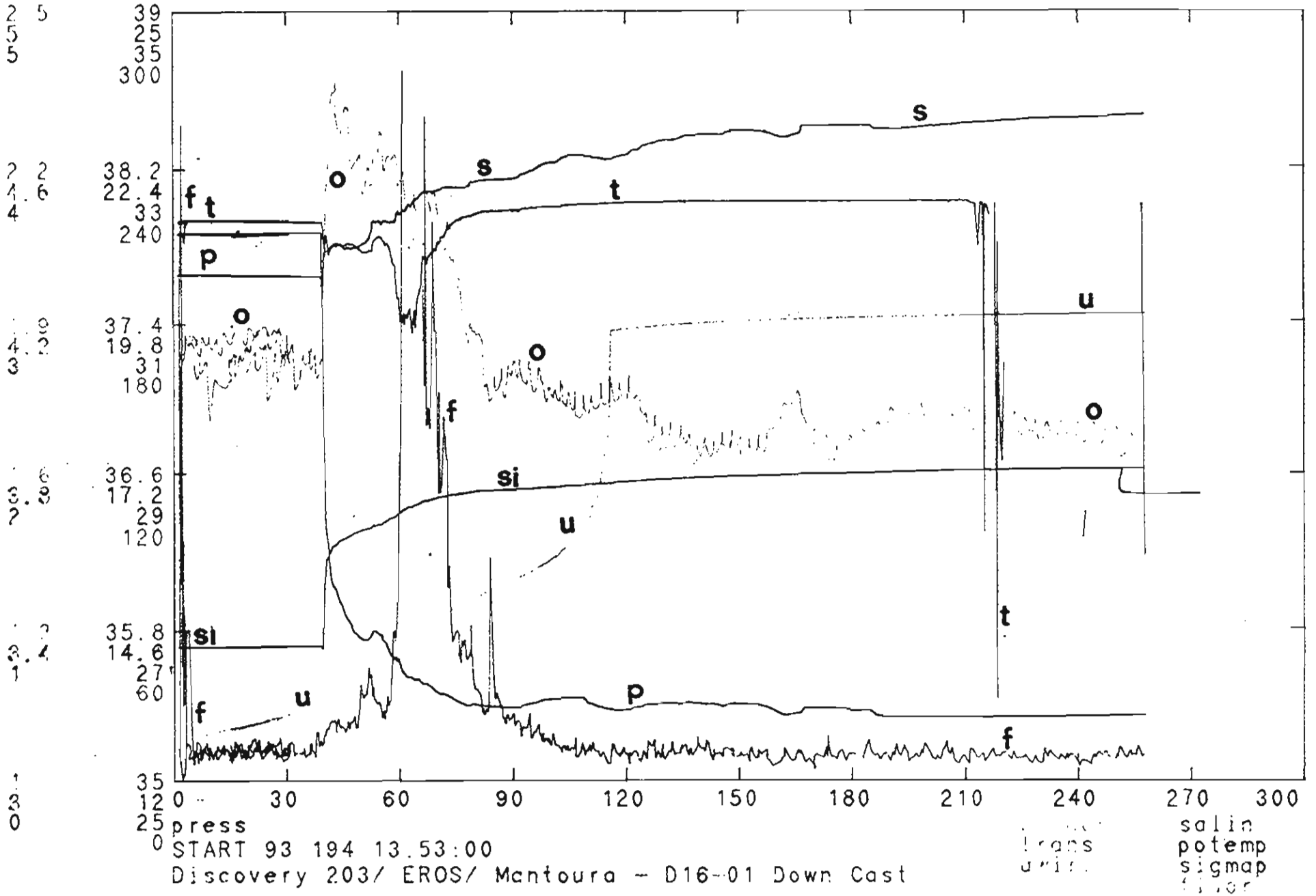
trans
salin
potemp
sigmap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press
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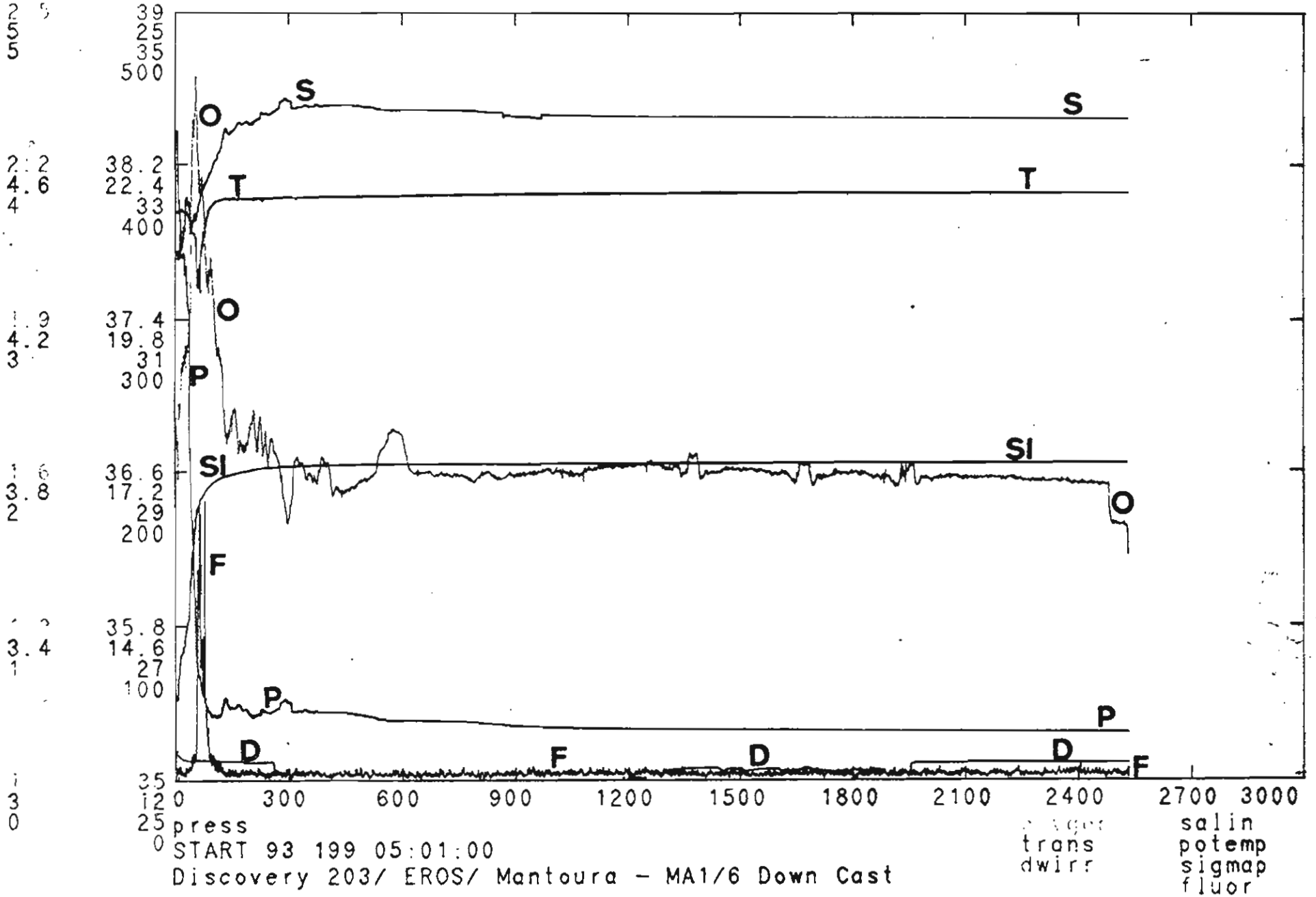
salin
potemp
sigmap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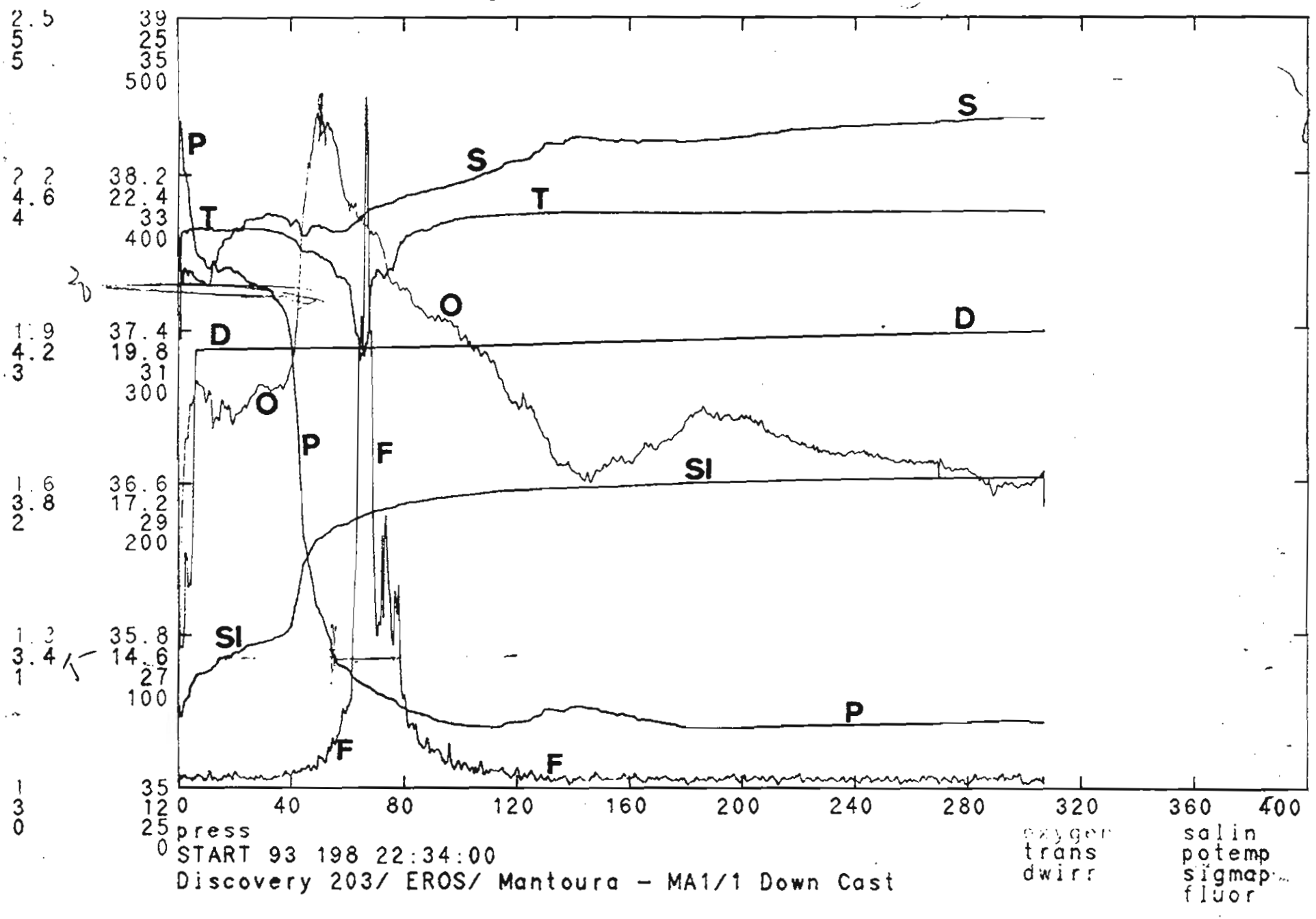
trans
dwirr
salin
potemp
sigmap
fluor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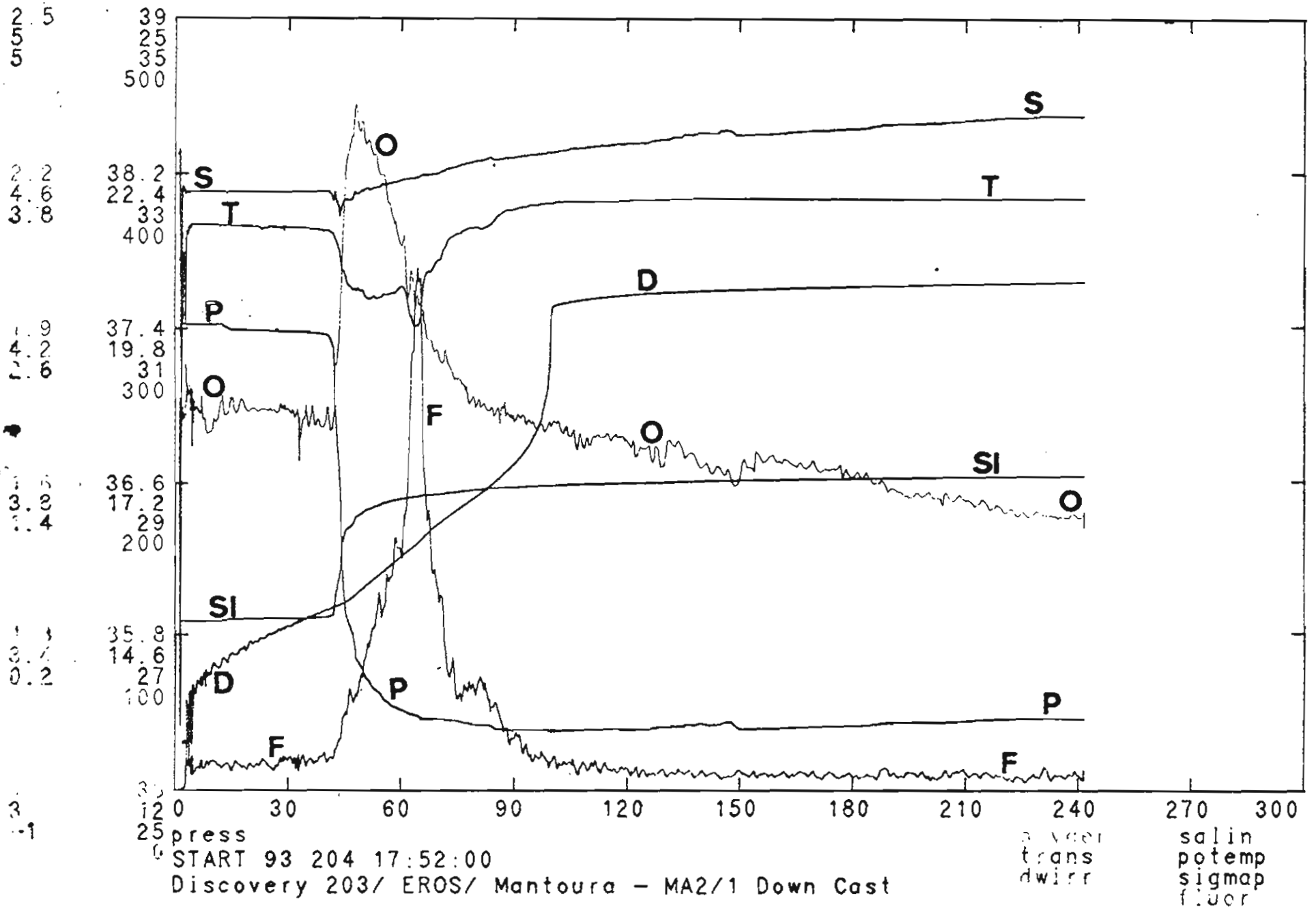
Discovery 203/ EROS/ Mantoura - MA1/1 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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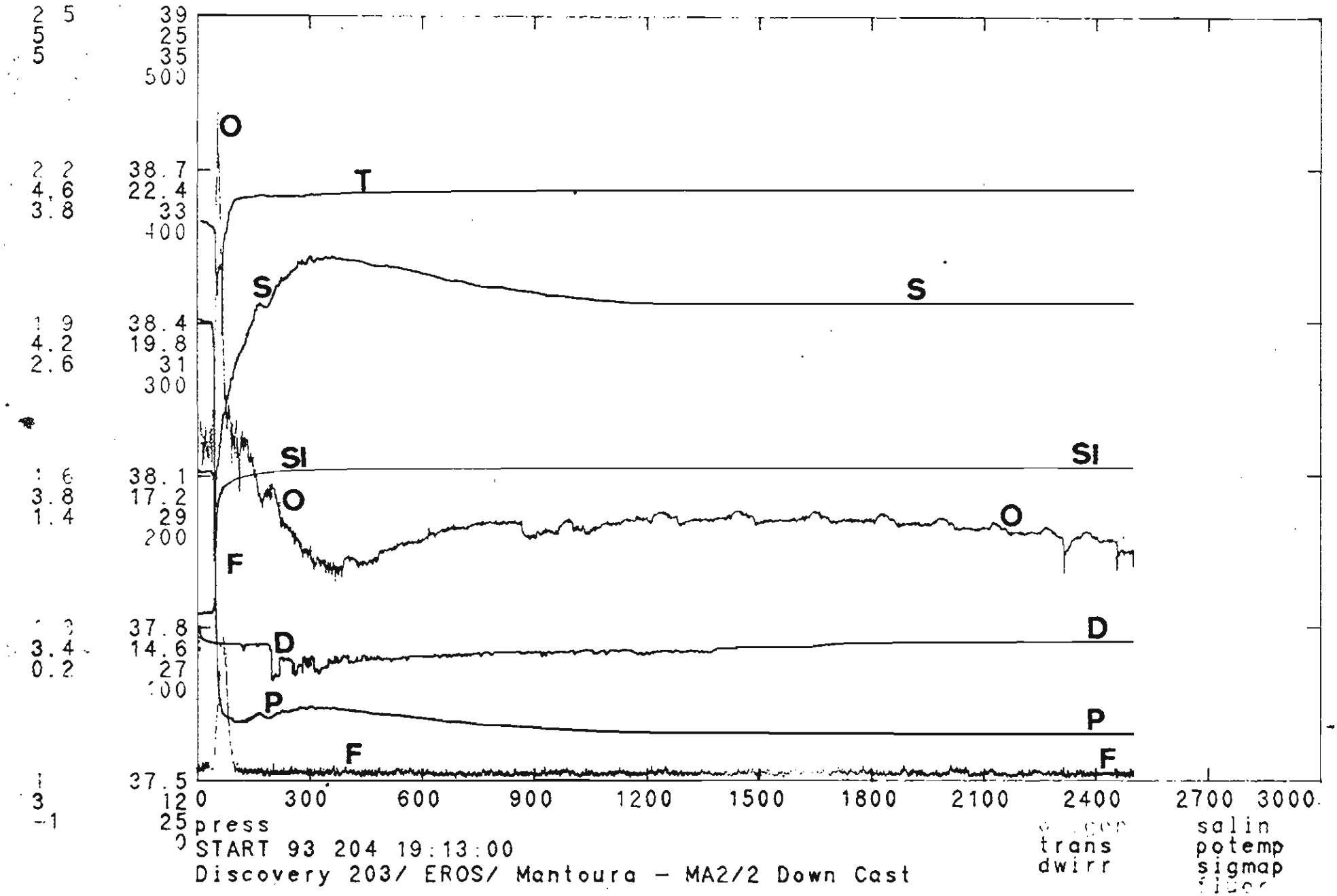
START 93 204 17:52:00
Discovery 203/ EROS/ Mantoura – MA2/1 Down Cast
trans
dwirr
salin
potemp
sigmap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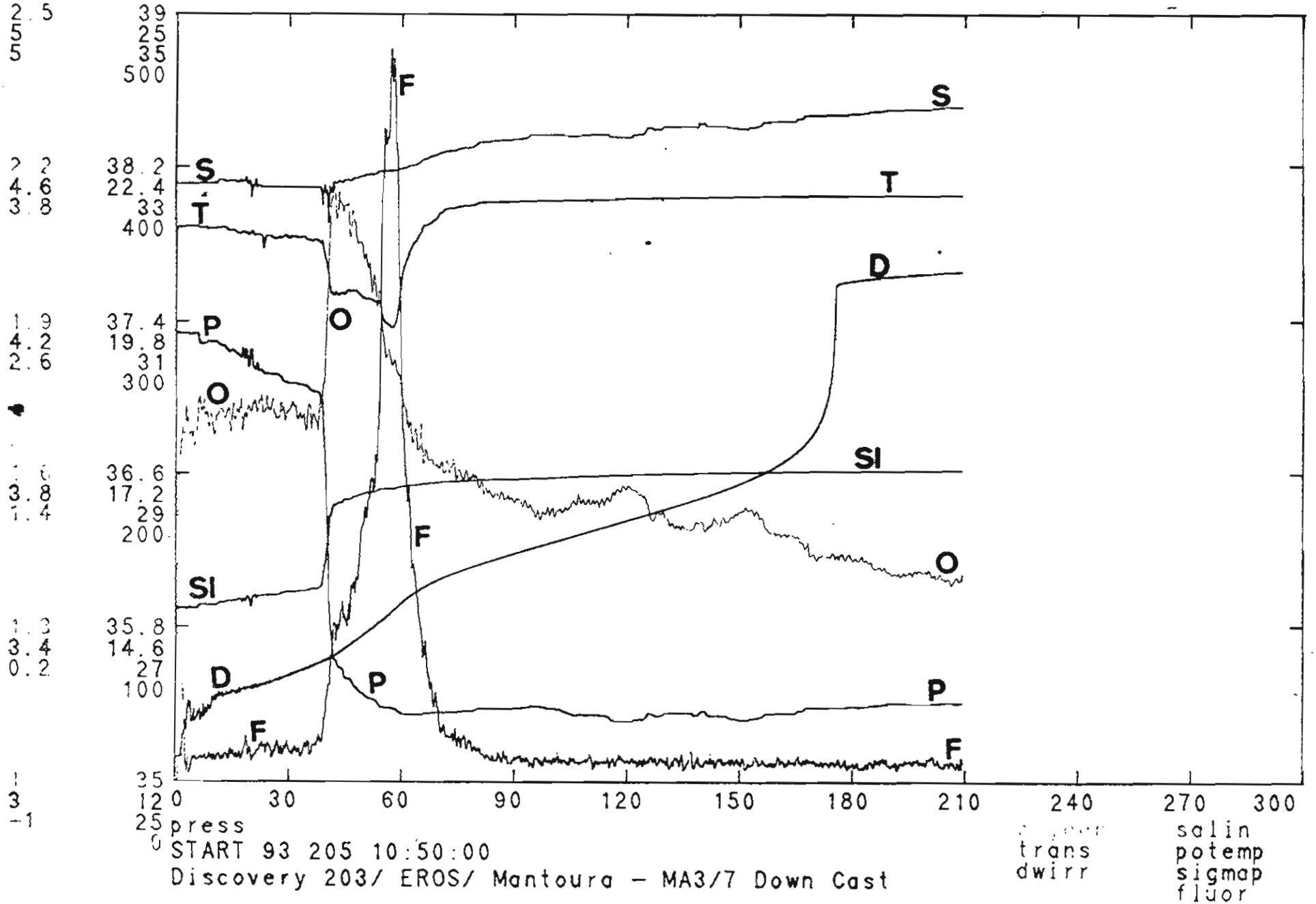
trans
dwirr
salin
potemp
sigmap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START 93 205 10:50:00
Discovery 203/ EROS/ Mantoura - MA3/7 Down Cast
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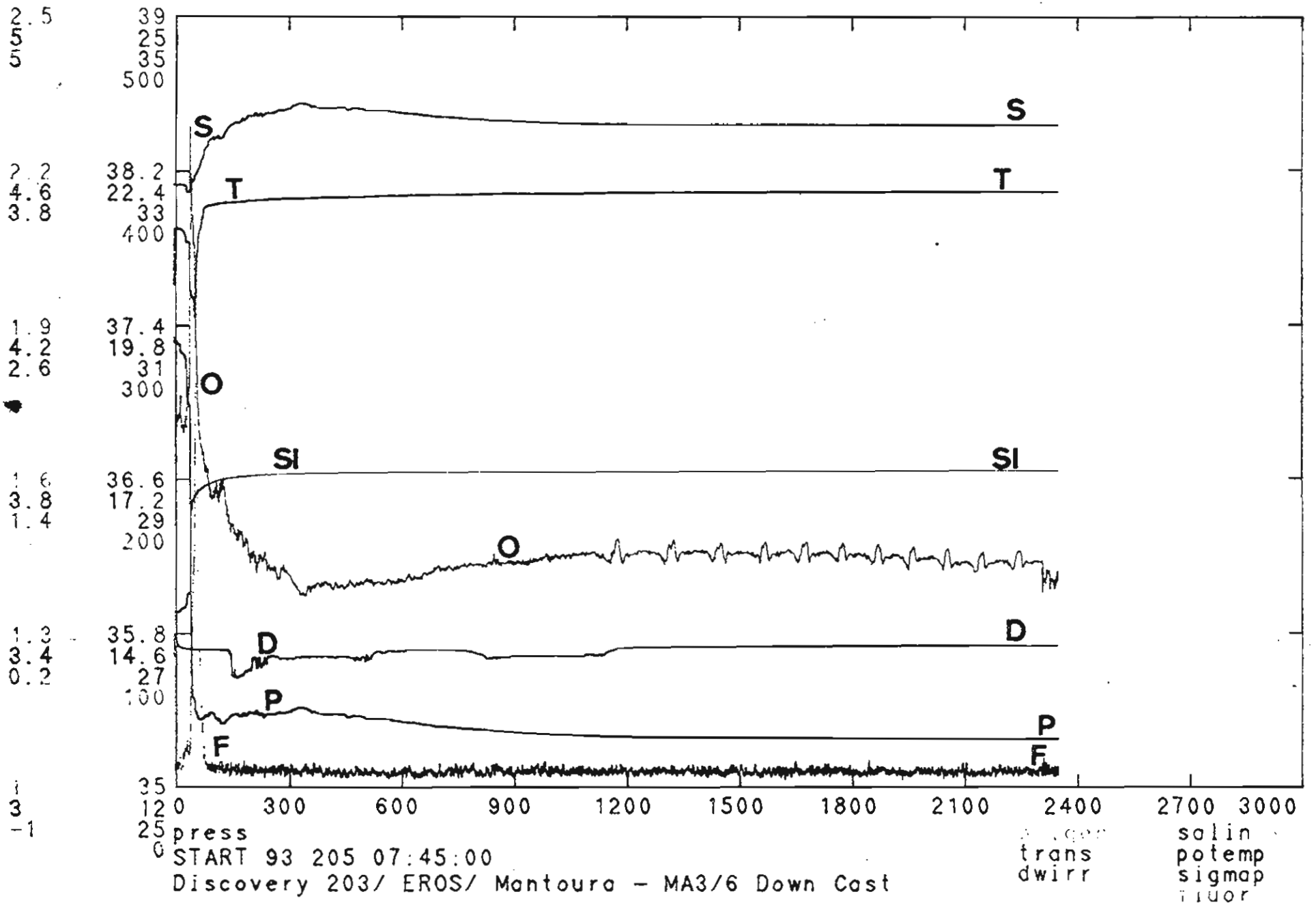
potemp
sigmap
fluor


2.5
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START 93 205 07:45:00
Discovery 203/ EROS/ Montoura - MA3/6 Down Cast
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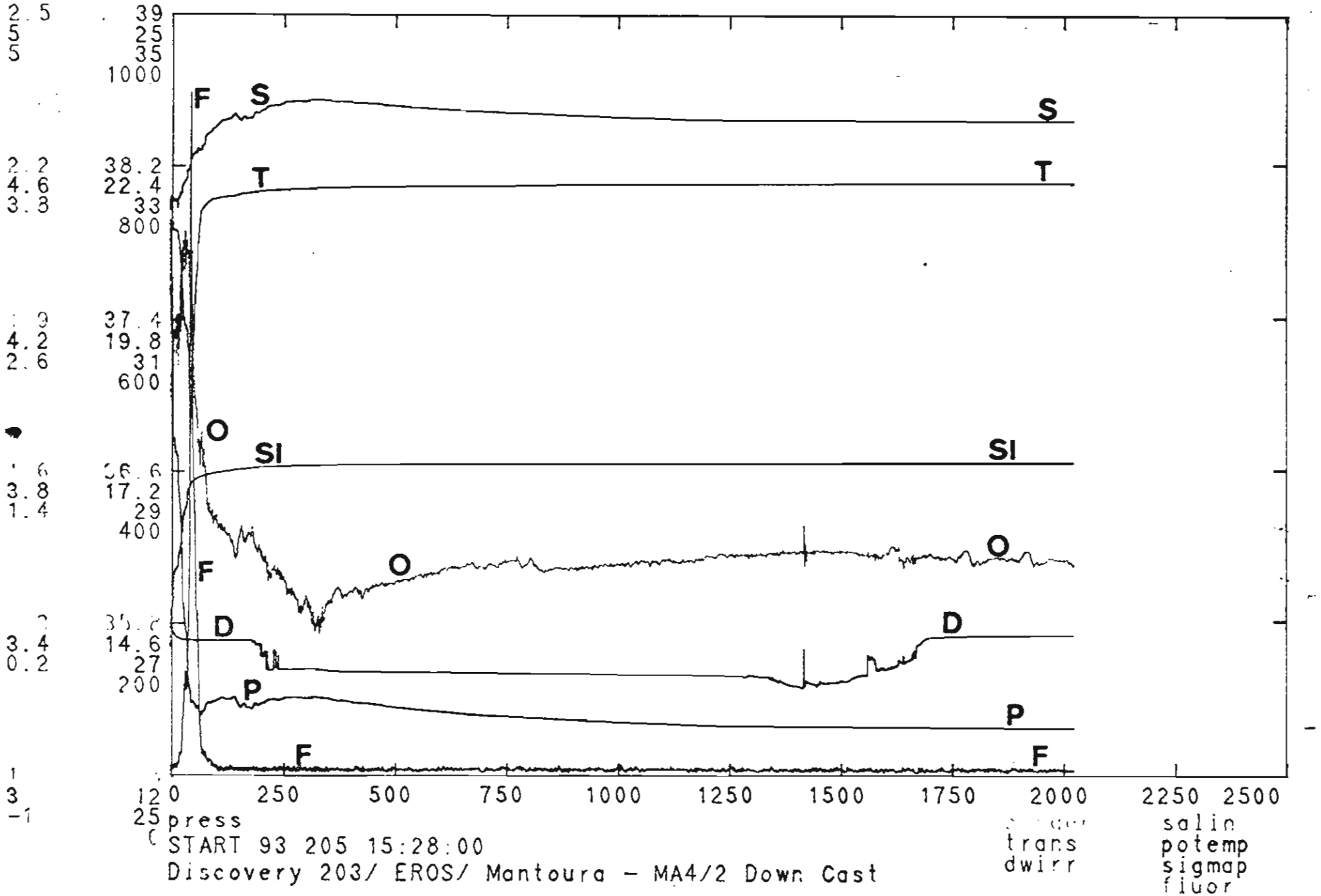
sigmap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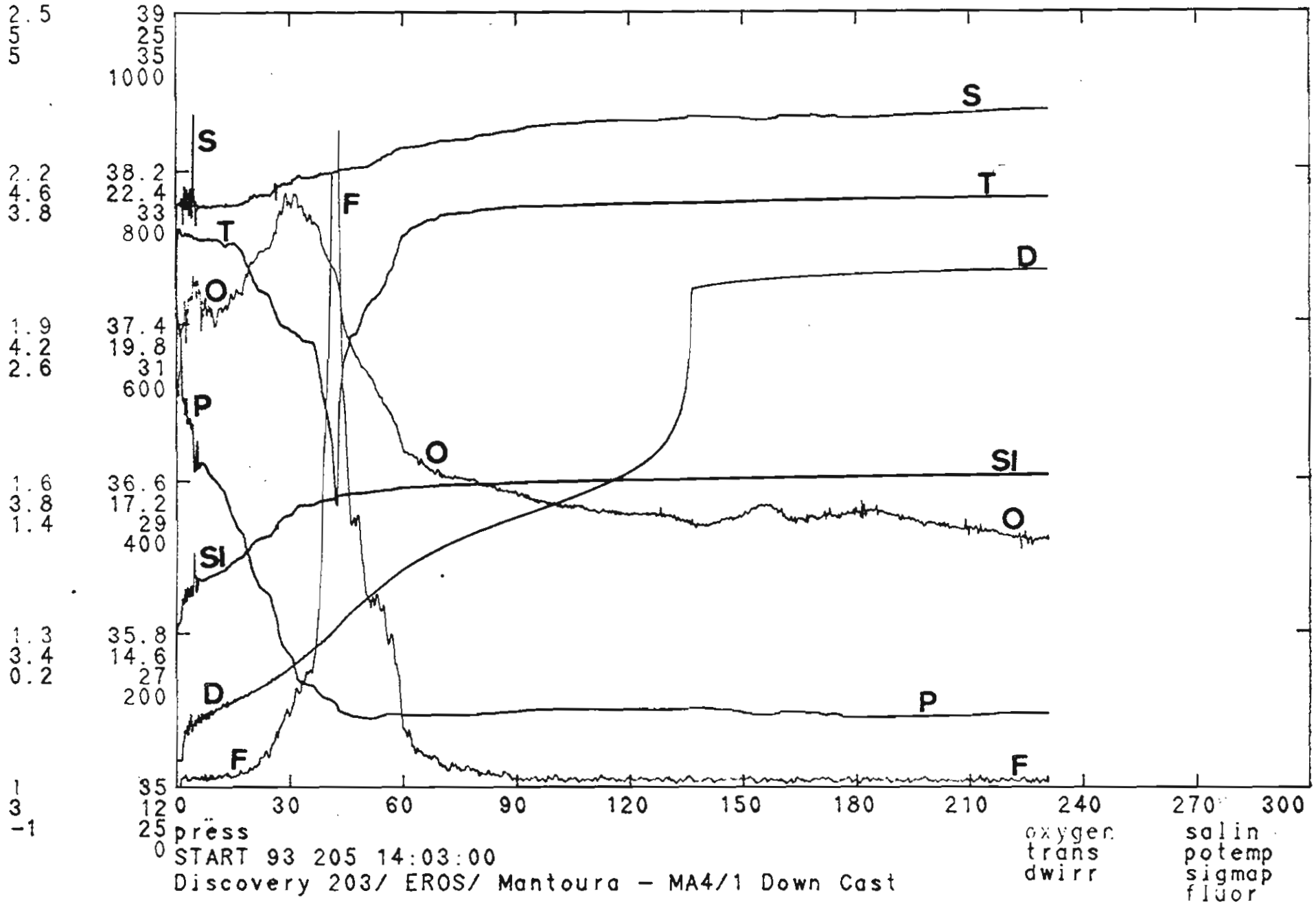
F
S
S
2.2
4.6
3.8
38.2
22.4
33
800
T
T
4.2
2.6
37.4
19.8
31
600
O
SI
SI
3.8
1.4
17.2
29
400
F
O
O
3.4
0.2
14.6
27
200
D
D
P
P
F
F
3
-1
12
25
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
press
START 93 205 15:28:00
Discovery 203/ EROS/ Mantoura - MA4/2 Down Cast
trans
dwirr
salin
potemp
sigmap
fluor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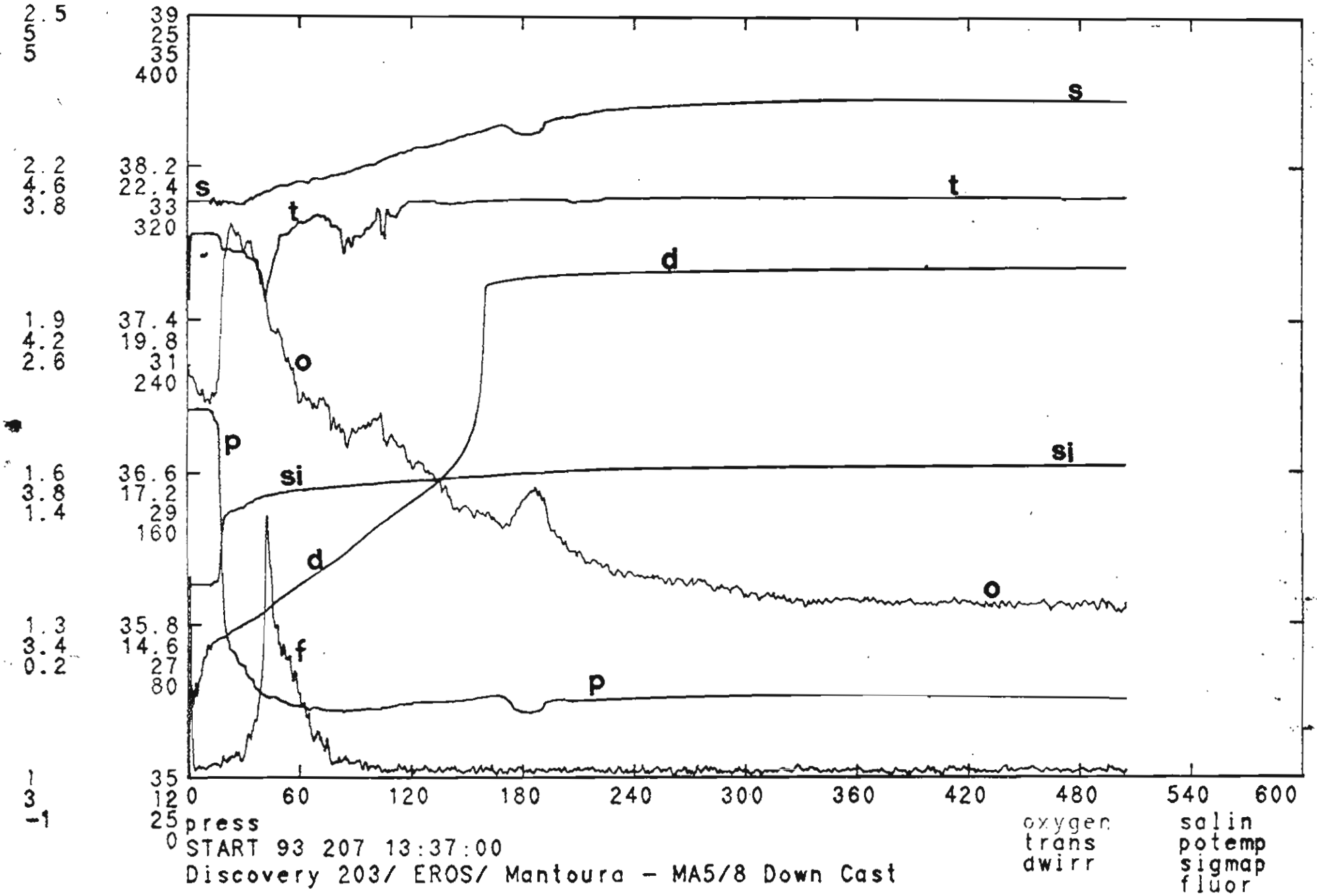
1.9
4.2
2.6
1.6
3.8
1.4
1.3
3.4
0.2
1
3
-1
39
25
35
1000
38.2
22.4
33
800
37.4
19.8
31
600
36.6
17.2
29
400
35.8
14.6
27
200
35
12
25
0
S
T
F
O
P
Sl
D
0
30
60
90
120
150
180
210
240
270
300
press
START 93 205 14:03:00
Discovery 203/ EROS/ Mantoura - MA4/1 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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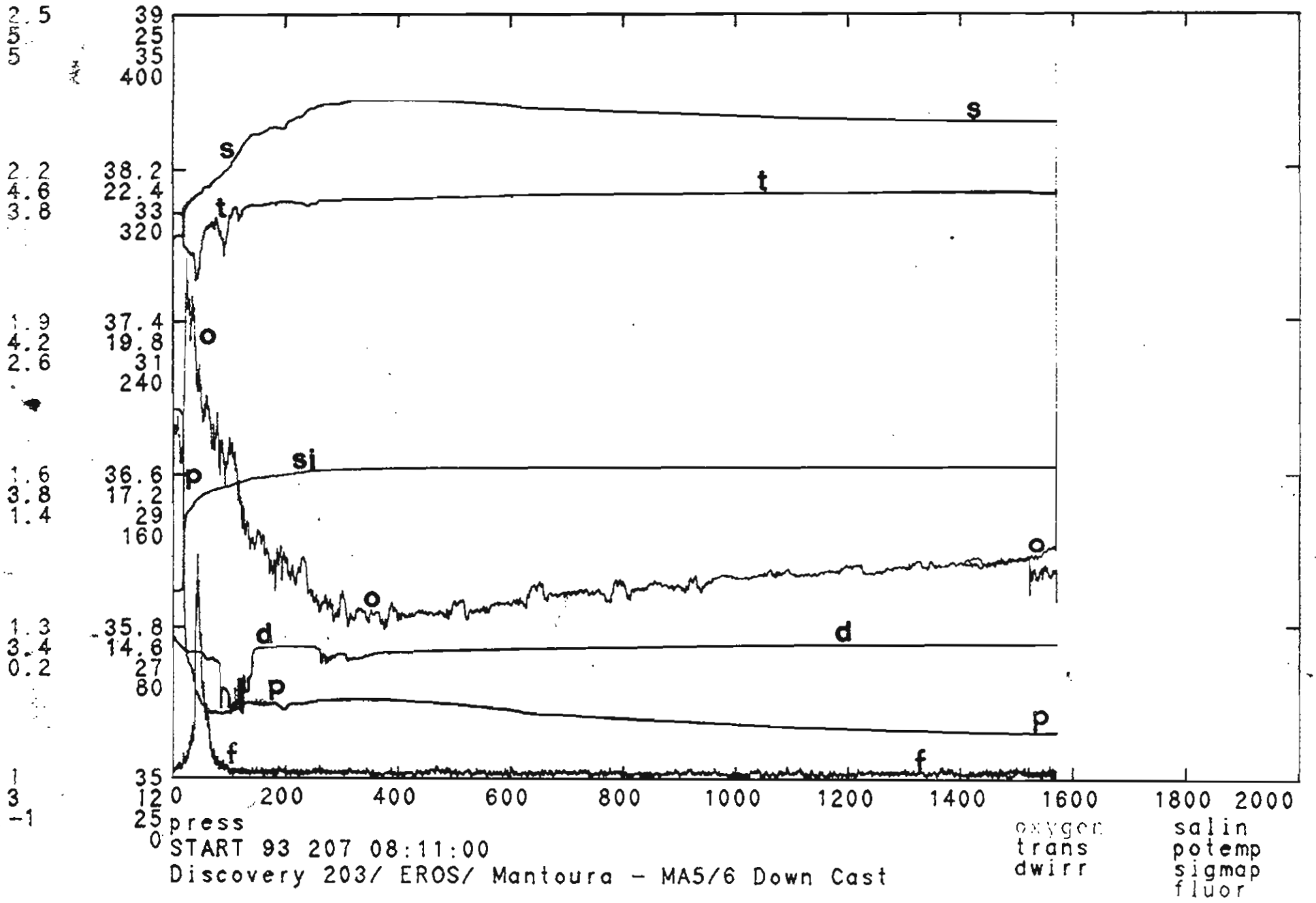
33
320
s
t
t
d
1.9
4.2
2.6
37.4
19.8
31
240
o
p
si
si
1.6
3.8
1.4
36.6
17.2
29
160
d
o
1.3
3.4
0.2
35.8
14.6
27
80
f
p
1
3
-1
35
12
25
0
0
60
120
180
240
300
360
420
480
540
600
press
START 93 207 13:37:00
Discovery 203/ EROS/ Mantoura - MA5/8 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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4.6
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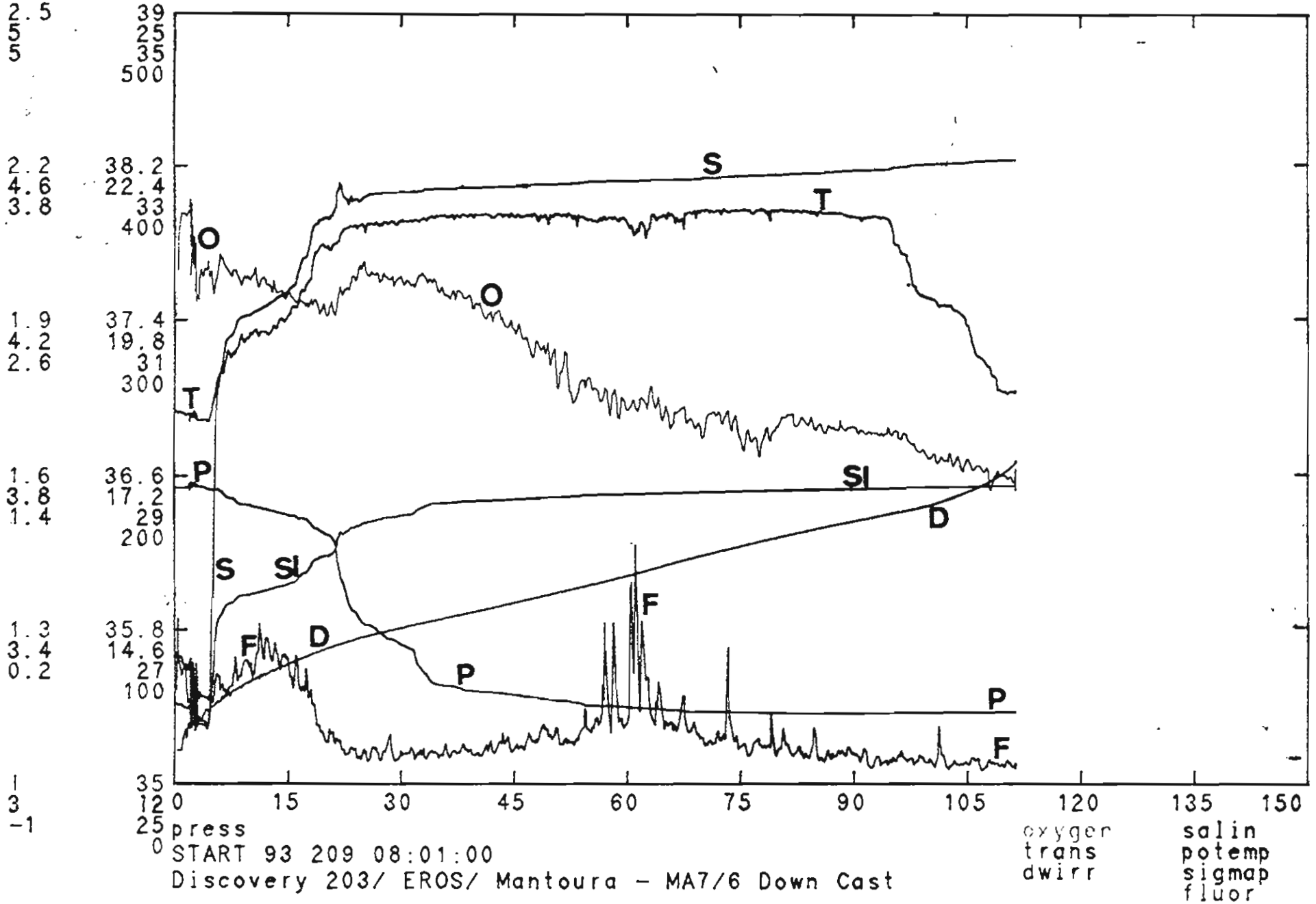
22.4
33
320
t
t
1.9
4.2
2.6
37.4
19.8
31
240
o
1.6
3.8
1.4
36.6
17.2
29
160
p
si
o
o
1.3
3.4
0.2
35.8
14.6
27
80
d
d
h
p
p
f
f
1
3
-1
35
12
25
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
press
START 93 207 08:11:00
Discovery 203/ EROS/ Mantoura - MA5/6 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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25
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500
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4.6
3.8
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22.4
33
400
1.9
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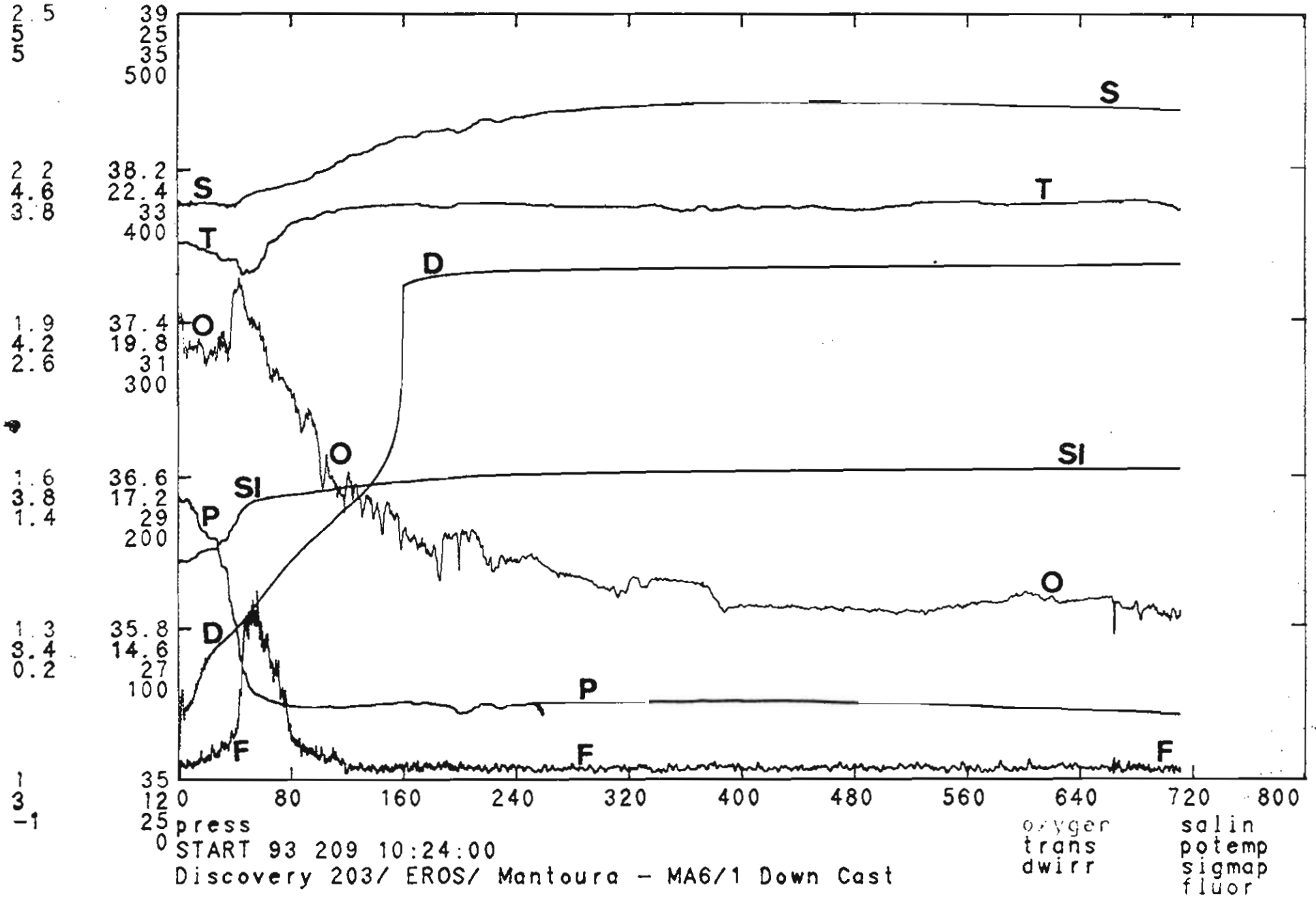
2.6
37.4
19.8
31
300
1.6
3.8
1.4
36.6
17.2
29
200
1.3
3.4
0.2
35.8
14.6
27
100
1
3
-1
35
12
25
0
S
T
O
O
T
P
SI
D
S
SI
F
D
P
F
P
F
0
15
30
45
60
75
90
105
120
135
150
press
START 93 209 08:01:00
Discovery 203/ EROS/ Mantoura - MA7/6 Down Cast
oxyger
trans
dwirr
salin
potemp
sigmap
fluor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5
2.2
4.6
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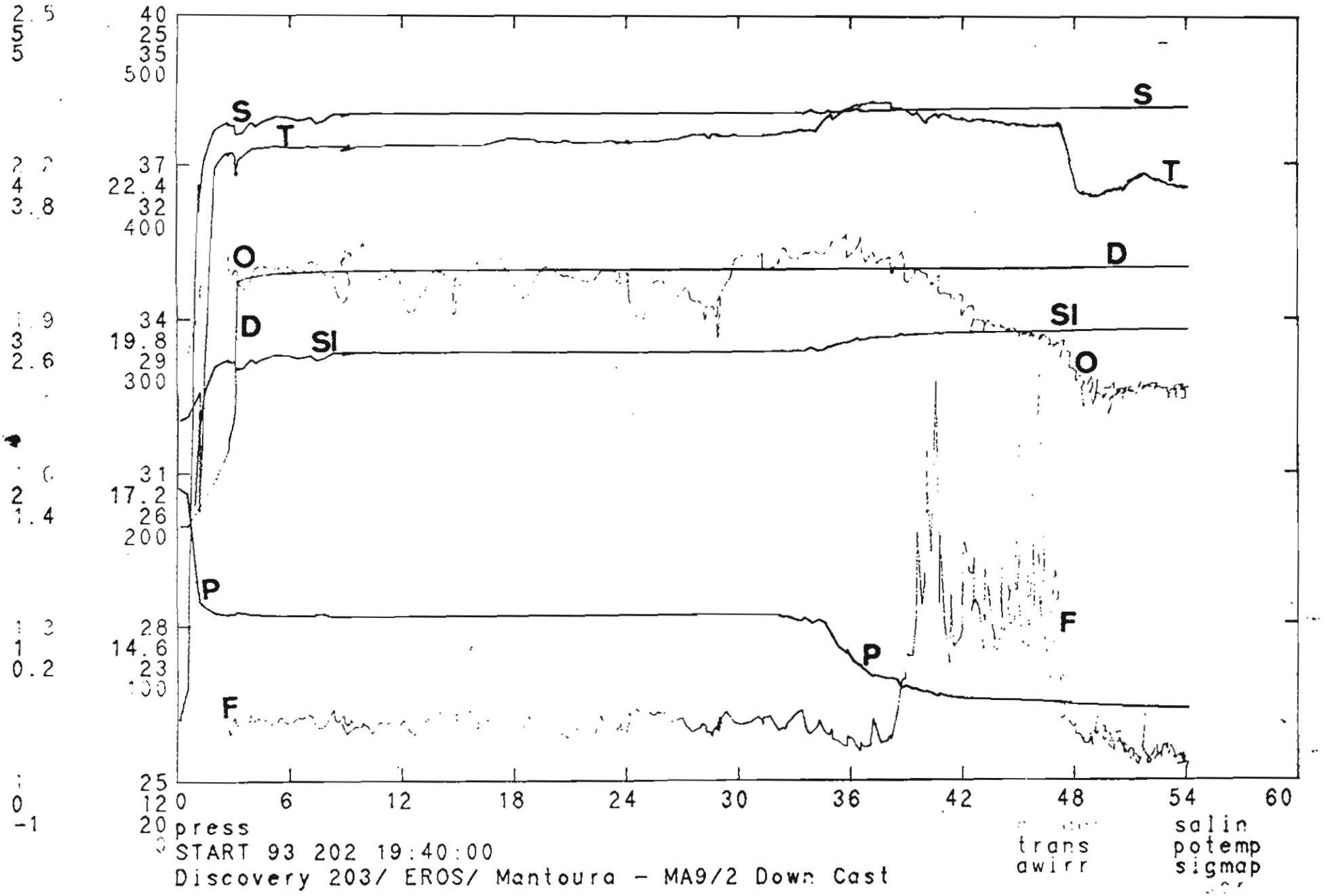
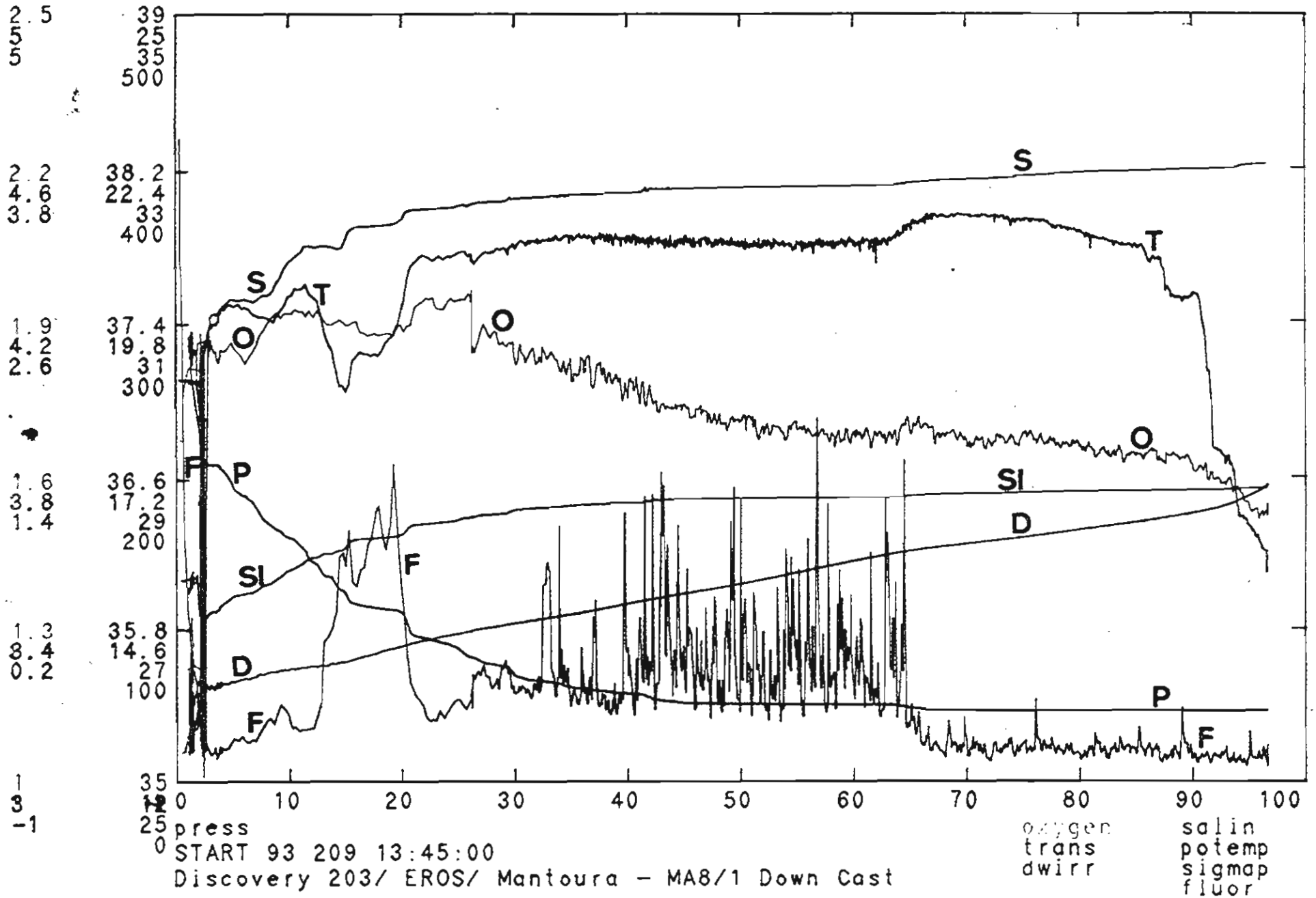
1.9
4.2
2.6
1.6
3.8
1.4
1.3
3.4
0.2
1
3
-1
39
25
35
500
38.2
22.4
33
400
37.4
19.8
31
300
36.6
17.2
29
200
35.8
14.6
27
100
35
12
25
0
S
T
D
O
SI
P
F
0
80
160
240
320
400
480
560
640
720
800
press
START 93 209 10:24:00
Discovery 203/ EROS/ Mantoura - MA6/1 Down Cast
oxyger
trans
dwirr
salin
potemp
sigmap
fluor


S
T
O
D
SI
P
F
press
START 93 202 19:40:00
Discovery 203/ EROS/ Mantoura - MA9/2 Down Cast
trans
awirr
salin
potemp
sigmap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25
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2.2
4.6
3.8
38.2
22.4
33
400
1.9
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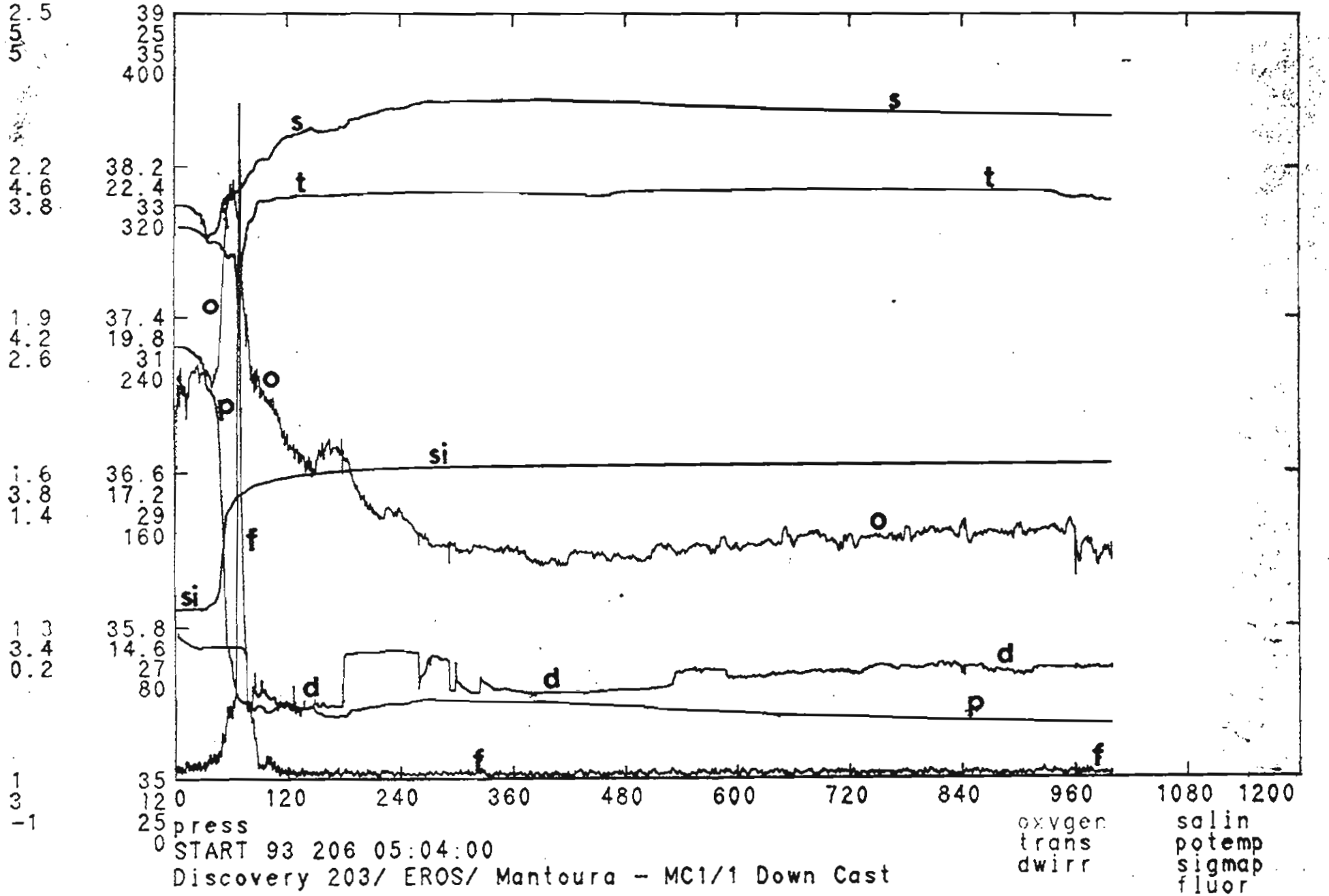
2.6
37.4
19.8
31
300
1.6
3.8
1.4
36.6
17.2
29
200
1.3
8.4
0.2
35.8
14.6
27
100
1
3
-1
35
25
0
S
T
O
P
Sl
D
F
0
10
20
30
40
50
60
70
80
90
100
press
START 93 209 13:45:00
Discovery 203/ EROS/ Mantoura - MA8/1 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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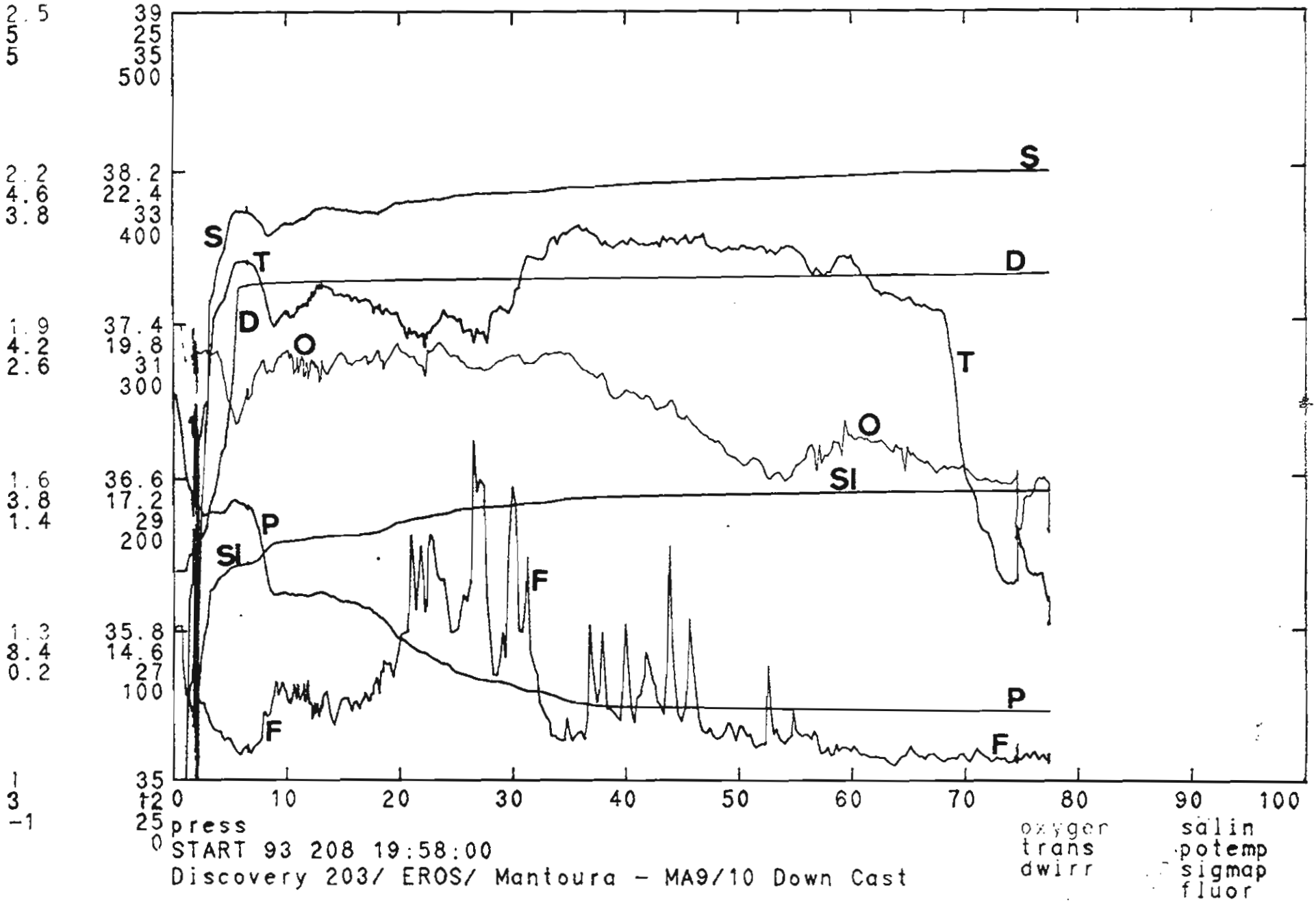
1.6
3.8
1.4
1.3
3.4
0.2
1
3
-1
39
25
35
400
38.2
22.4
33
320
37.4
19.8
31
240
36.6
17.2
29
160
35.8
14.6
27
80
35
12
25
0
s
t
o
p
si
f
d
0
120
240
360
480
600
720
840
960
1080
1200
press
START 93 206 05:04:00
Discovery 203/ EROS/ Mantoura - MC1/1 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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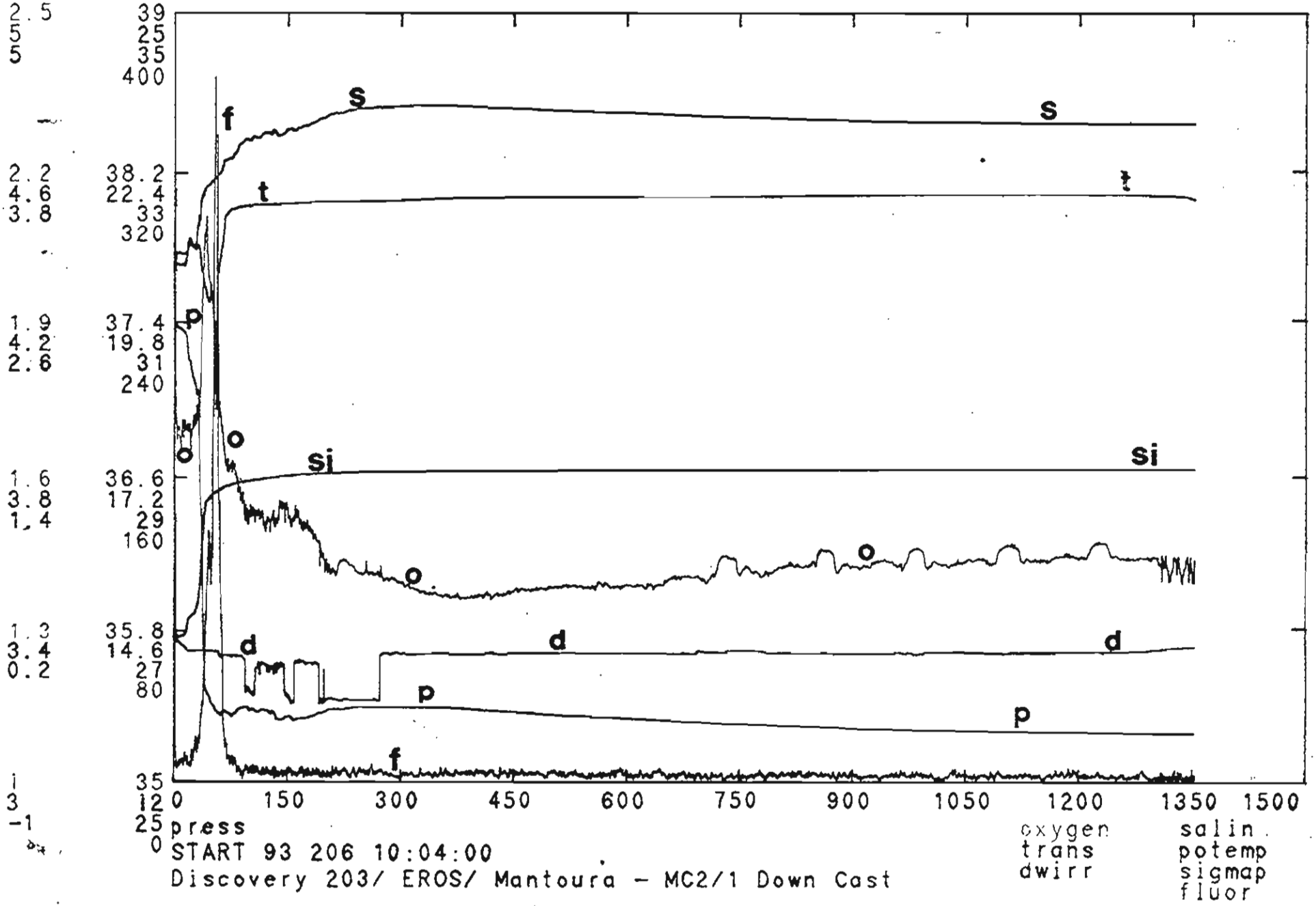
3.8
1.4
1.3
8.4
0.2
1
3
-1
39
25
35
500
38.2
22.4
33
400
37.4
19.8
31
300
36.6
17.2
29
200
35.8
14.6
27
100
35
12
25
0
S
T
D
O
P
Sl
F
0
10
20
30
40
50
60
70
80
90
100
press
START 93 208 19:58:00
Discovery 203/ EROS/ Mantoura - MA9/10 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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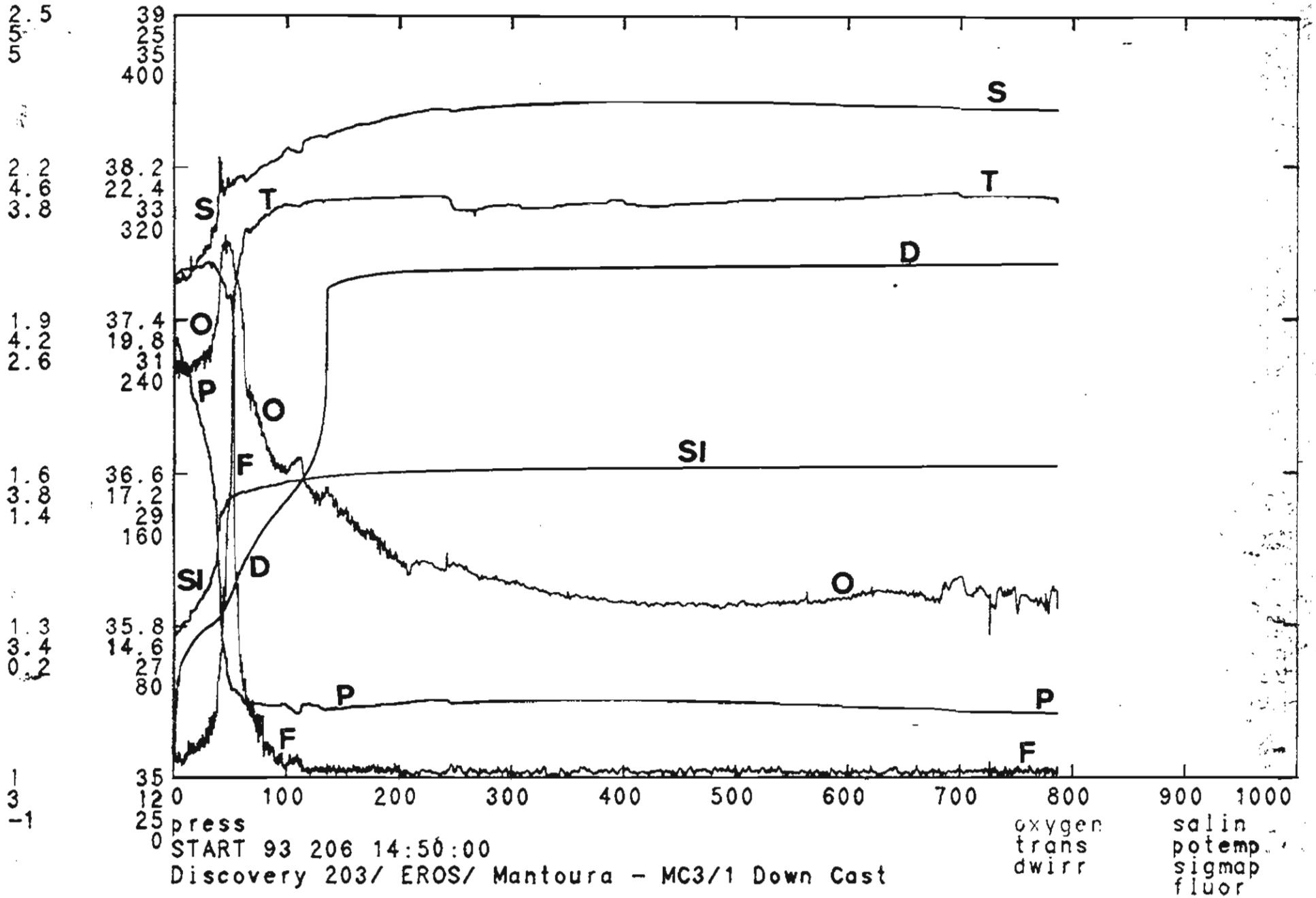
2.6
1.6
3.8
1.4
1.3
3.4
0.2
1
3
-1
39
25
35
400
38.2
22.4
33
320
37.4
19.8
31
240
36.6
17.2
29
160
35.8
14.6
27
80
35
12
25
0
f
s
t
p
o
Si
d
0
150
300
450
600
750
900
1050
1200
1350
1500
press
START 93 206 10:04:00
Discovery 203/ EROS/ Mantoura - MC2/1 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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2.2
4.6
3.8
1.9
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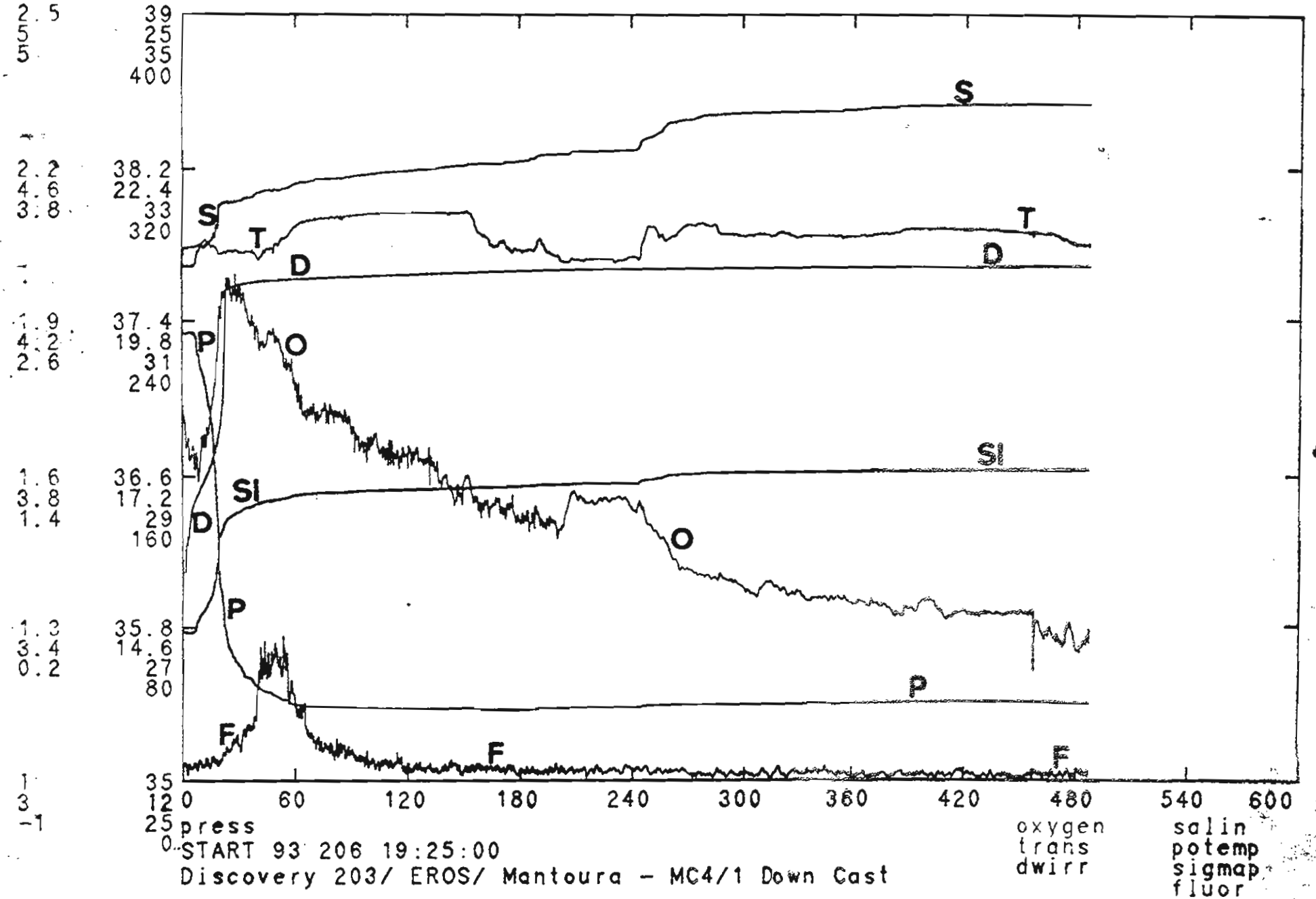
2.6
1.6
3.8
1.4
1.3
3.4
0.2
1
3
-1
39
25
35
400
38.2
22.4
33
320
37.4
19.8
31
240
36.6
17.2
29
160
35.8
14.6
27
80
35
12
25
0
S
T
D
O
P
F
SI
0
100
200
300
400
500
600
700
800
900
1000
press
START 93 206 14:50:00
Discovery 203/ EROS/ Mantoura - MC3/1 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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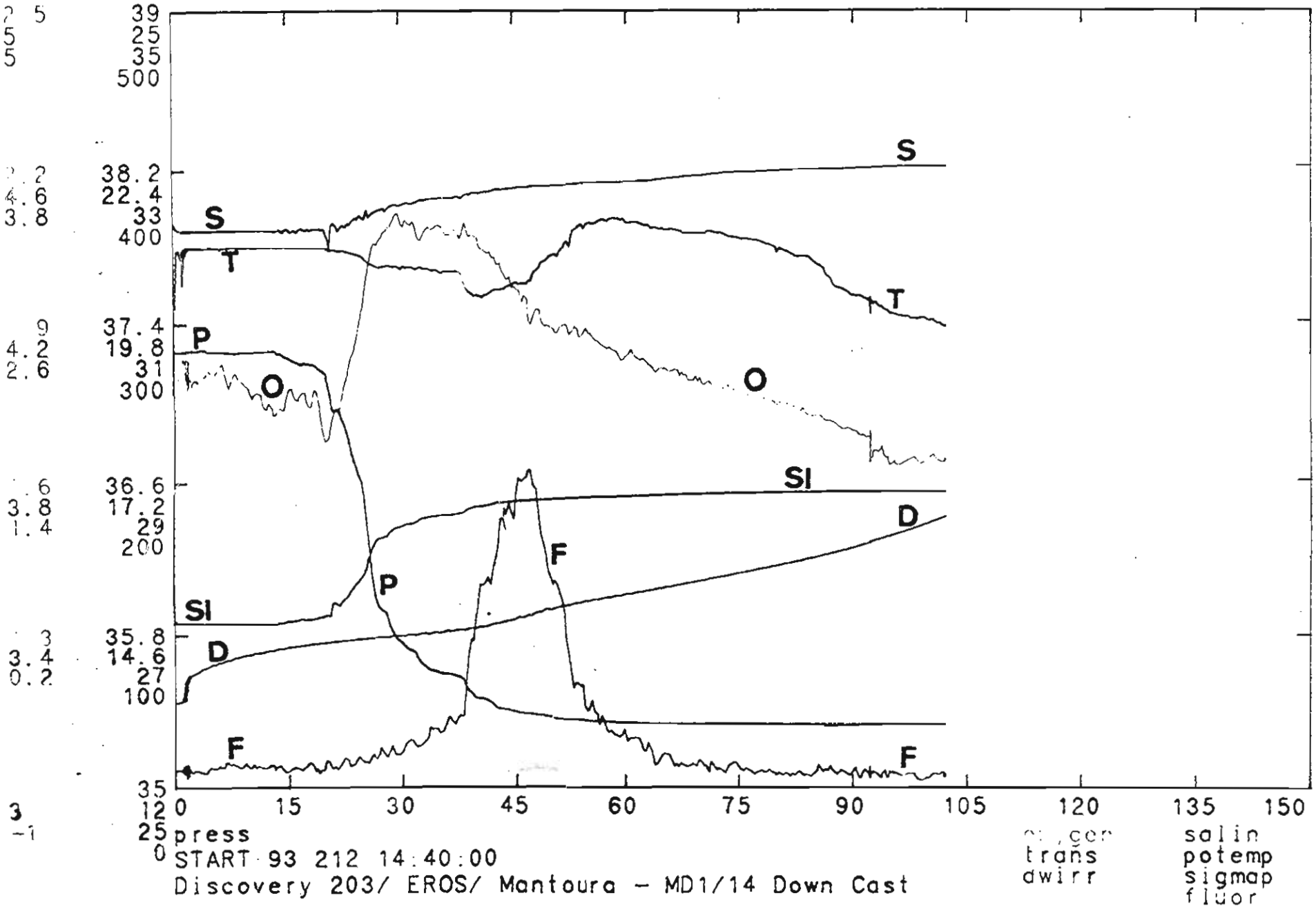
5
5
39
25
35
400
S
2.2
4.6
3.8
38.2
22.4
33
320
S
T
T
D
D
1.9
4.2
2.6
37.4
19.8
31
240
P
O
SI
1.6
3.8
1.4
36.6
17.2
29
160
SI
D
O
P
1.3
3.4
0.2
35.8
14.6
27
80
P
F
F
F
1
3
-1
35
12
25
0
0
60
120
180
240
300
360
420
480
540
600
press
START 93 206 19:25:00
Discovery 203/ EROS/ Mantoura - MC4/1 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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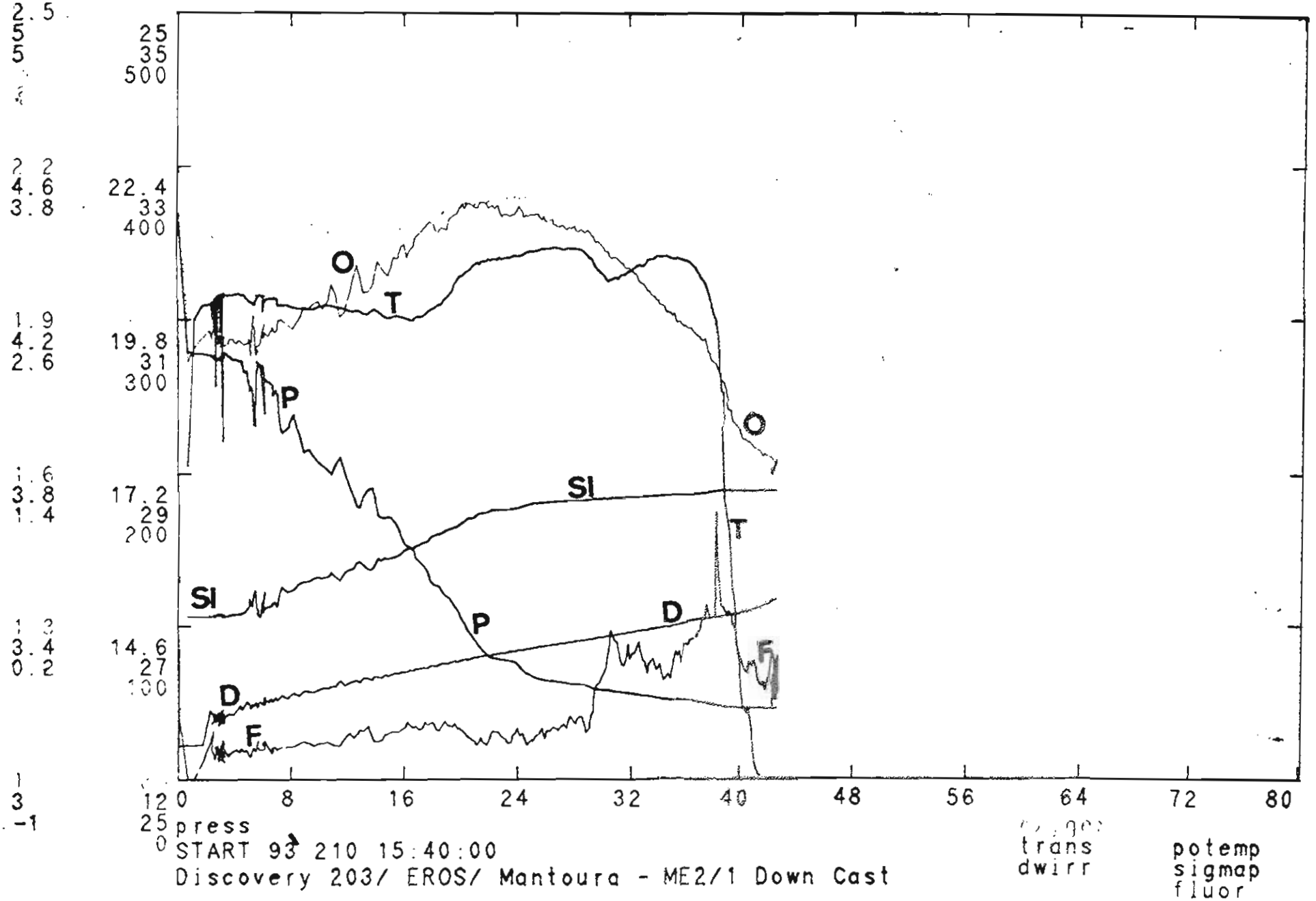
500
38.2
22.4
33
400
37.4
19.8
31
300
36.6
17.2
29
200
35.8
14.6
27
100
35
12
25
0
S
T
P
O
Sl
D
F
0
15
30
45
60
75
90
105
120
135
150
press
START 93 212 14:40:00
Discovery 203/ EROS/ Mantoura - MD1/14 Down Cast
trans
dwirr
potemp
sigmap
fluor


2.5
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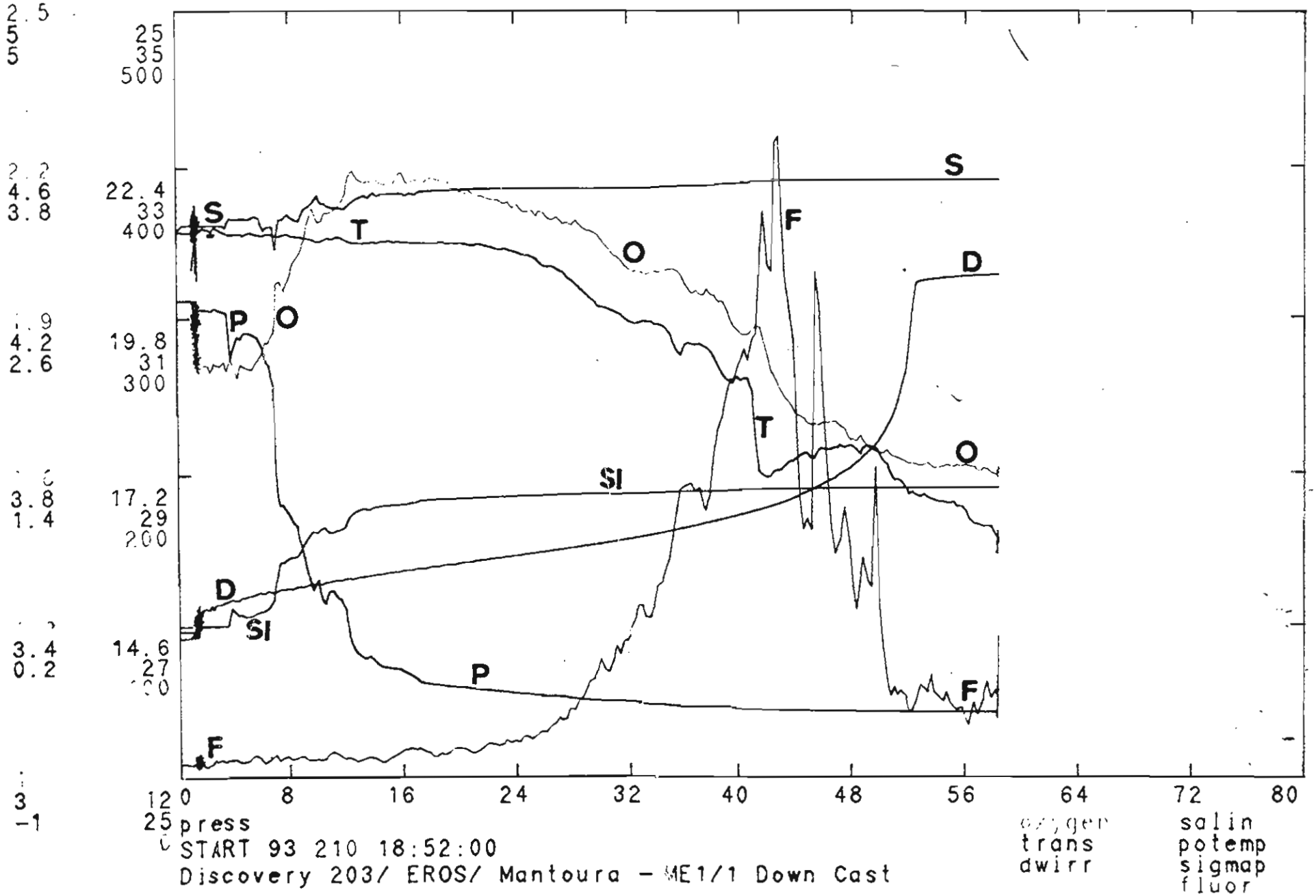
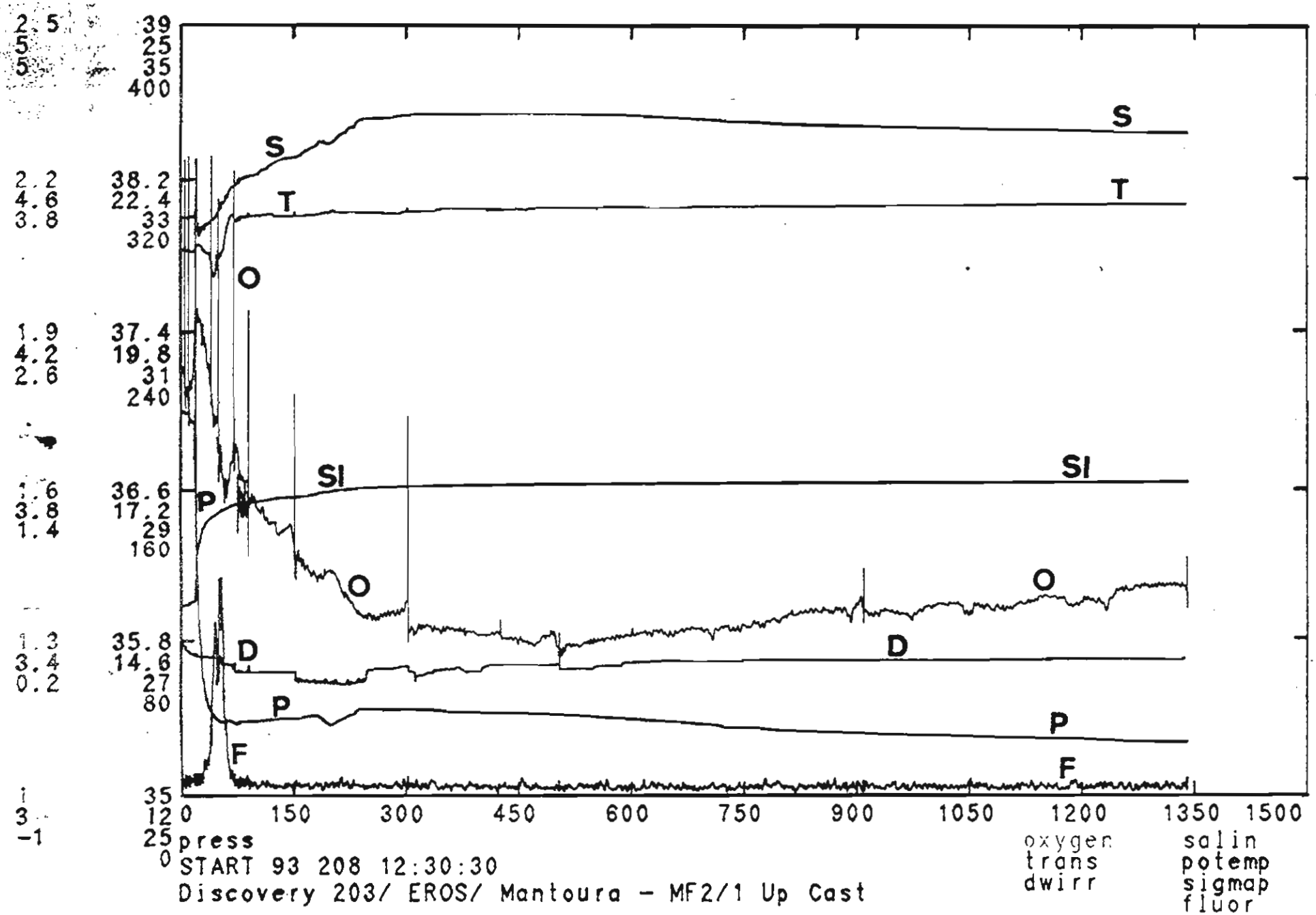
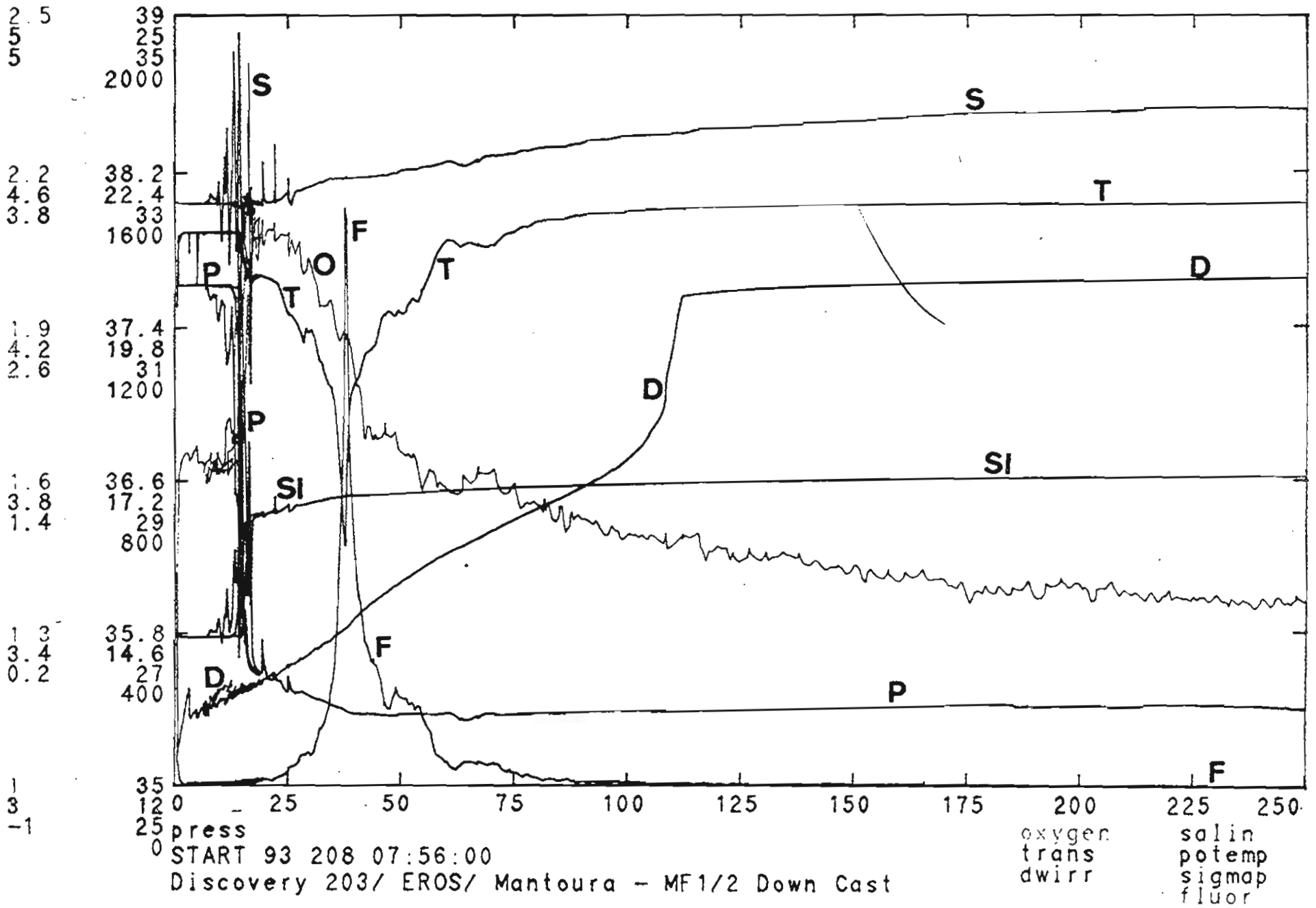
5
25
35
500
2.2
4.6
3.8
22.4
33
400
O
T
1.9
4.2
2.6
19.8
31
300
P
O
1.6
3.8
1.4
17.2
29
200
SI
T
SI
P
D
1.3
3.4
0.2
14.6
27
100
D
F
1
3
-1
12
25
0
0
8
16
24
32
40
48
56
64
72
80
press
START 93 210 15:40:00
Discovery 203/ EROS/ Mantoura - ME2/1 Down Cast
trans
dwirr
potemp
sigmap
fluor


2.5
5
5
25
35
500
2.2
4.6
3.8
22.4
33
400
S
T
O
P
O
S
F
D
T
O
SI
D
SI
P
F
.9
4.2
2.6
19.8
31
300
3.8
1.4
17.2
29
200
3.4
0.2
14.6
27
0
3
-1
12
25
0
8
16
24
32
40
48
56
64
72
80
press
START 93 210 18:52:00
Discovery 203/ EROS/ Mantoura - ME1/1 Down Cast
trans
dwirr
salin
potemp
sigmap
fluor


2.5
5
5
39
25
35
400
S
S
2.2
4.6
3.8
38.2
22.4
33
320
T
T
O
1.9
4.2
2.6
37.4
19.8
31
240
SI
SI
P
1.6
3.8
1.4
36.6
17.2
29
160
O
O
1.3
3.4
0.2
35.8
14.6
27
80
D
D
P
P
F
F
i
3
-1
35
12
25
0
0
150
300
450
600
750
900
1050
1200
1350
1500
press
START 93 208 12:30:30
Discovery 203/ EROS/ Mantoura - MF2/1 Up Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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2.2
4.6
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1.9
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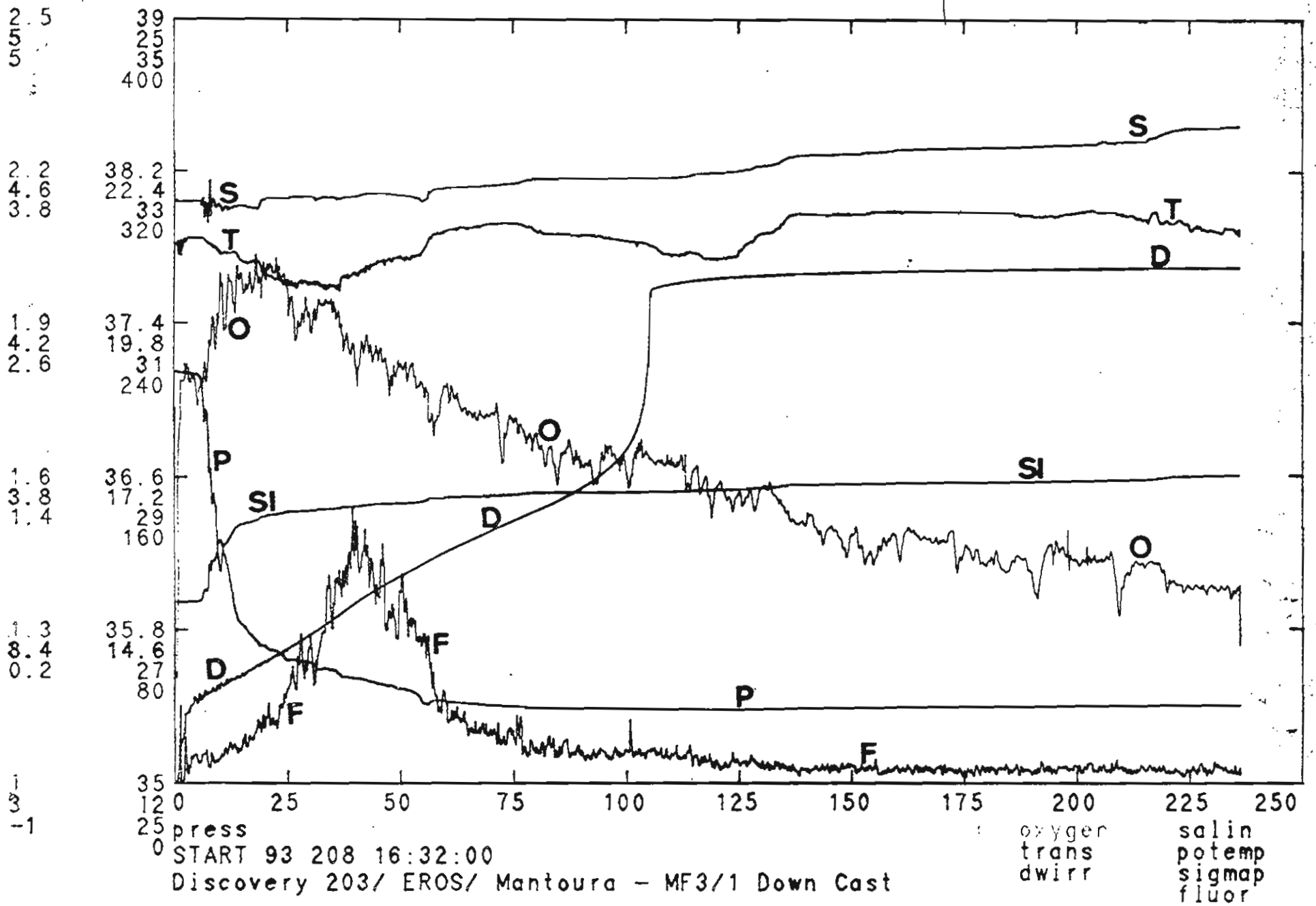
2.6
1.6
3.8
1.4
1.3
3.4
0.2
1
3
-1
39
25
35
2000
38.2
22.4
33
1600
37.4
19.8
31
1200
36.6
17.2
29
800
35.8
14.6
27
400
35
12
25
0
S
P
O
T
F
T
D
P
SI
F
D
S
T
D
SI
P
F
0
25
50
75
100
125
150
175
200
225
250
press
START 93 208 07:56:00
Discovery 203/ EROS/ Mantoura - MF1/2 Down Cast
oxygen
trans
dwirr
salin
potemp
sigmap
fluor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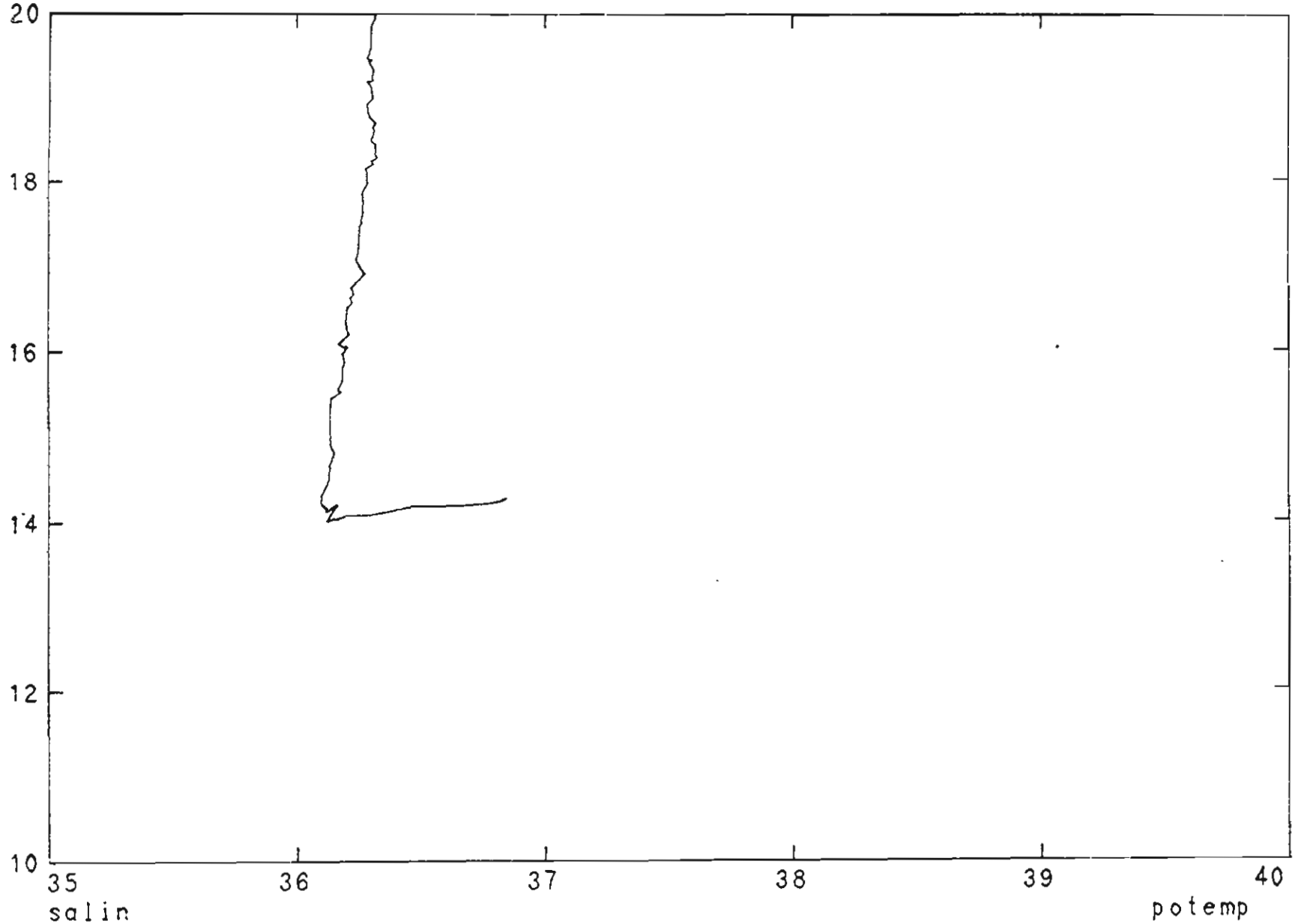
5
2.2
4.6
3.8
1.9
4.2
2.6
1.6
3.8
1.4
1.3
8.4
0.2
1
3
-1
39
25
35
400
38.2
22.4
33
320
37.4
19.8
31
240
36.6
17.2
29
160
35.8
14.6
27
80
35
12
25
0
S
T
O
P
SI
D
F
0
25
50
75
100
125
150
175
200
225
250
press
START 93 208 16:32:00
Discovery 203/ EROS/ Mantoura - MF3/1 Down Cast
oxyger
trans
dwirr
salin
potemp
sigmap
fluor

9 T/S PLOTS

Selected temperature vs salinity water mass plots for seach station are shown here. For individual casts please refer to CTD diskettes provided.


20
18
16
14
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10
35
36
37
38
39
40
salin
potemp
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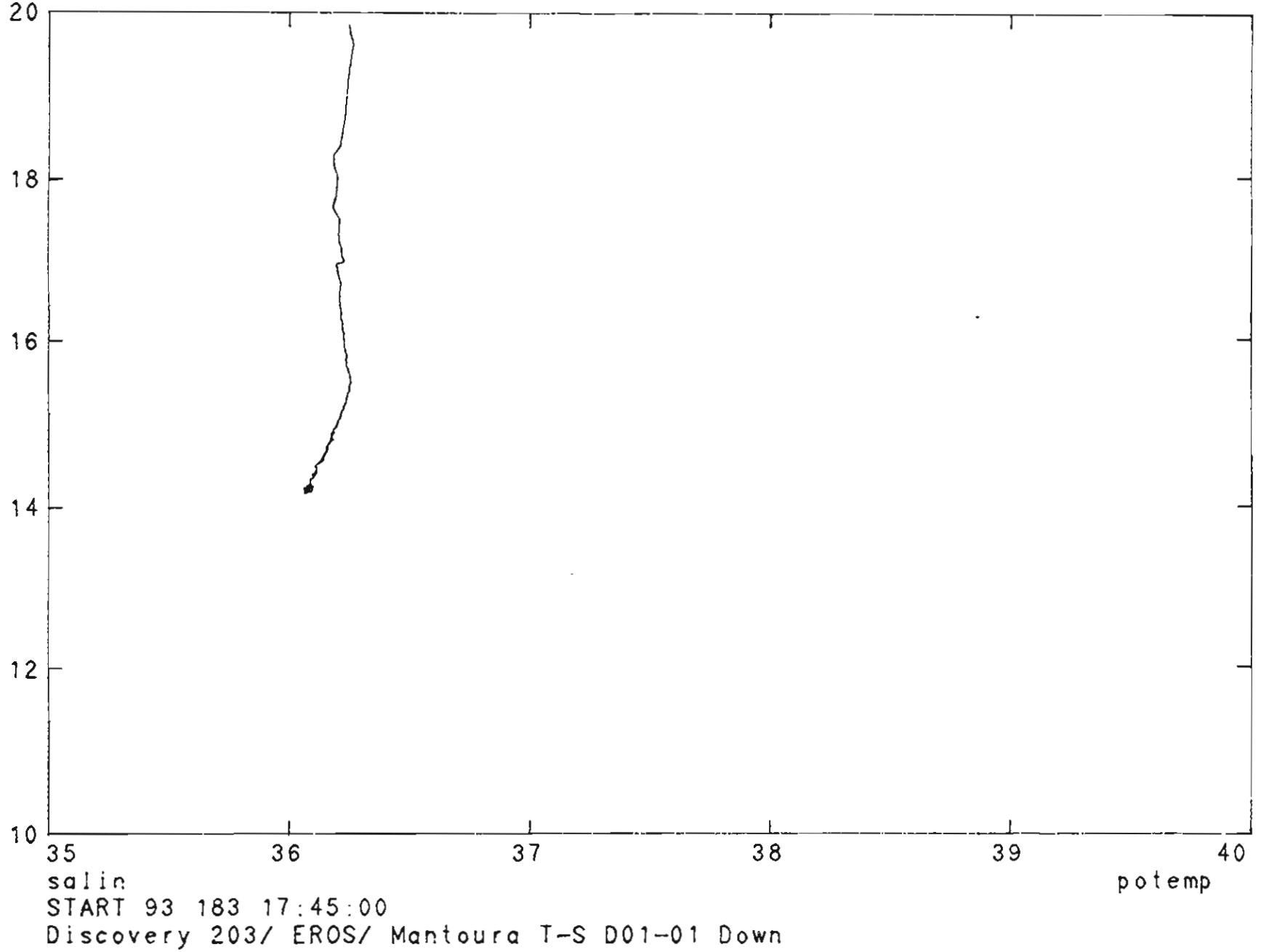
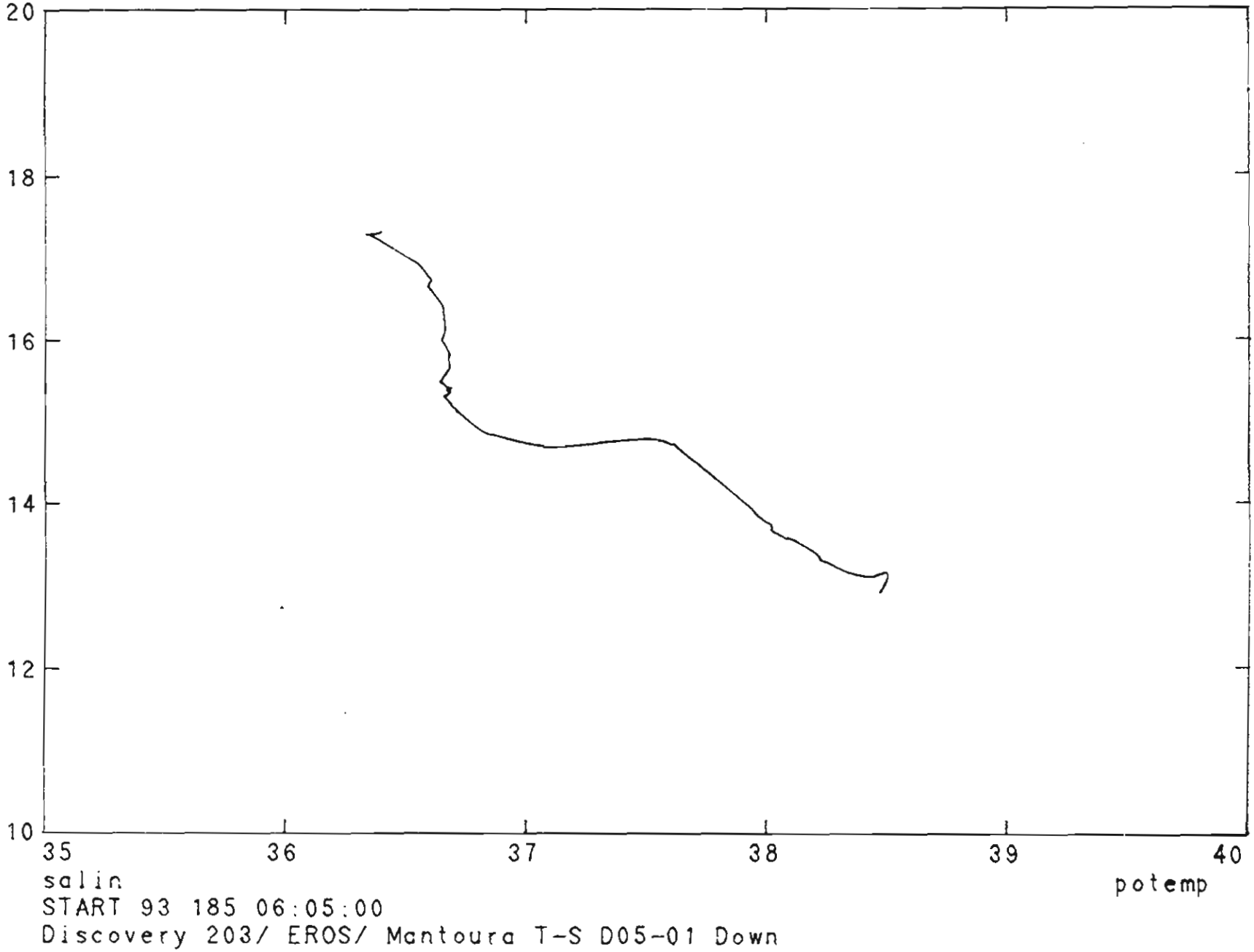
Discovery 203/ EROS/ Mantoura T-S D02-01 Down


20
18
16
14
12
10
35
36
37
38
39
40
salin
potemp
START 93 183 17:45:00
Discovery 203/ EROS/ Mantoura T-S D01-01 Down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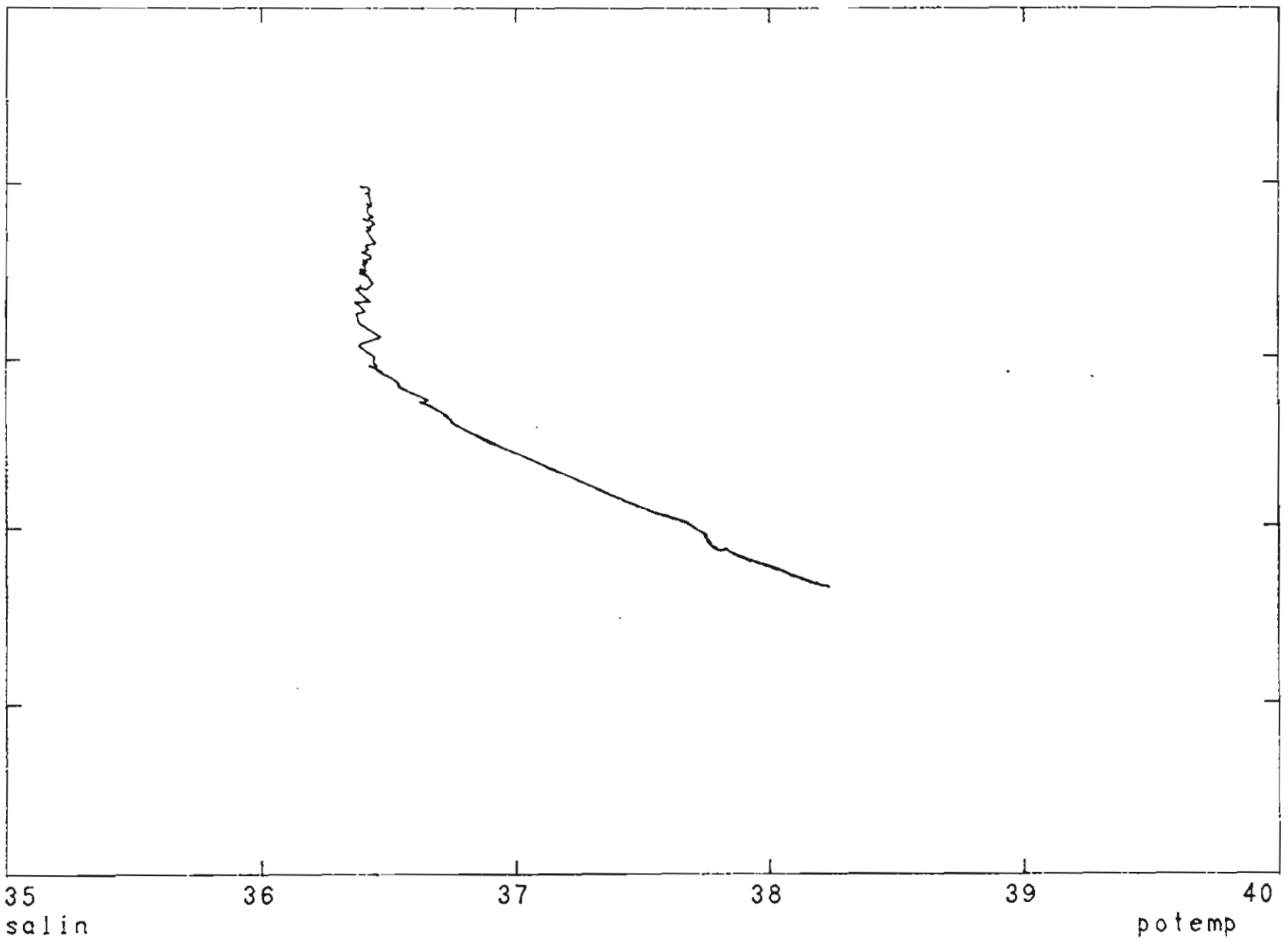
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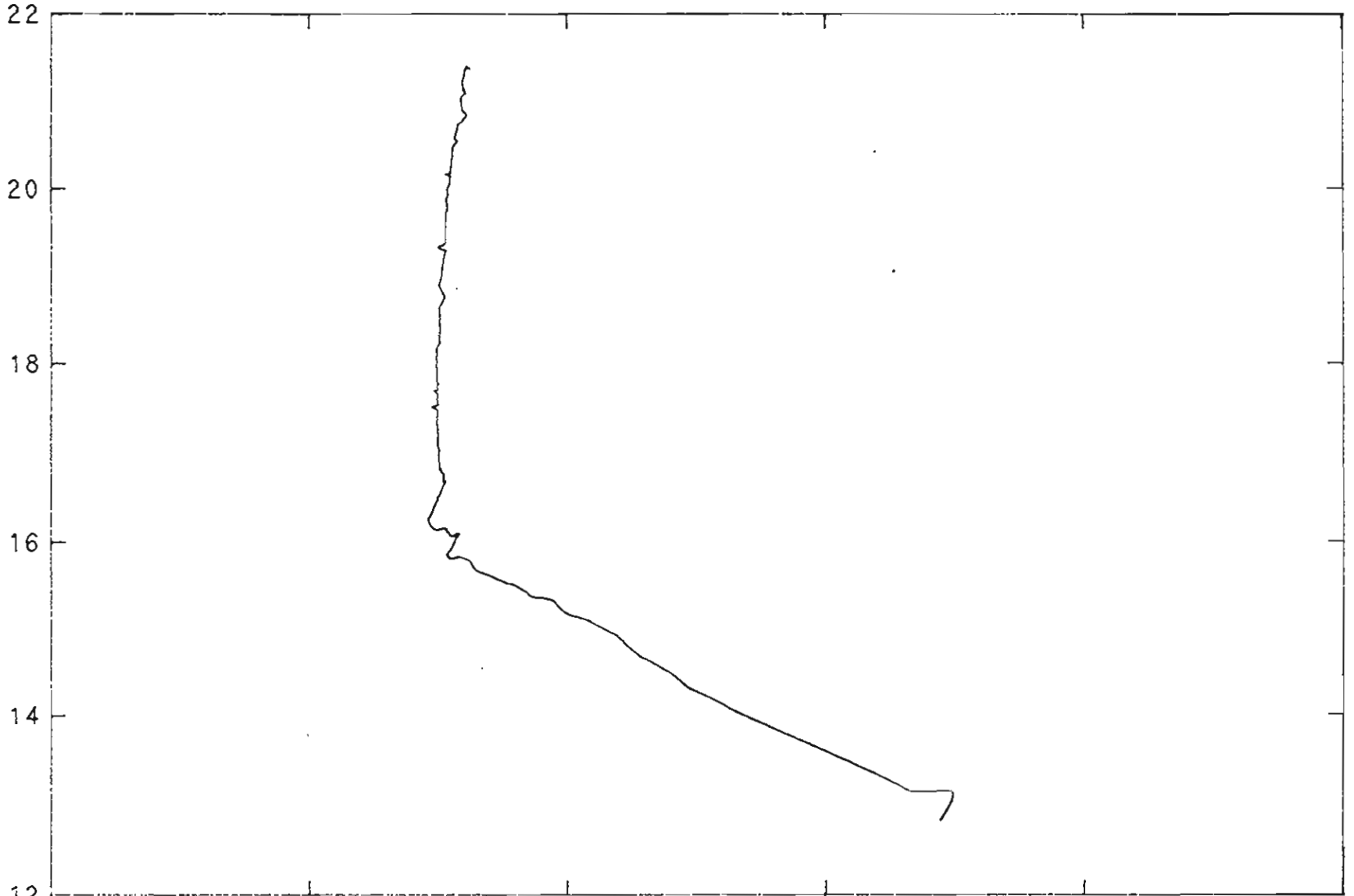
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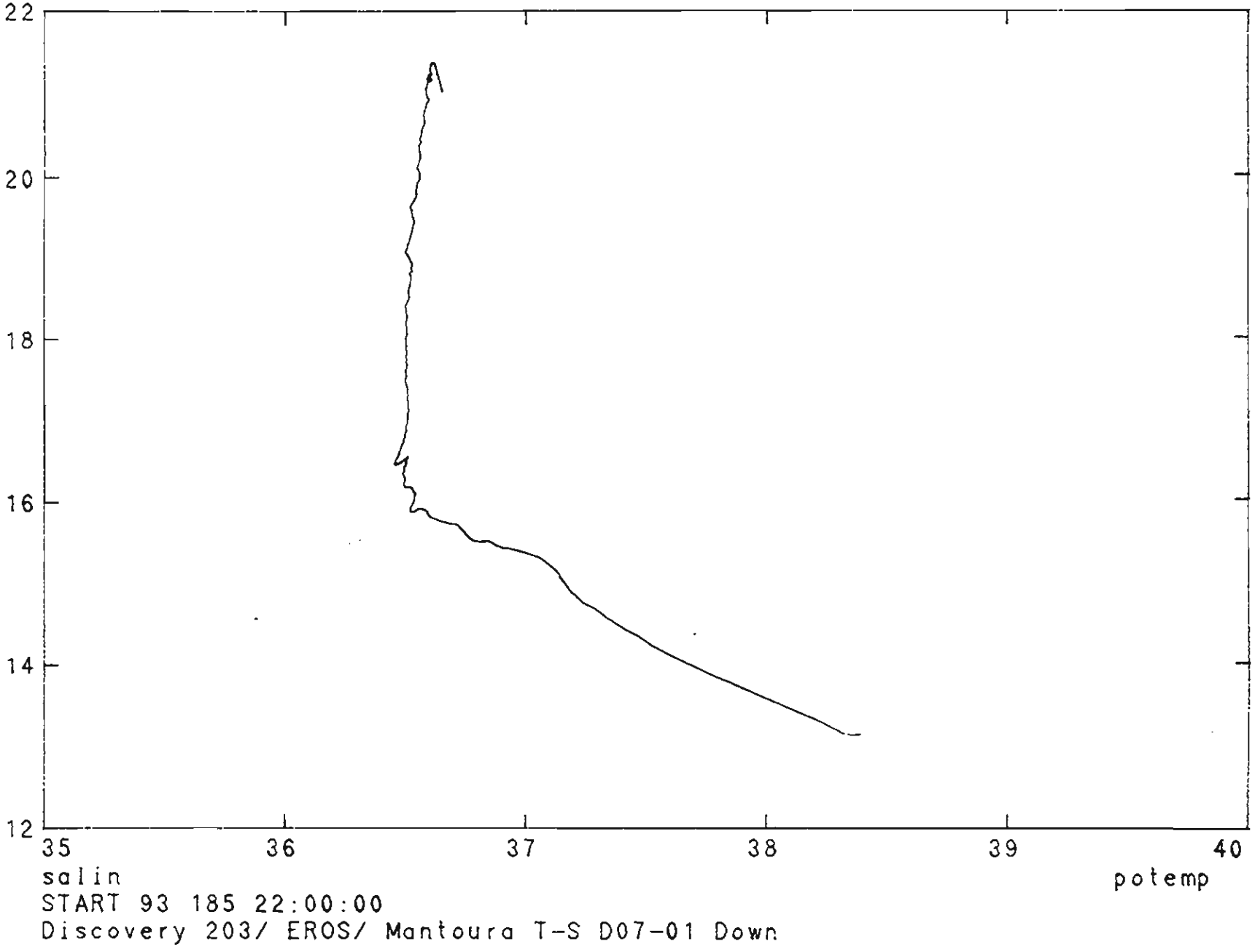
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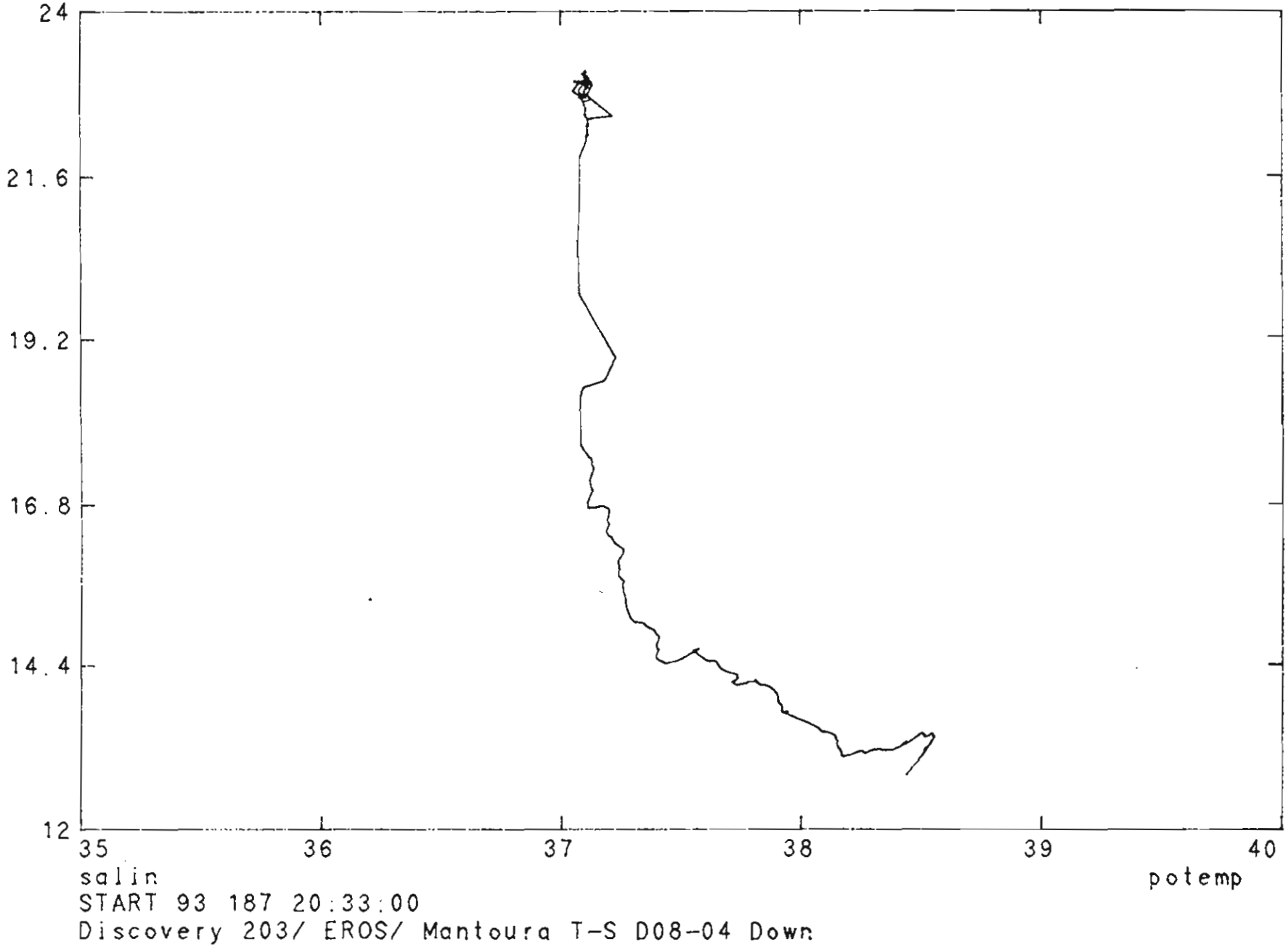
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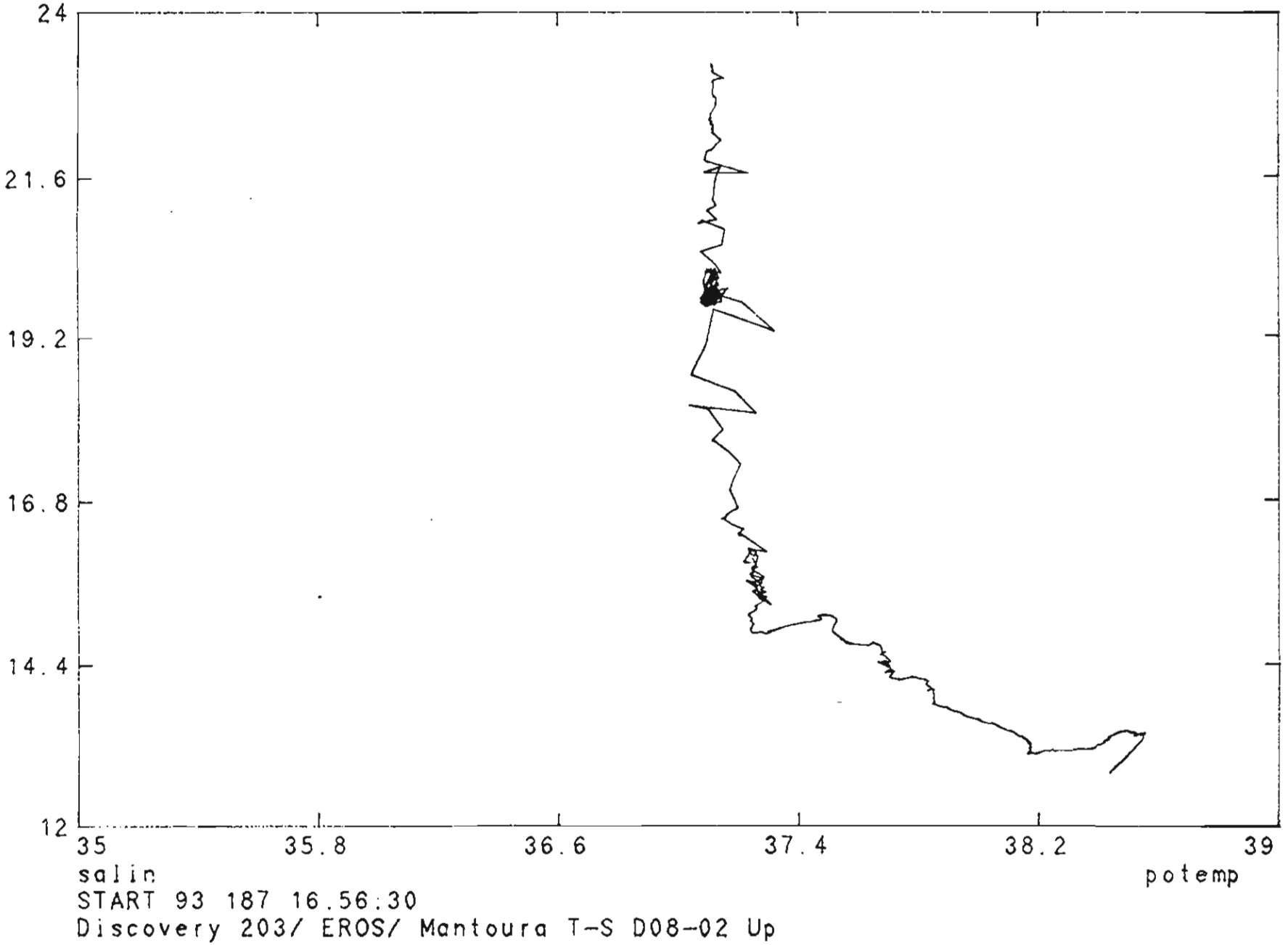
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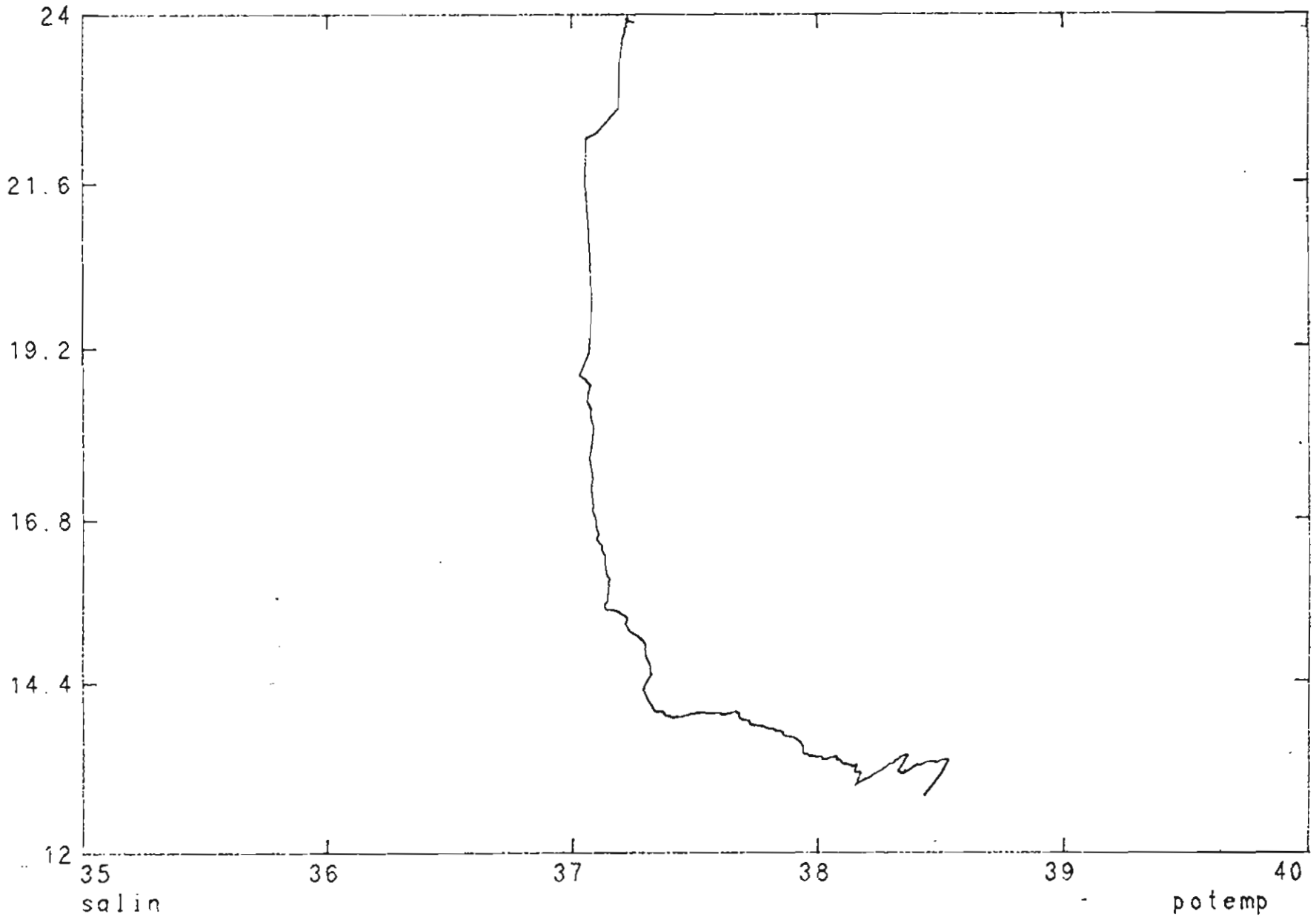
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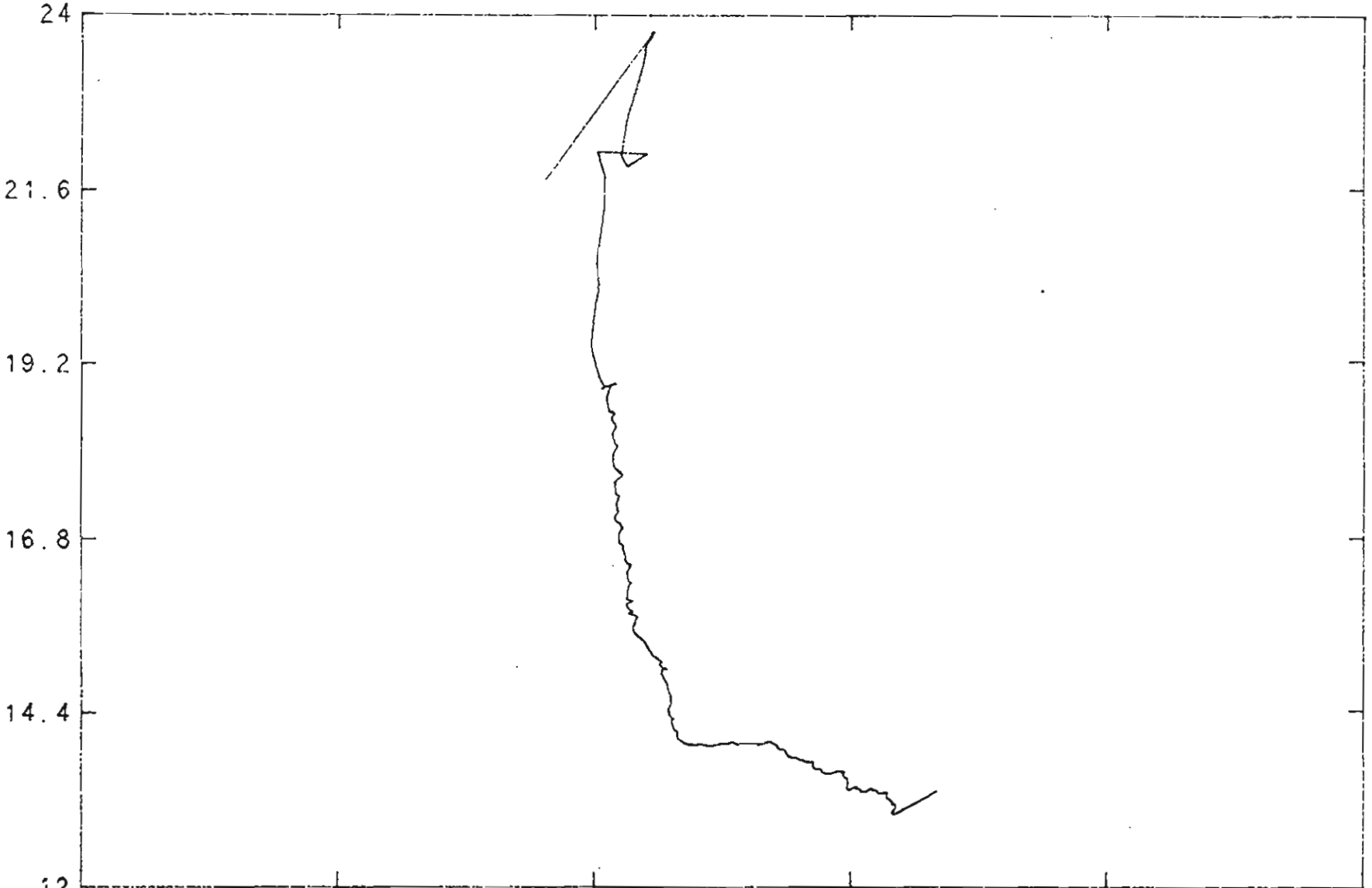
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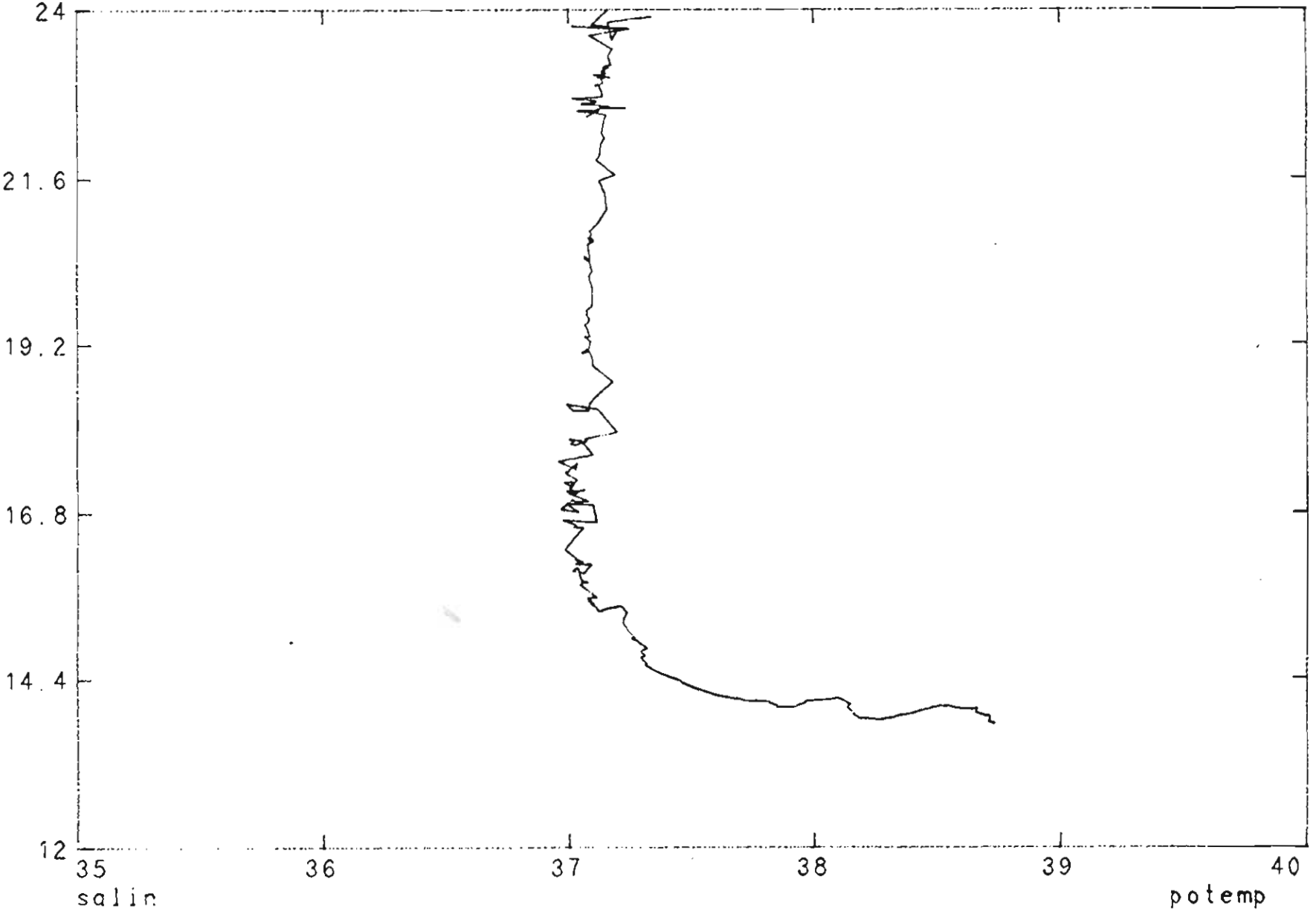
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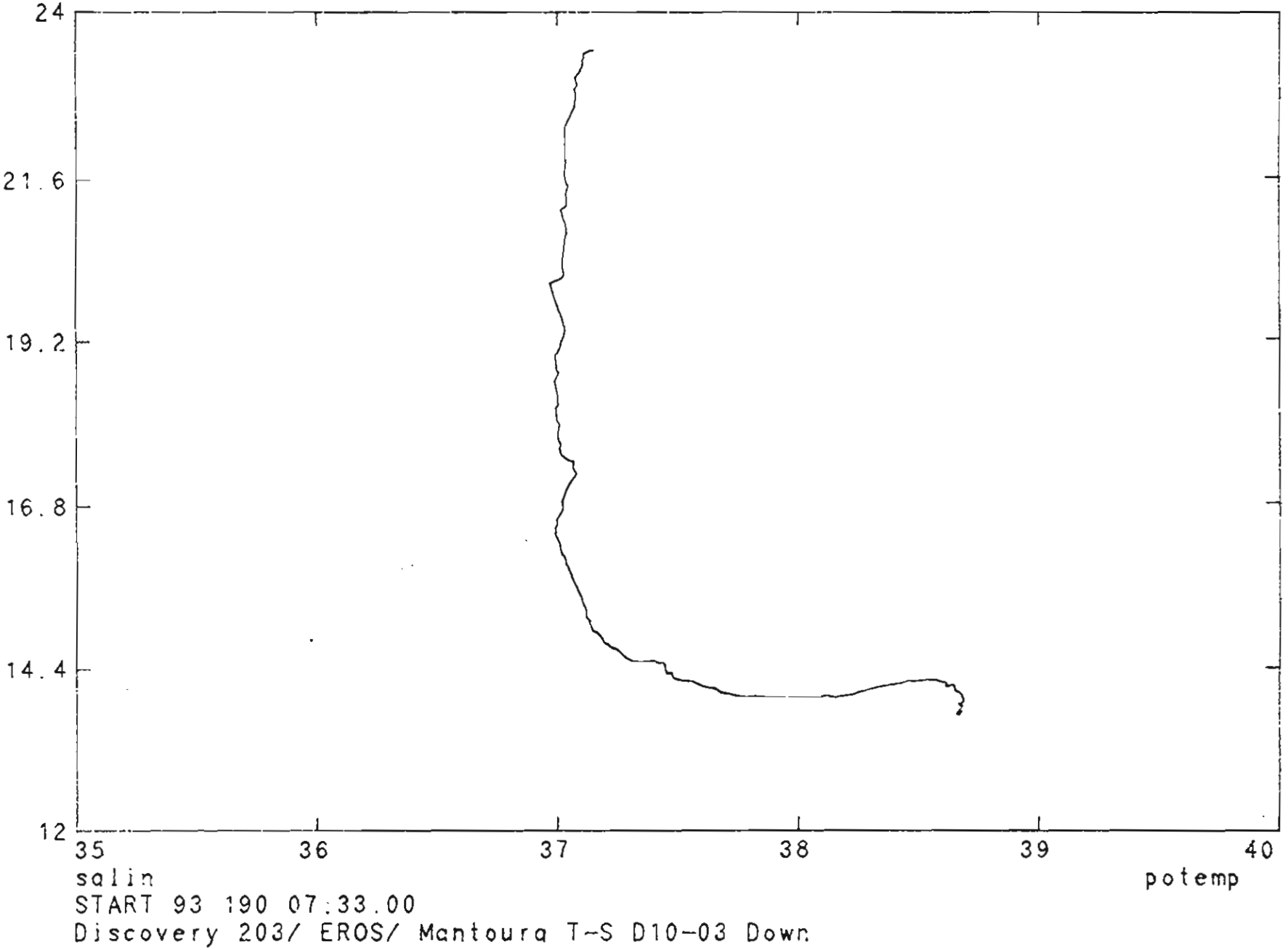
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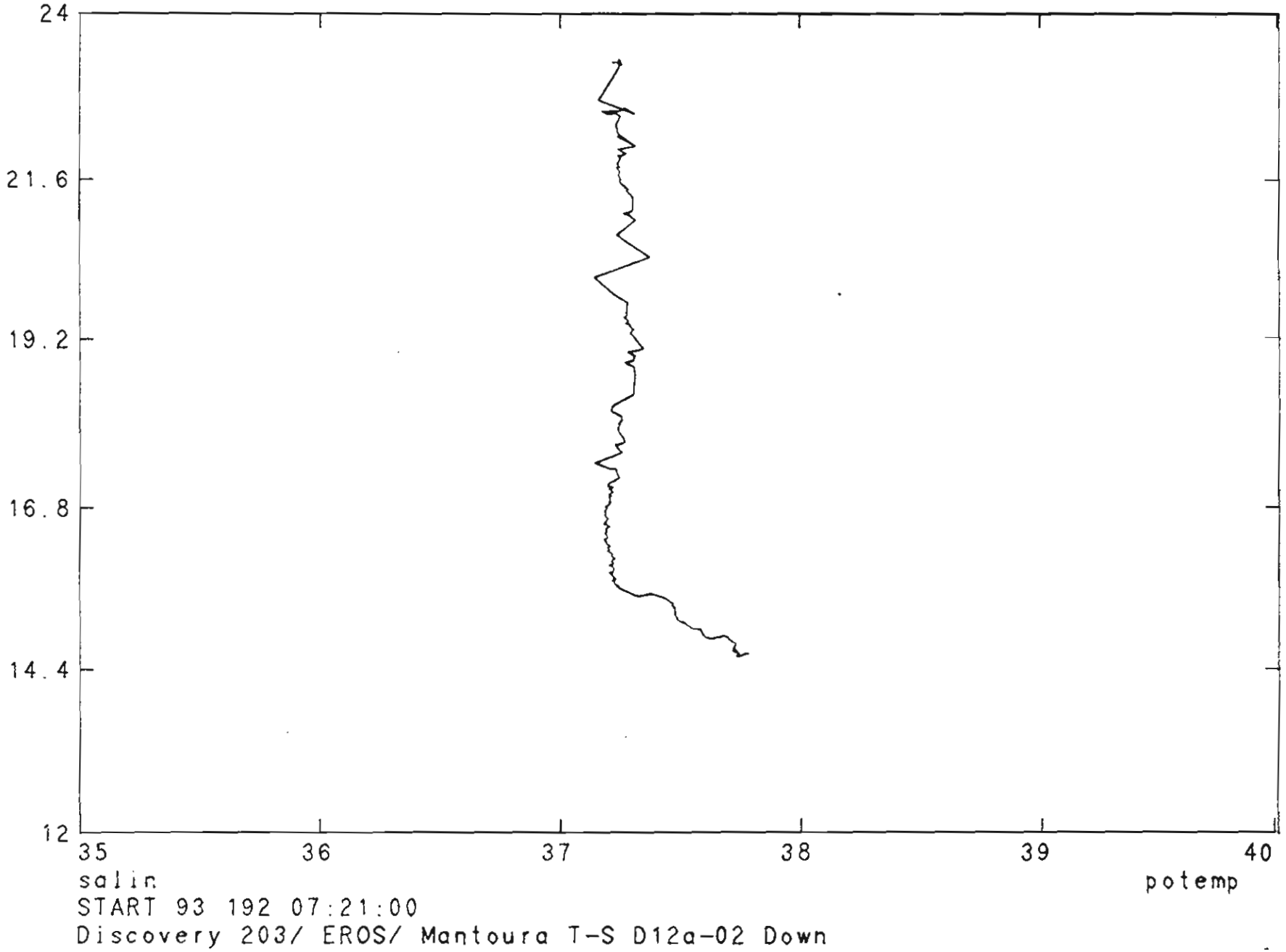
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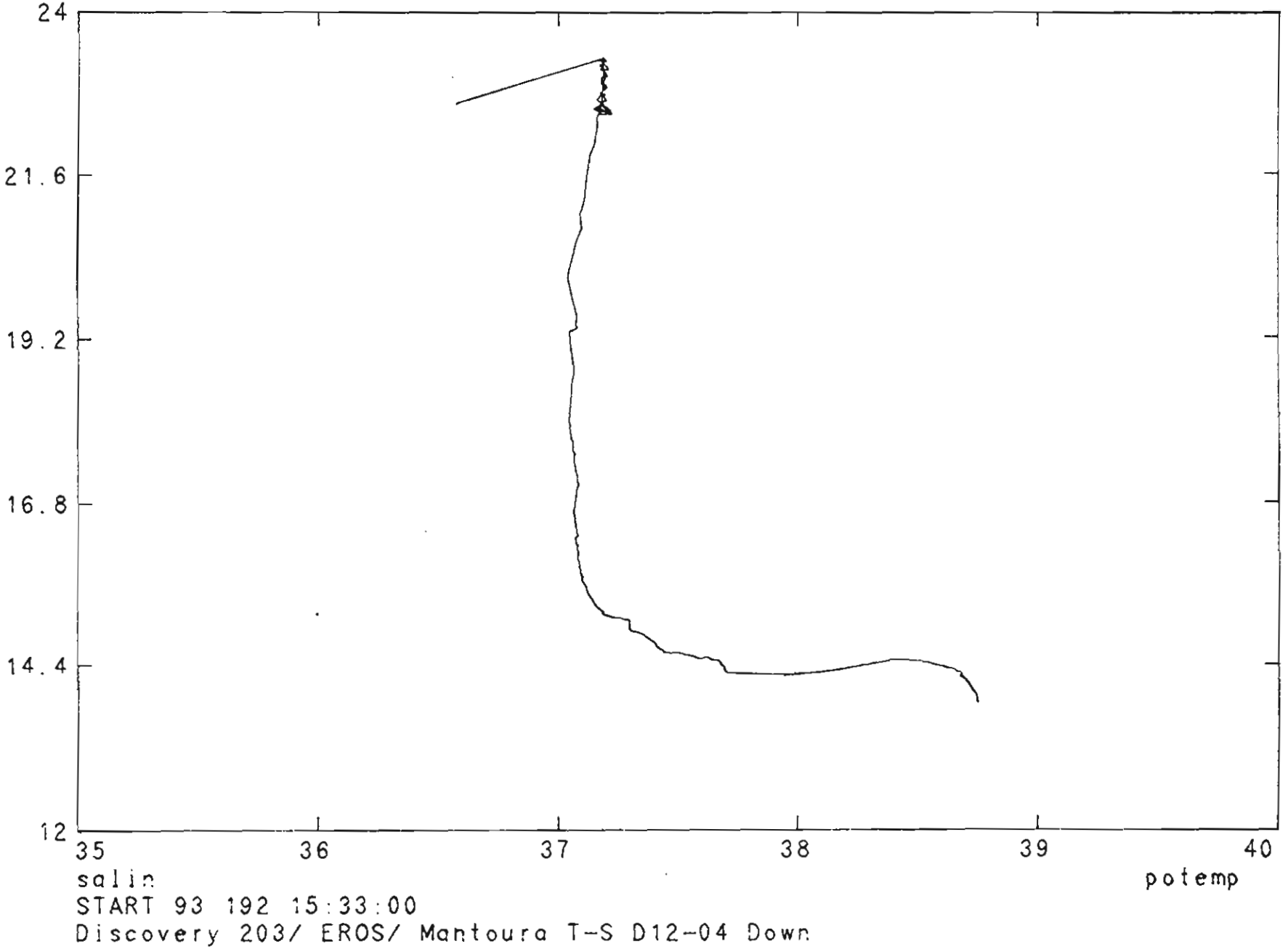
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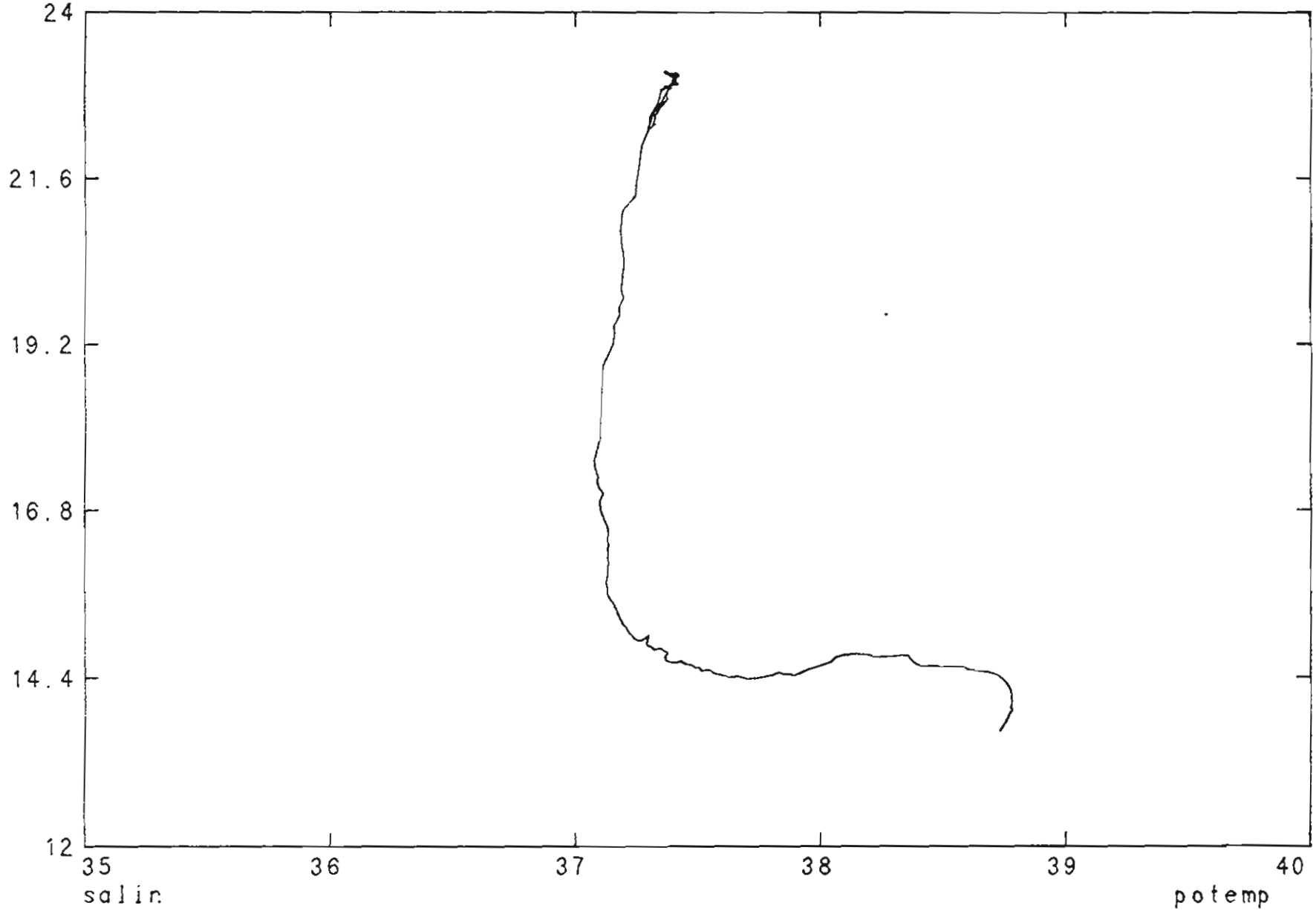
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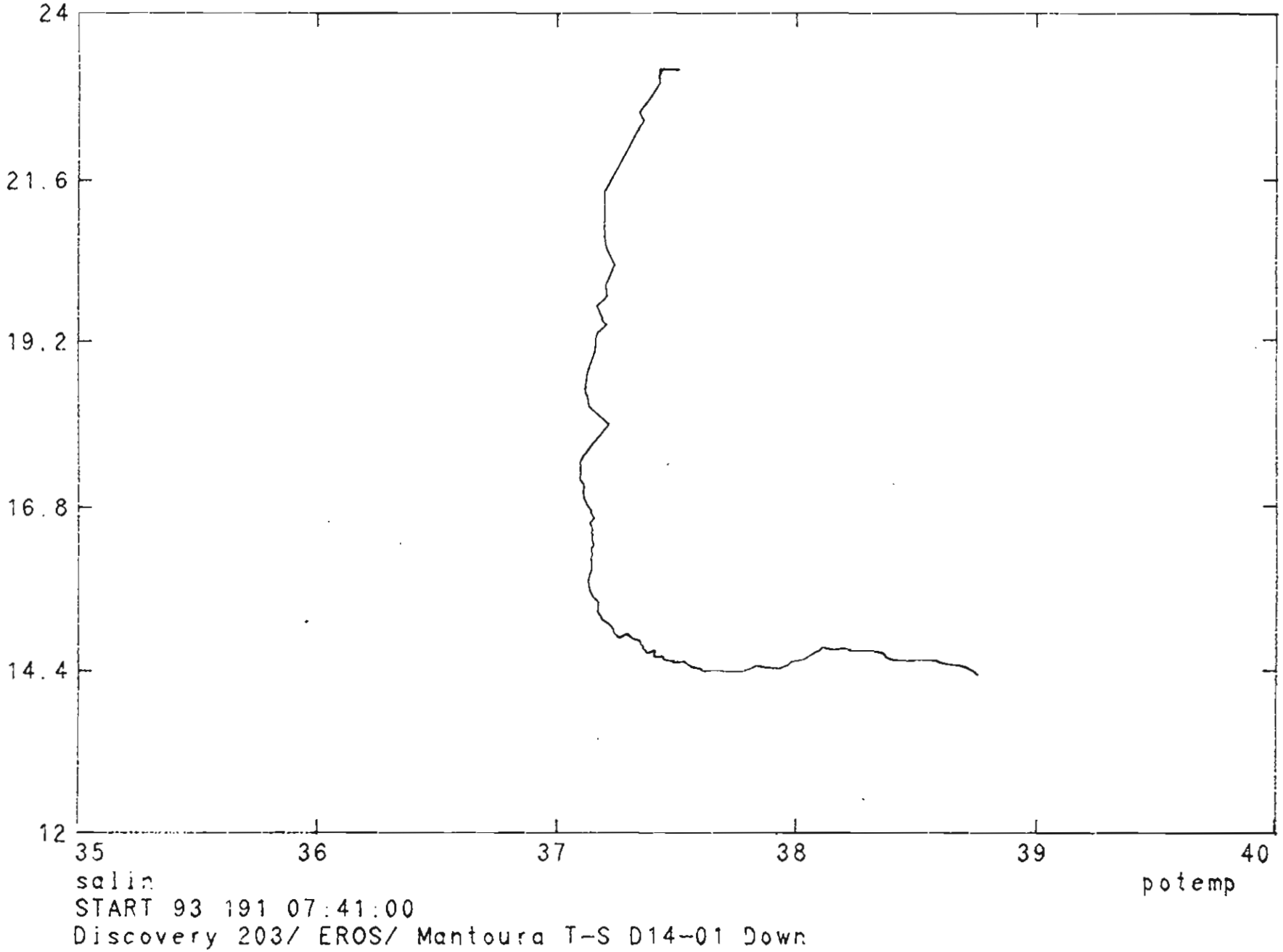
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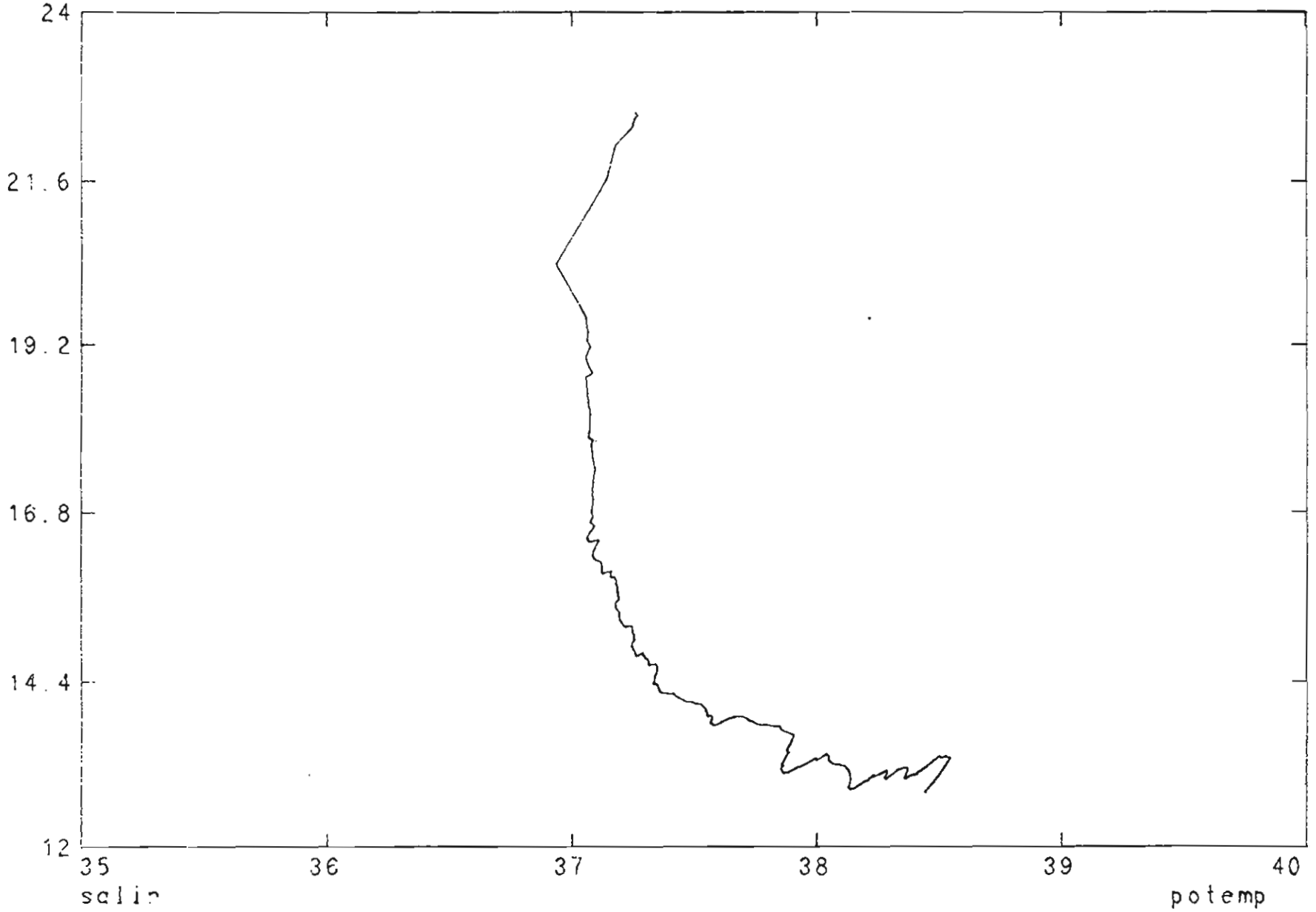
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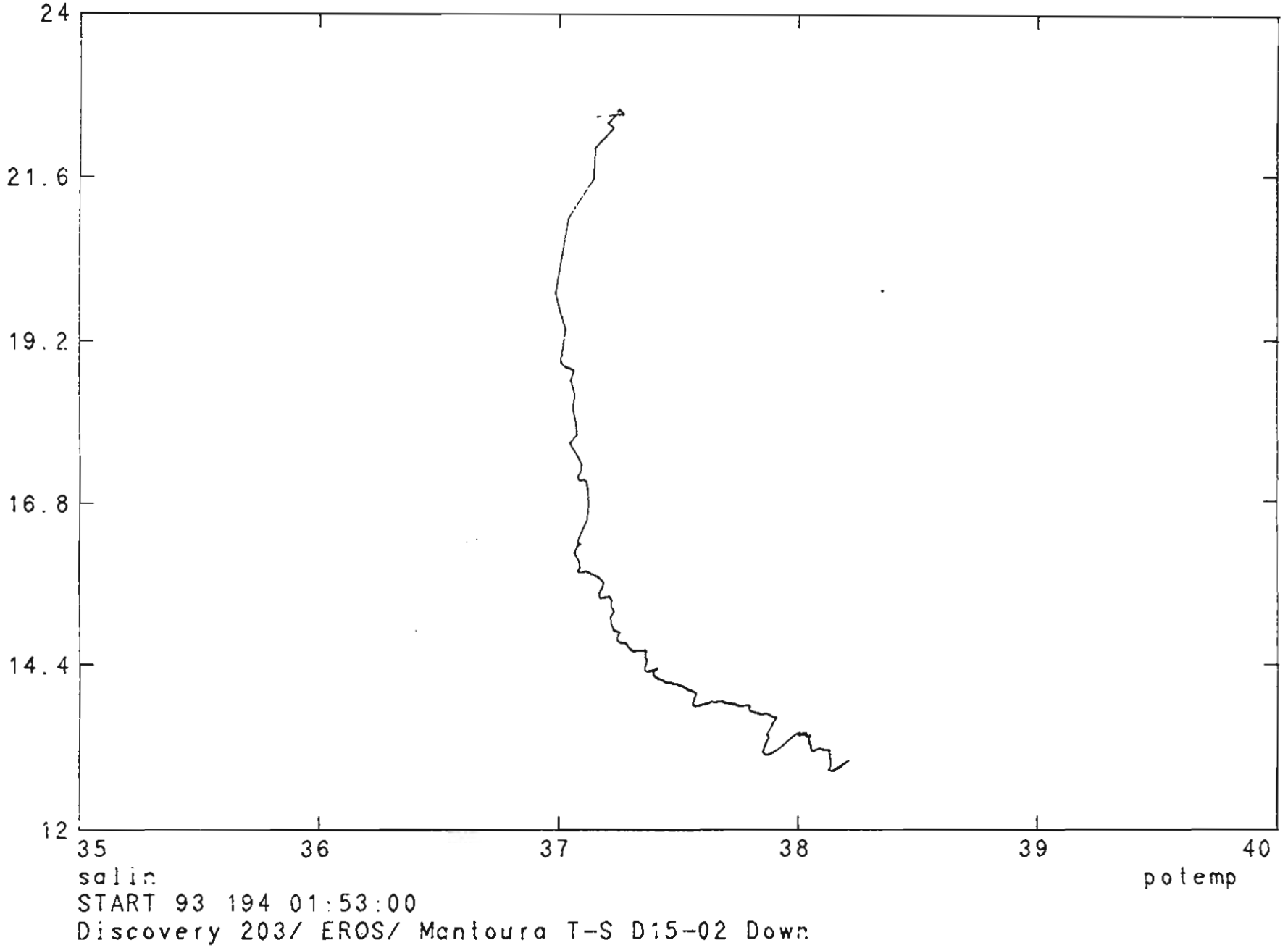
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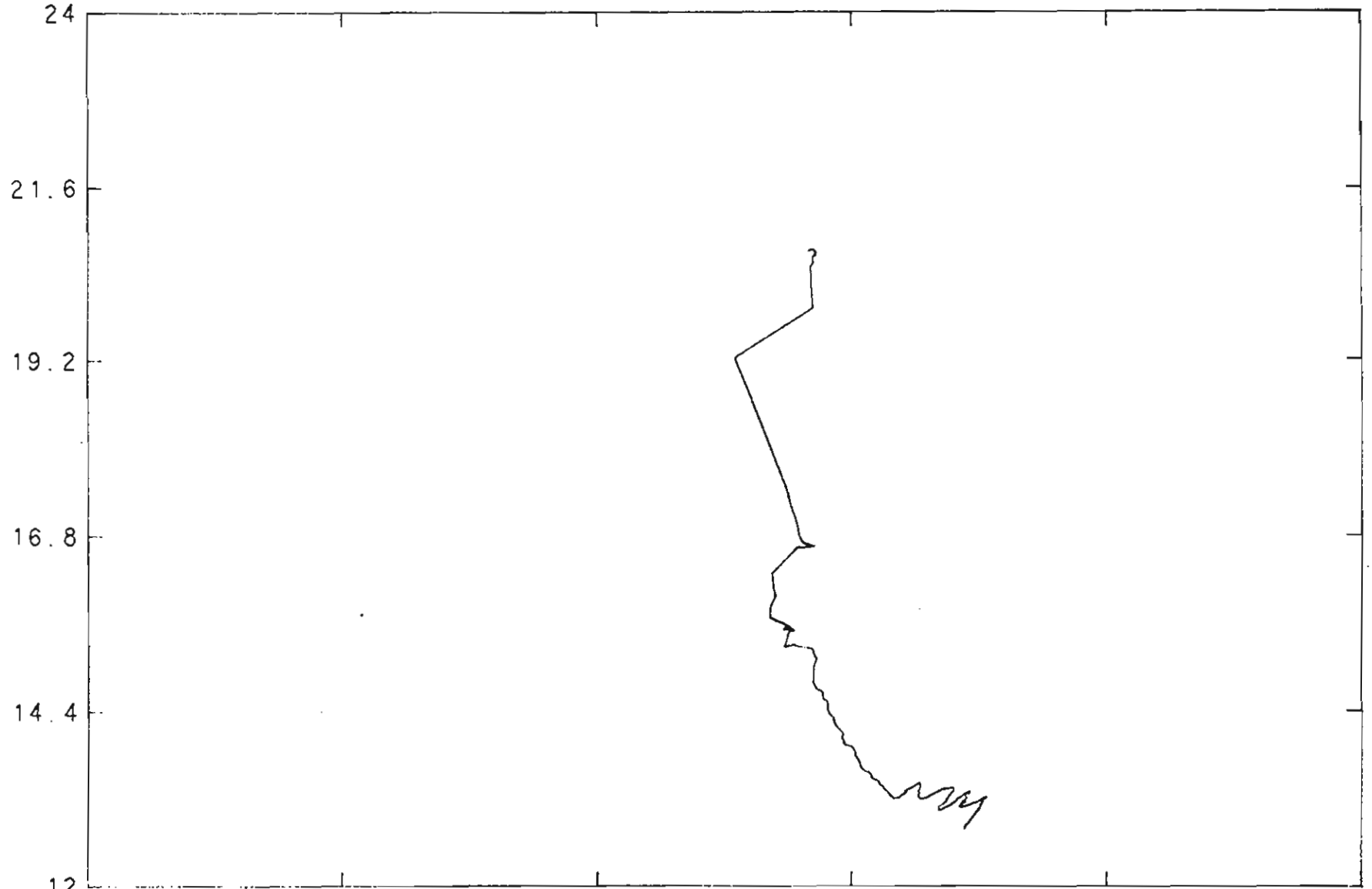
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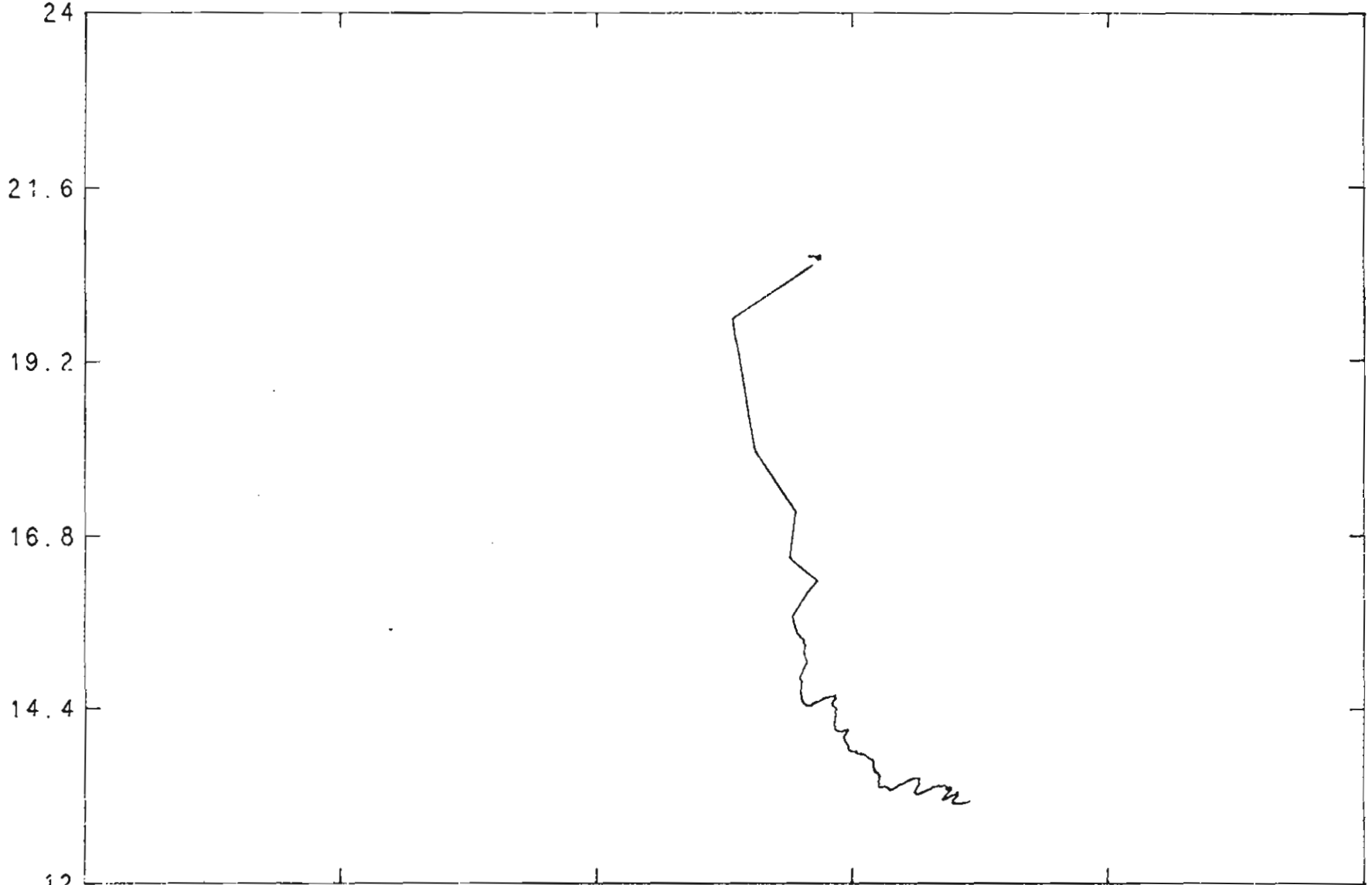
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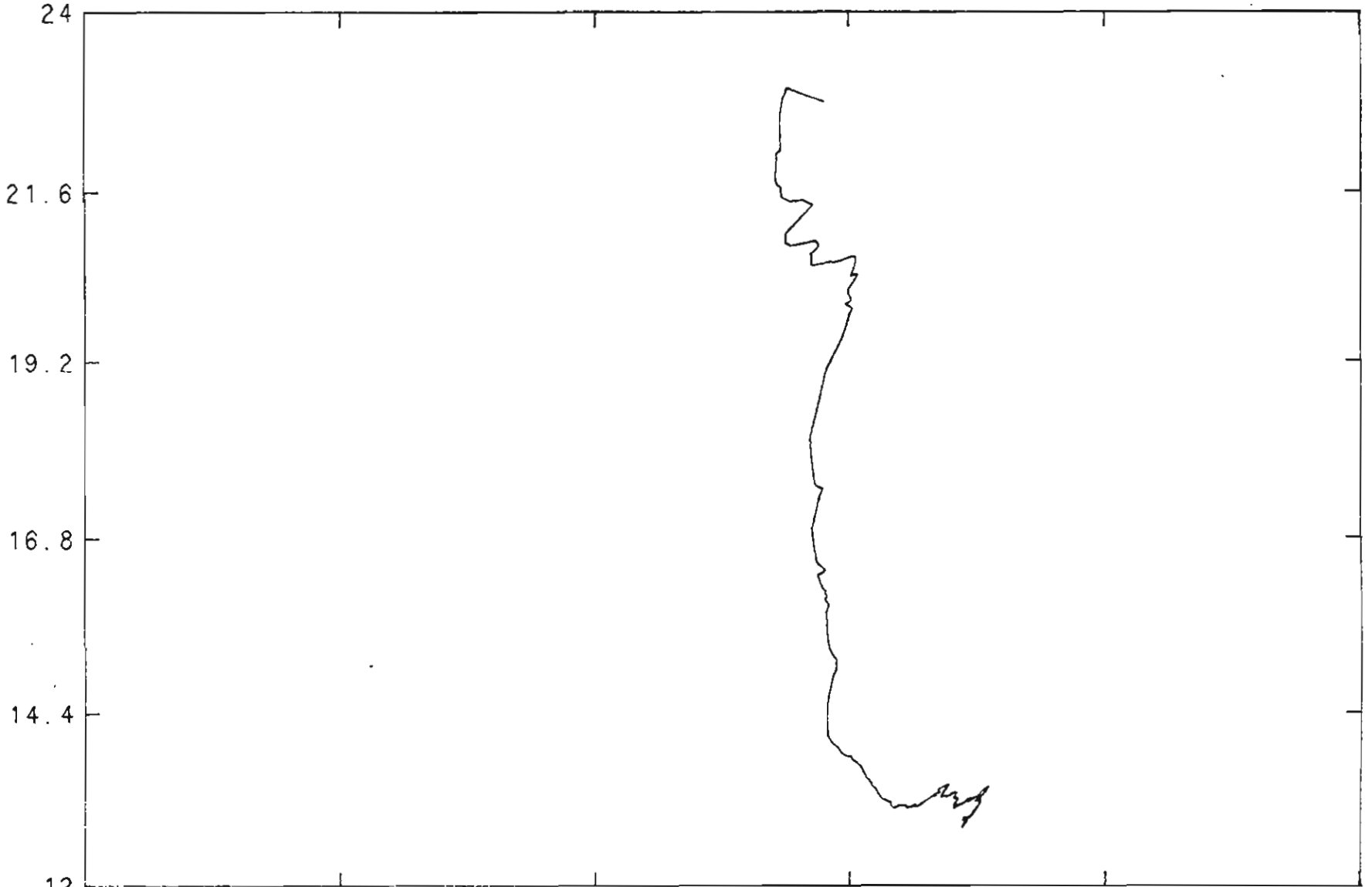
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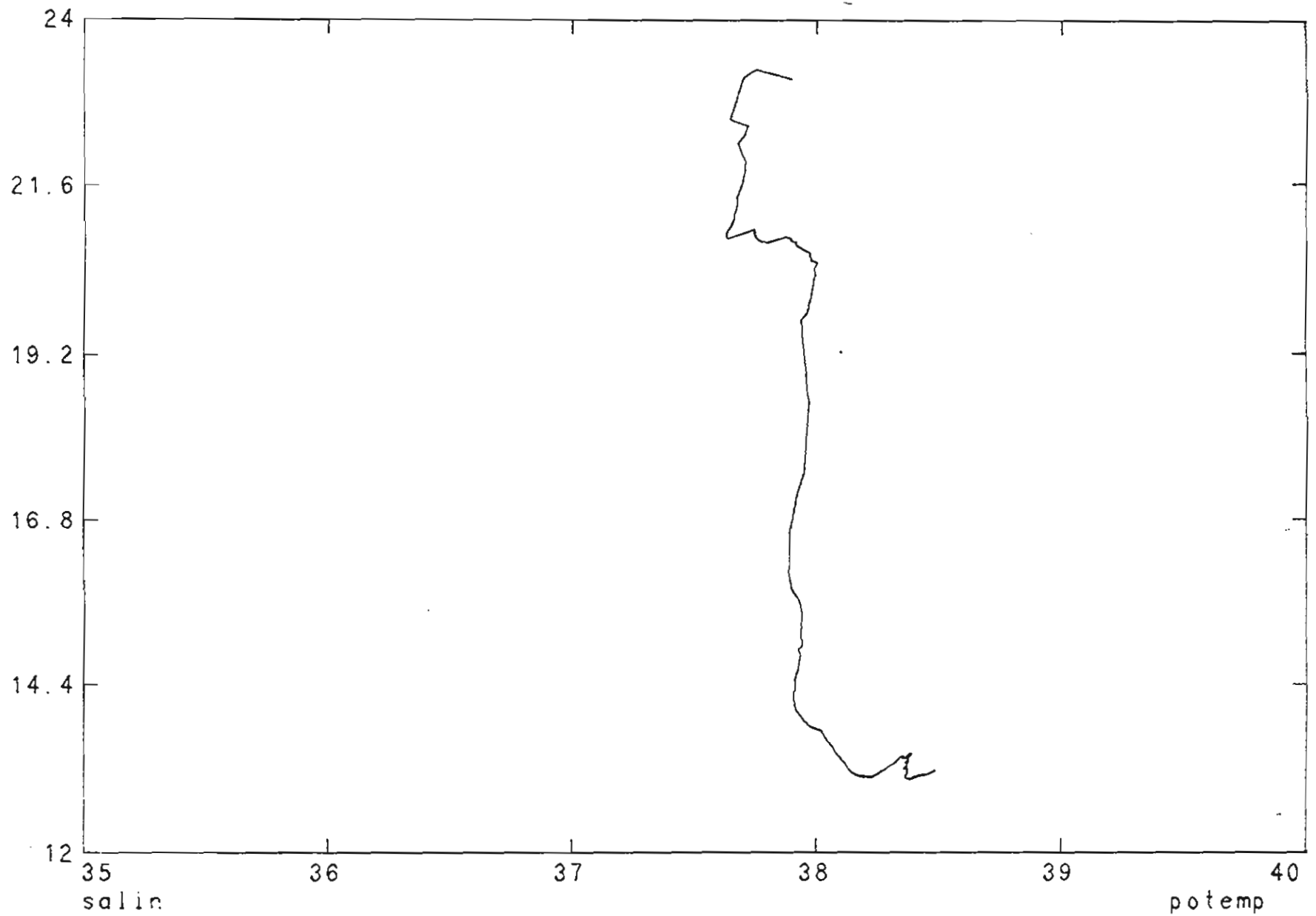
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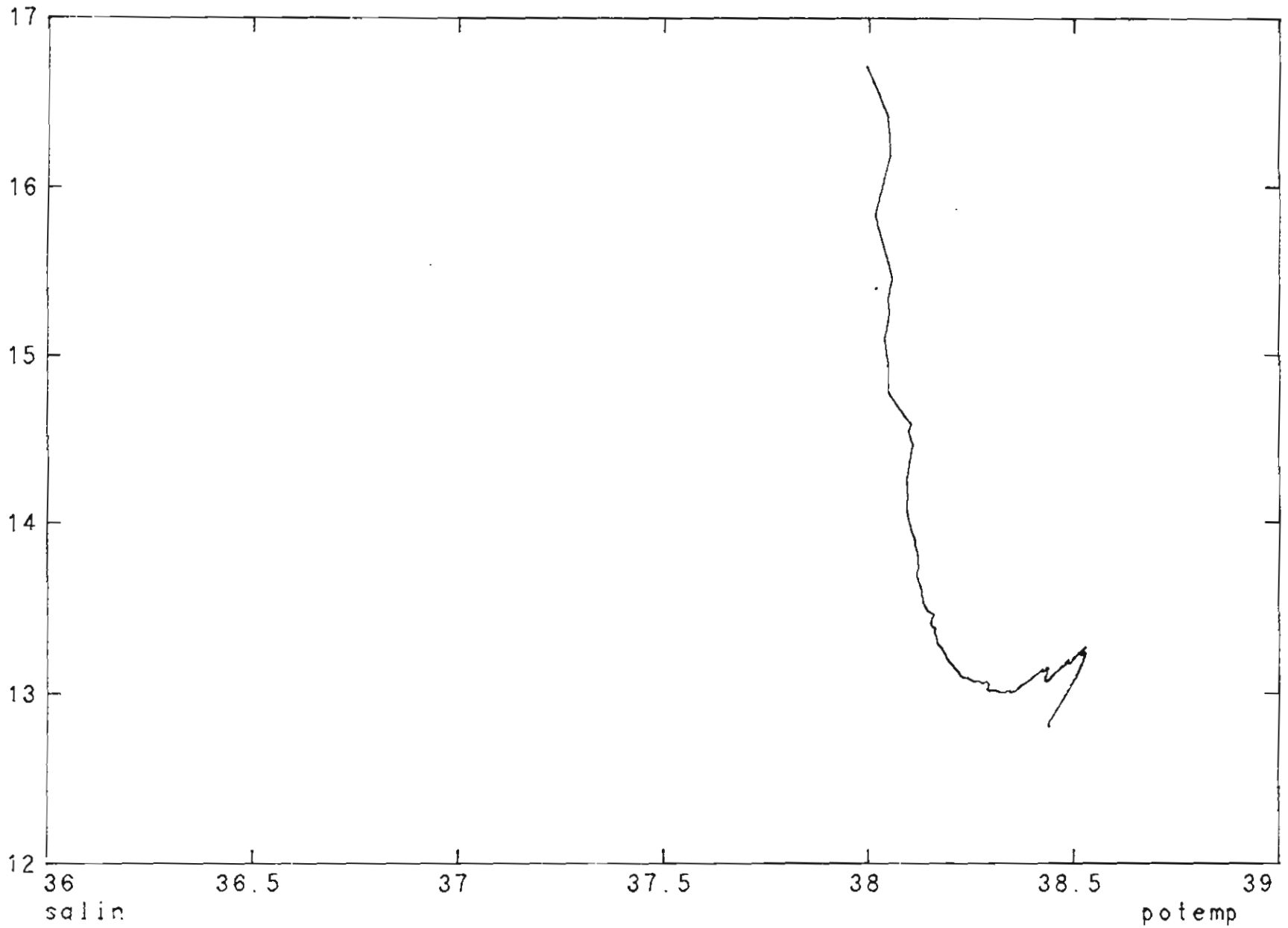
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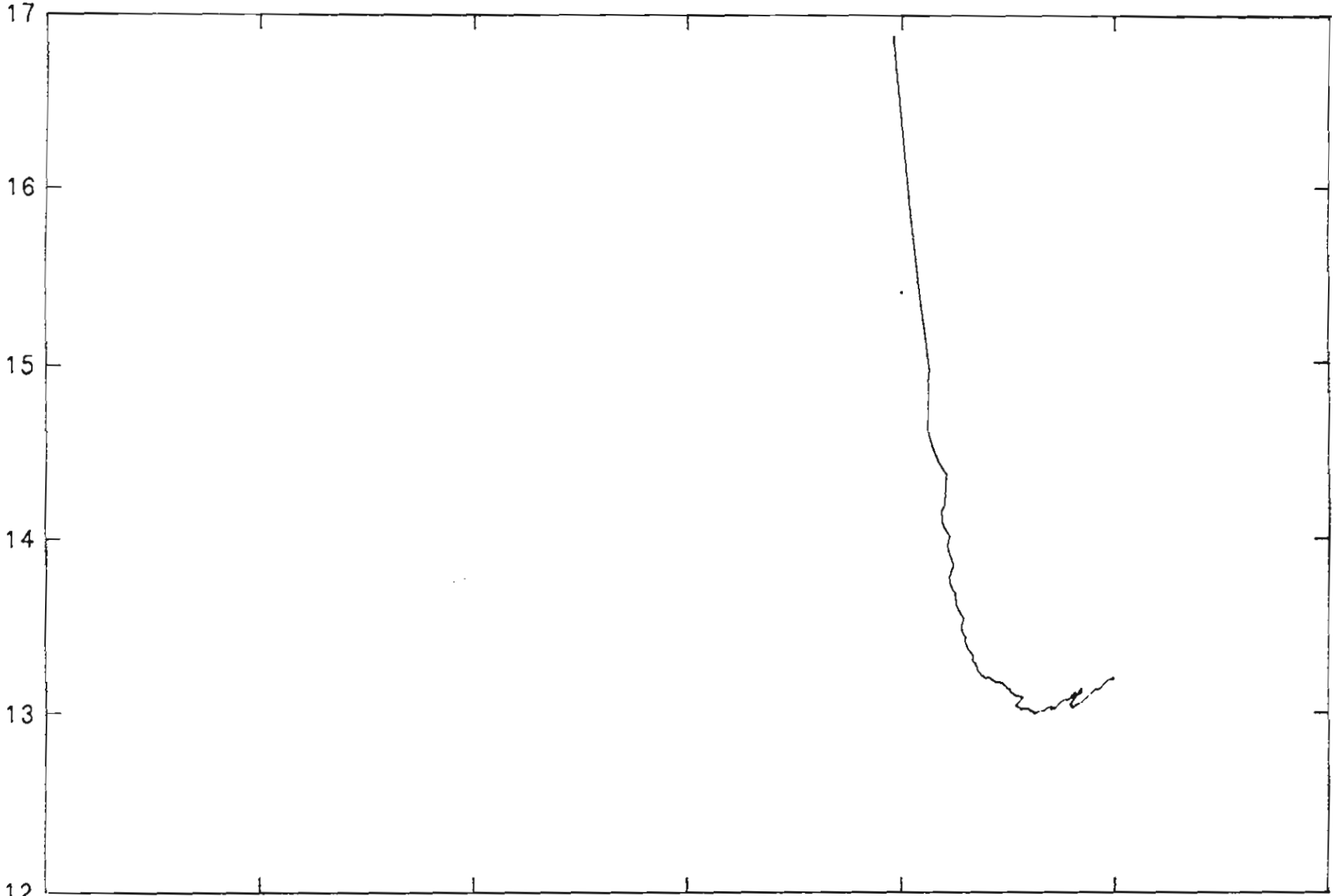
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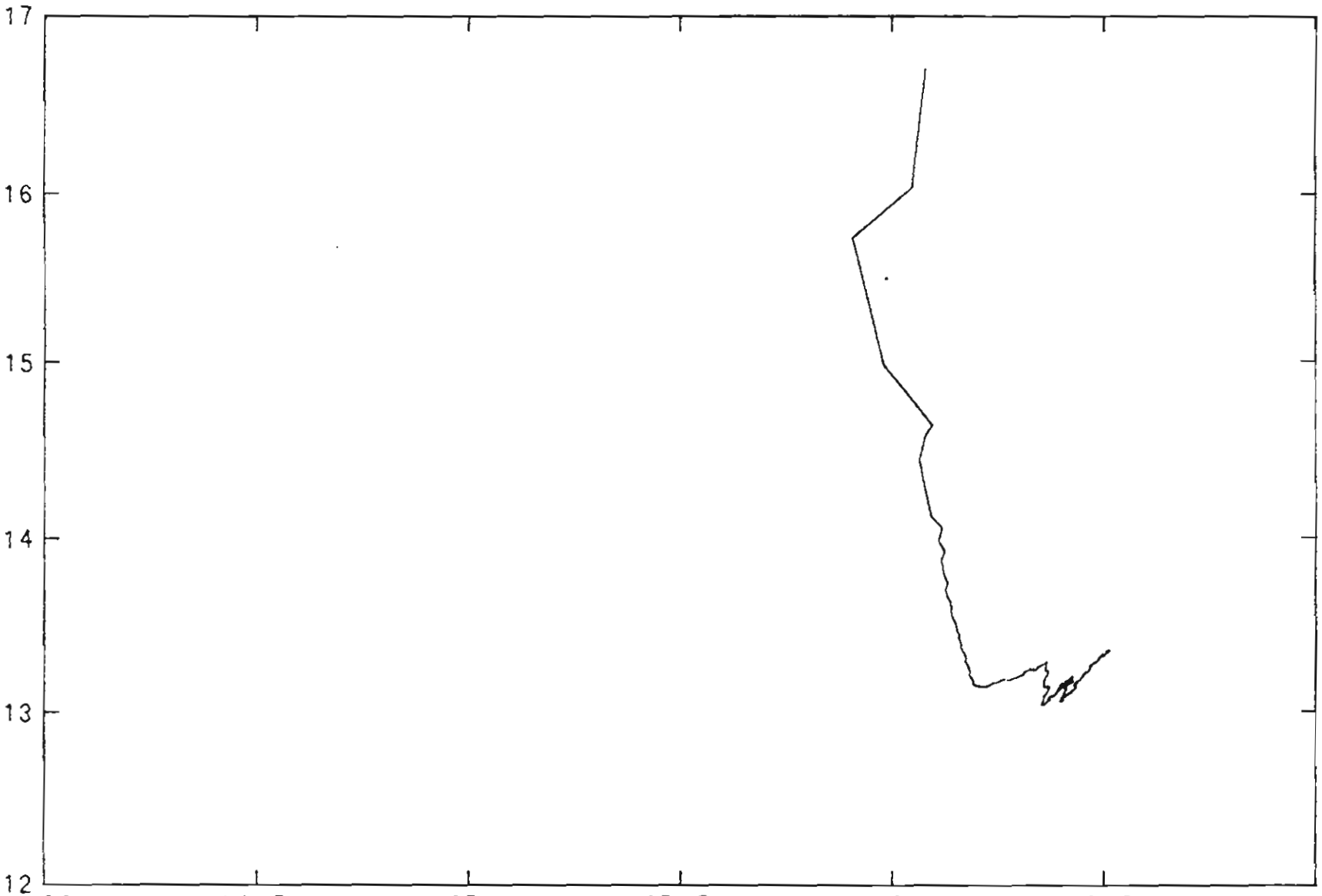
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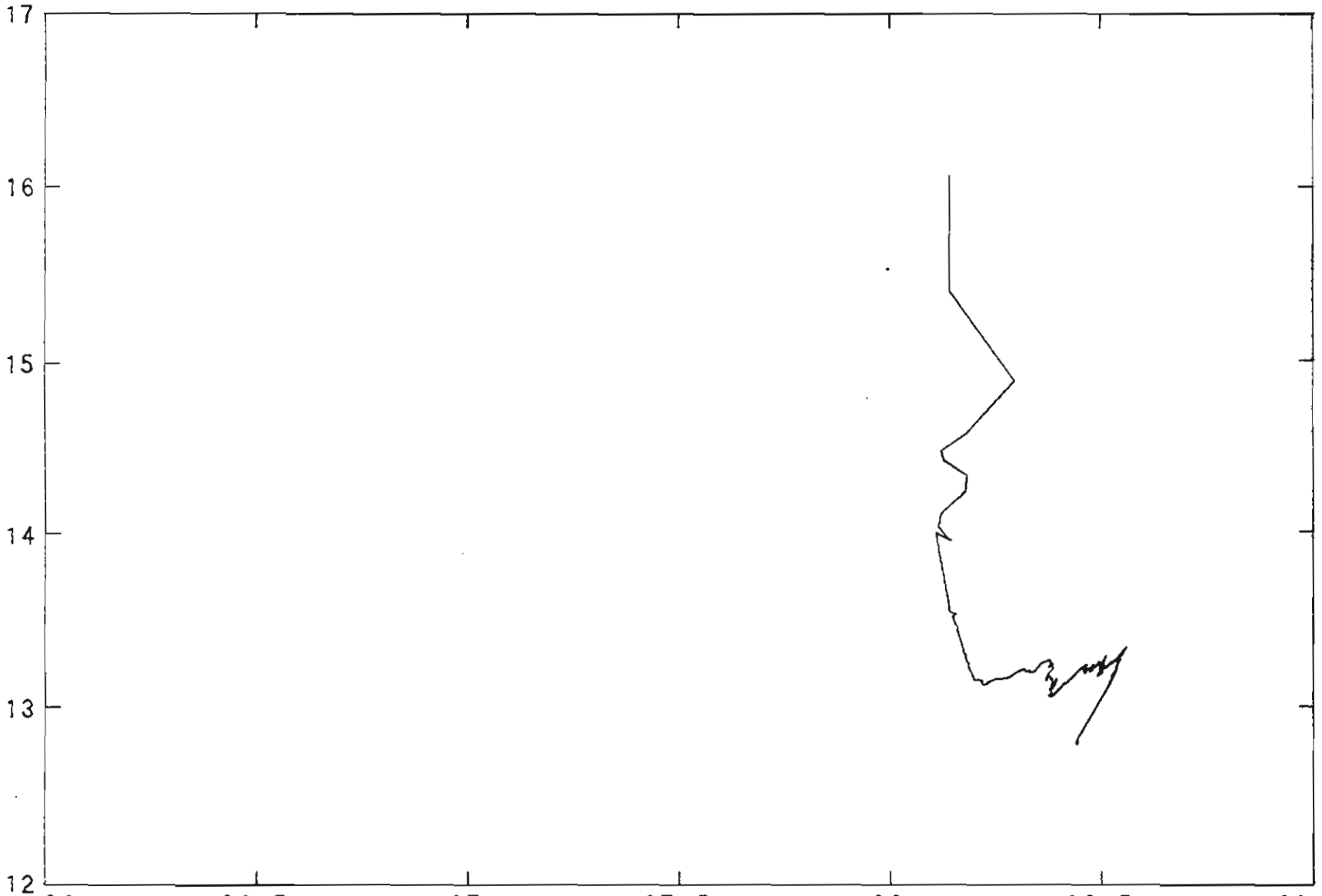
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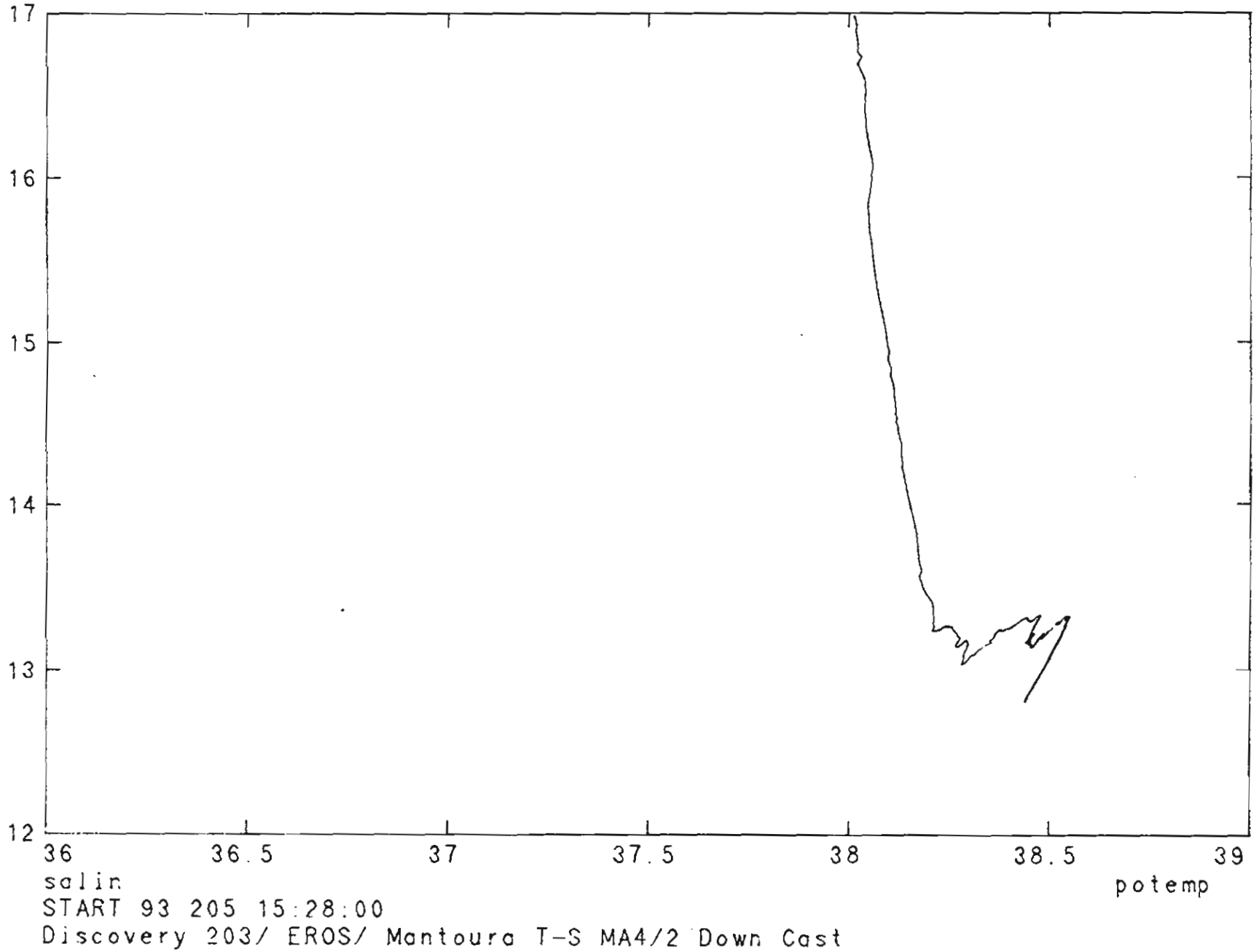
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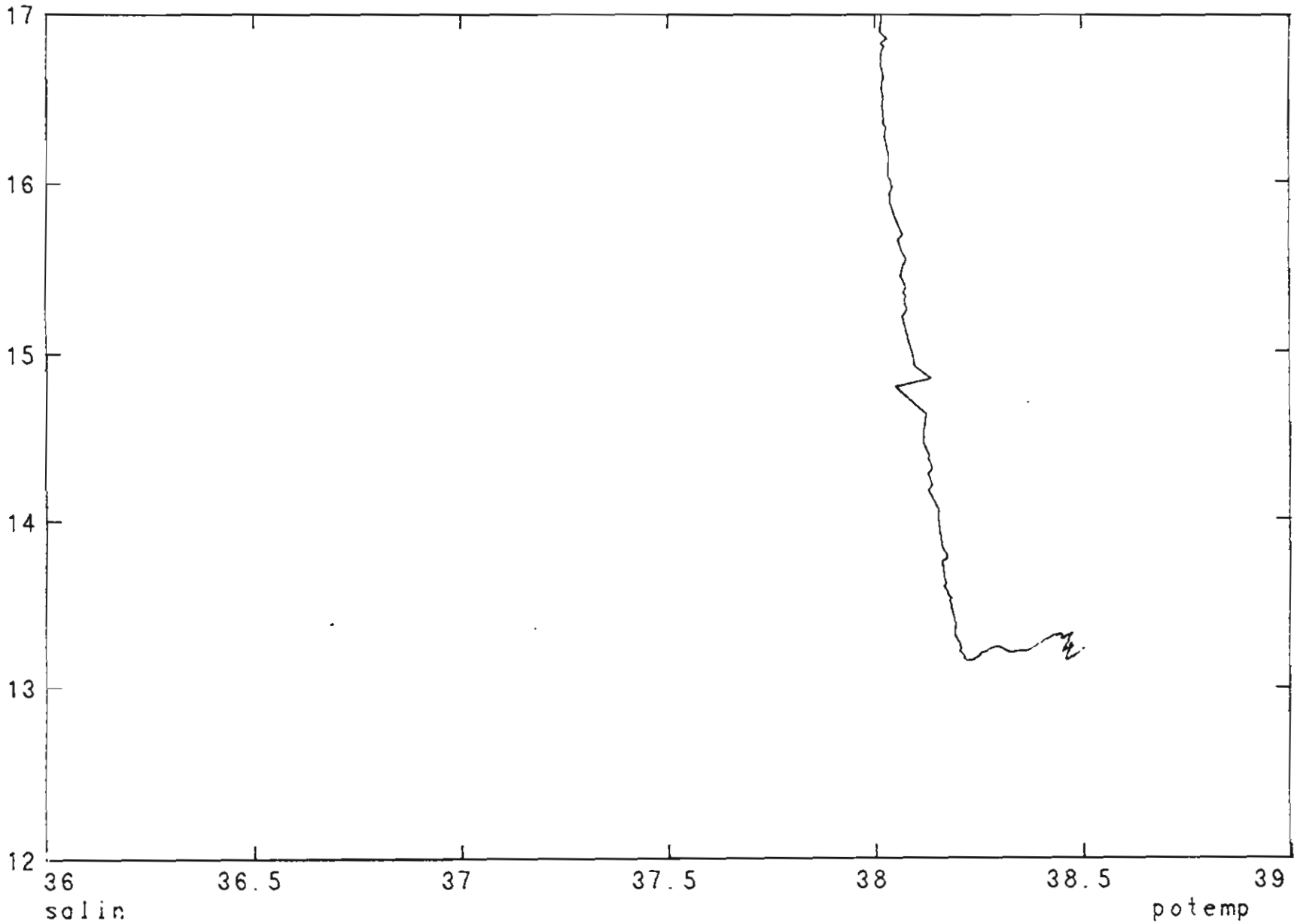
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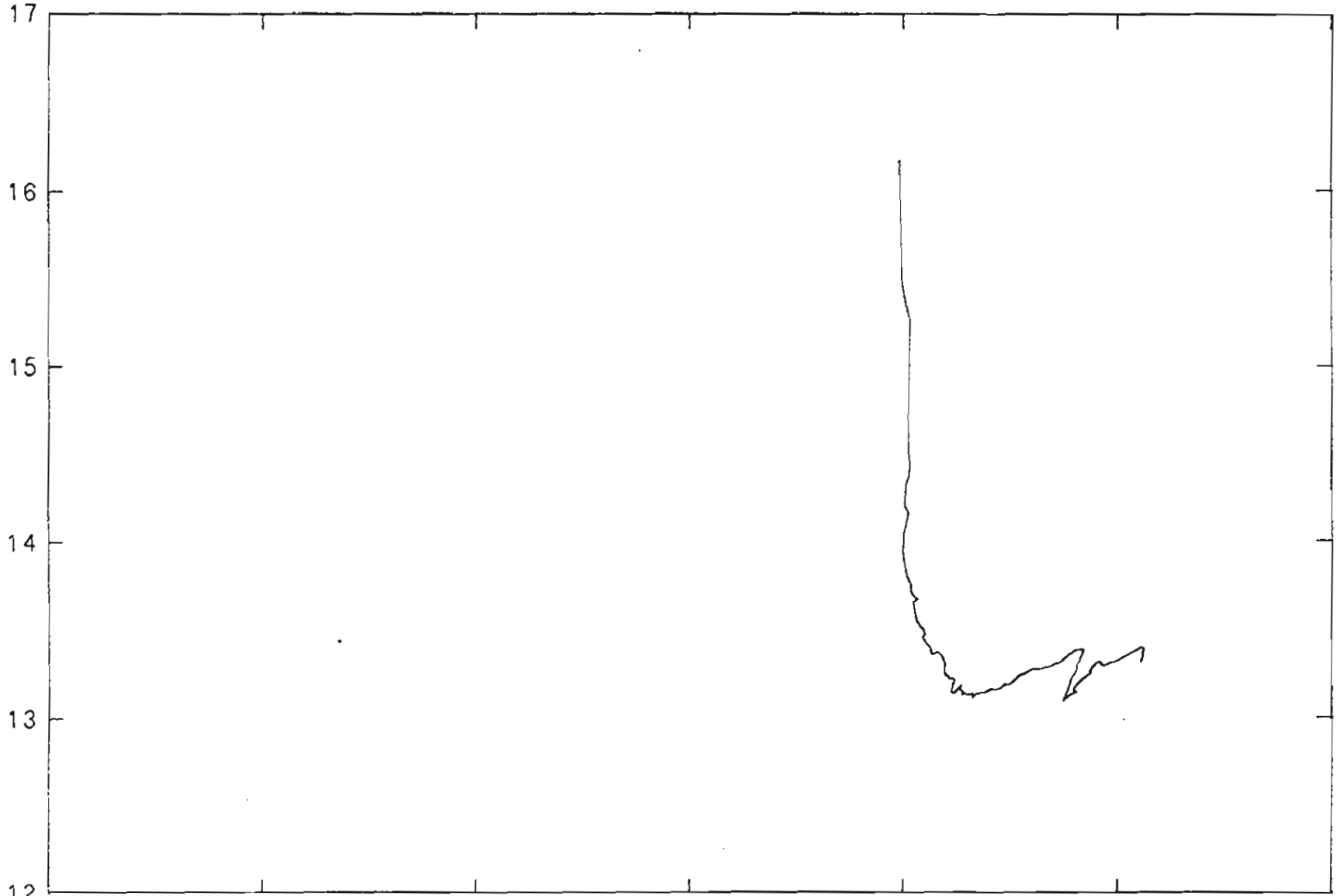
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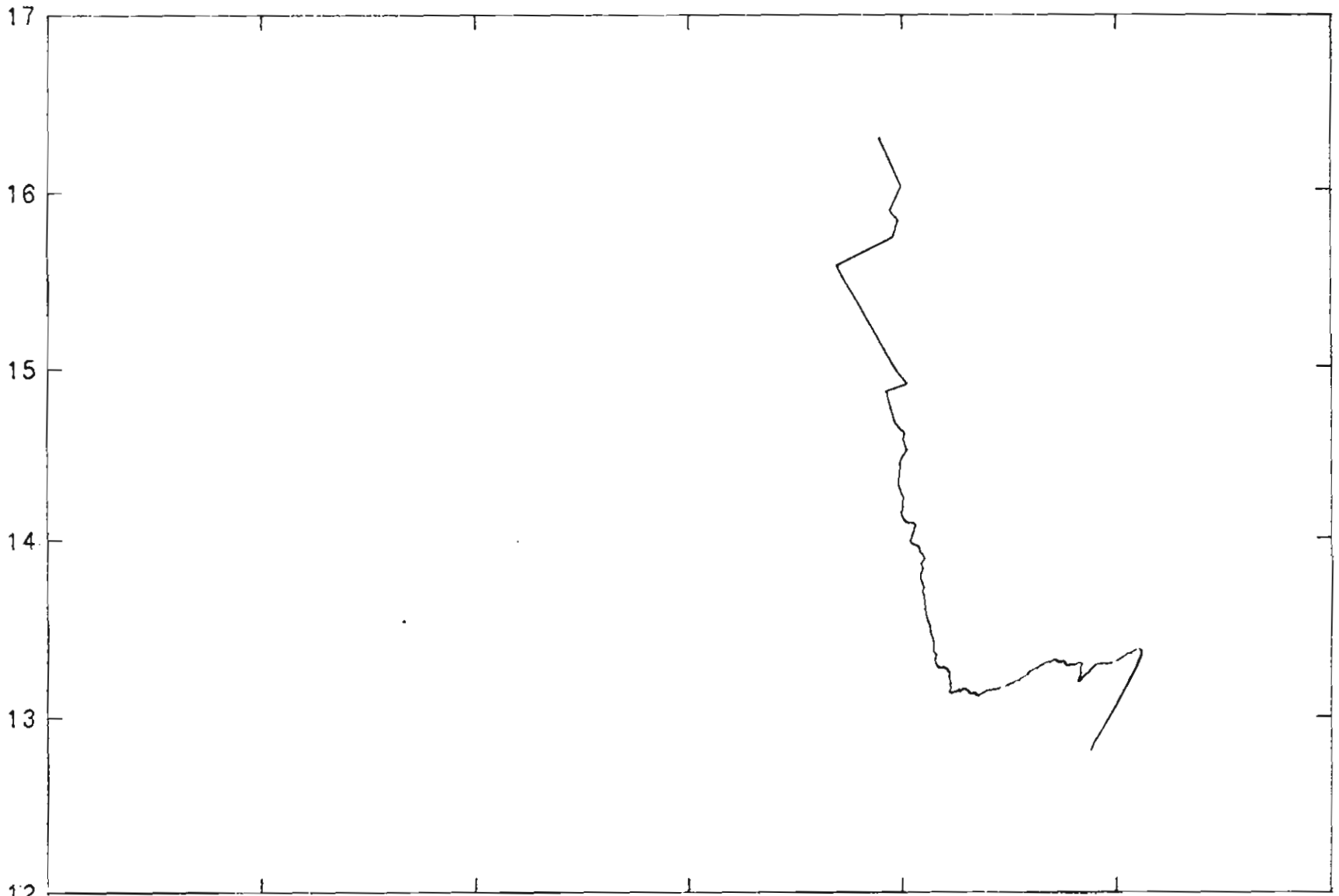
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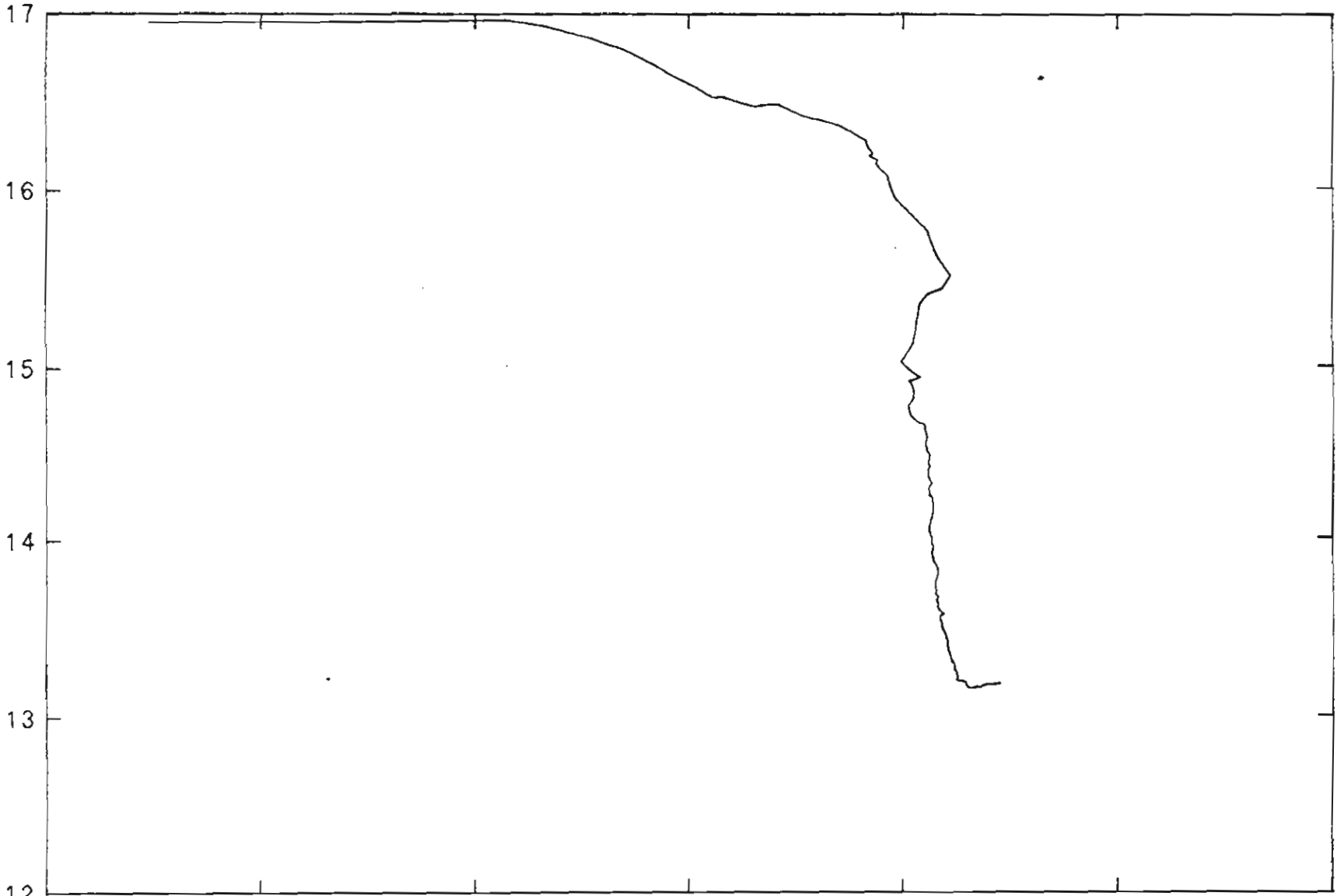
Discovery 203/ EROS/ Mantoura T-S MA5/6 Down Cast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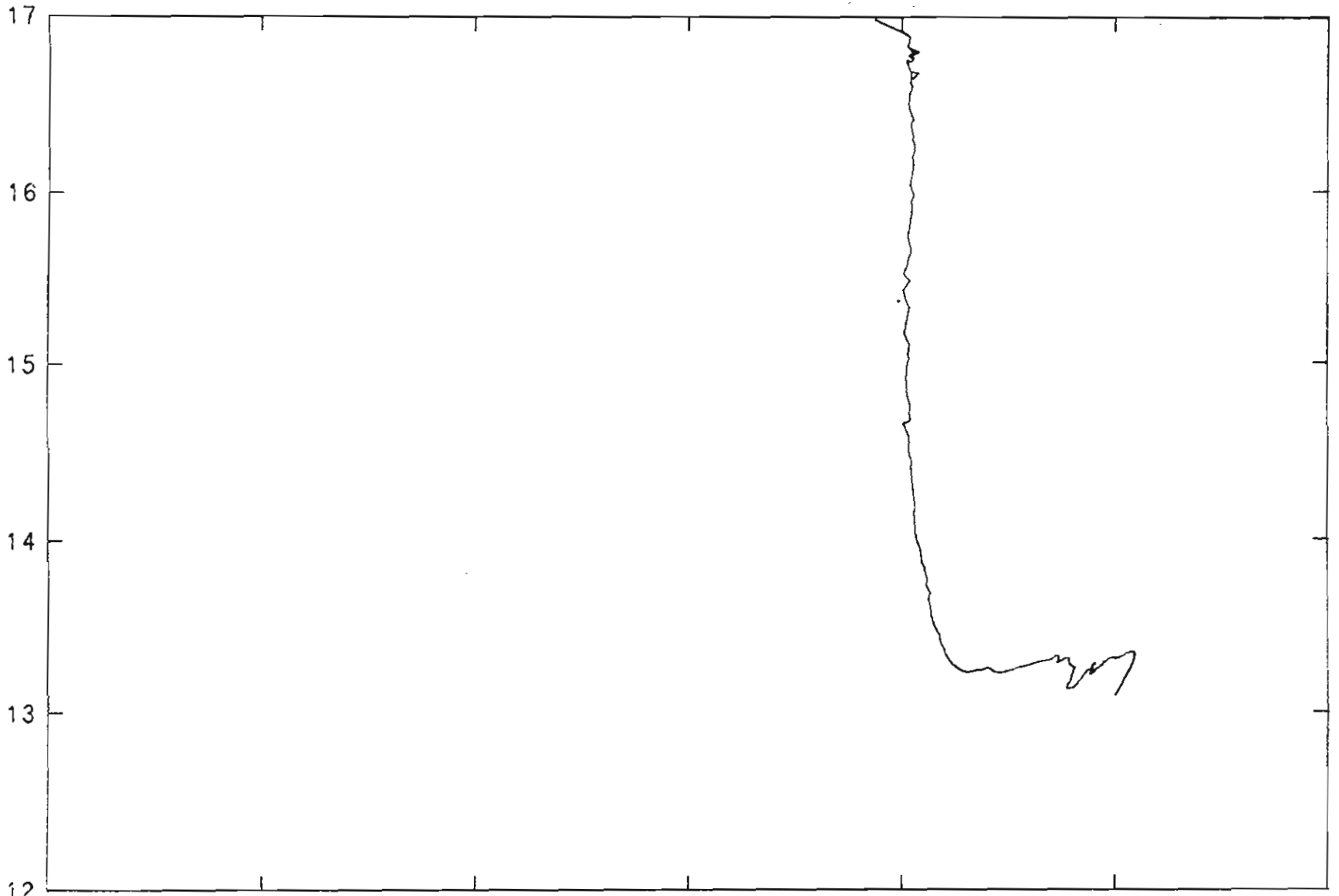
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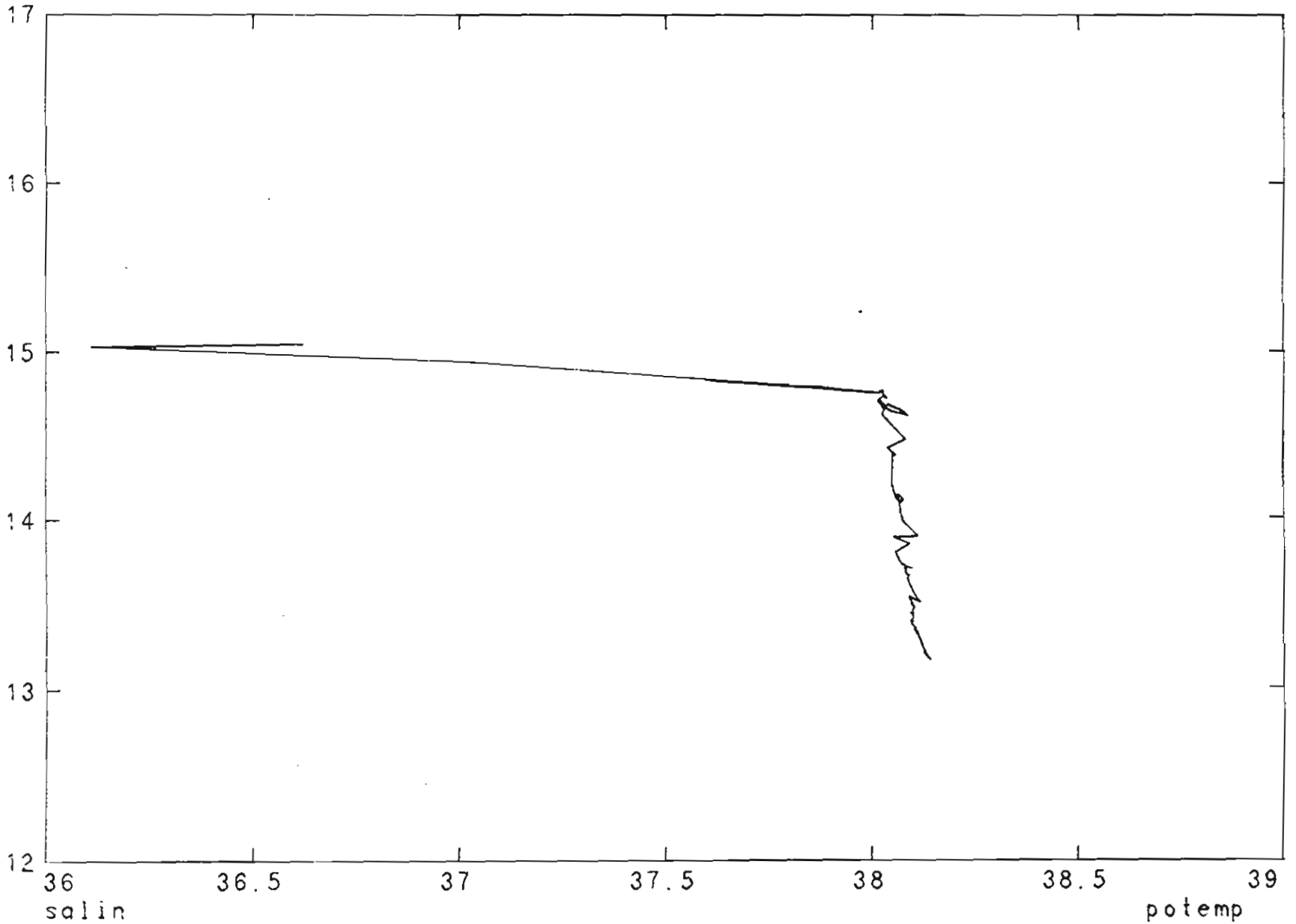
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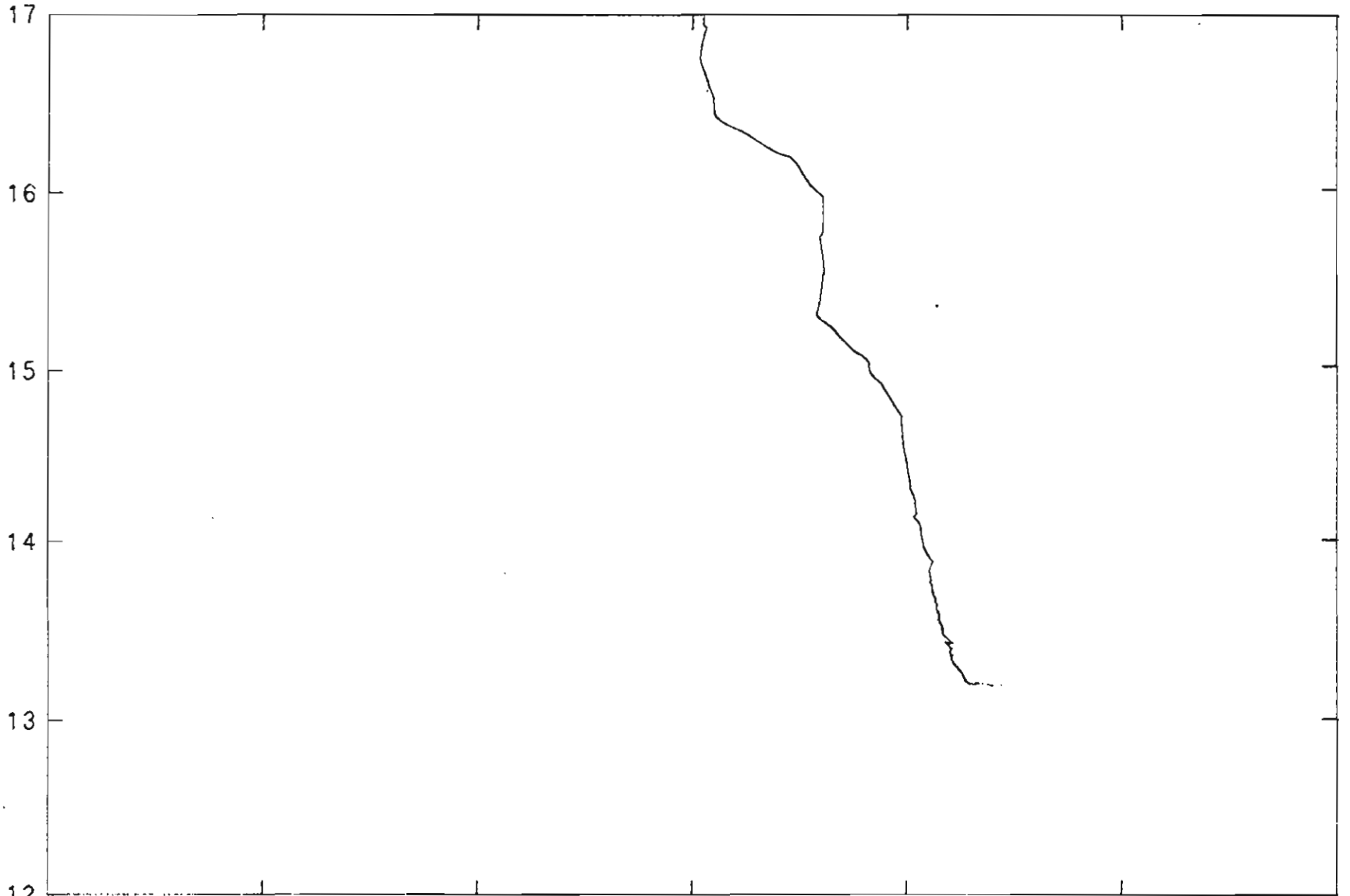
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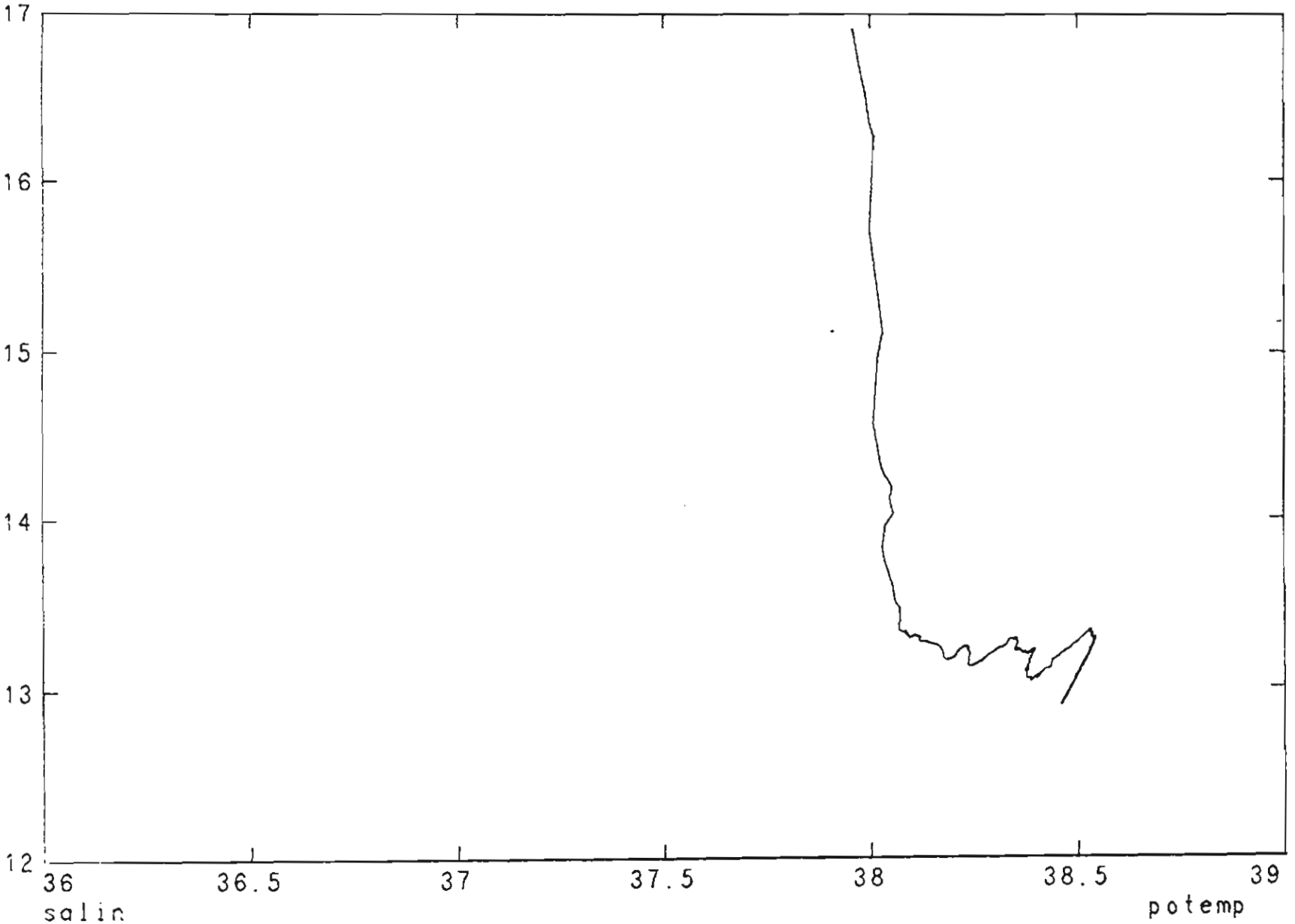
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potemp
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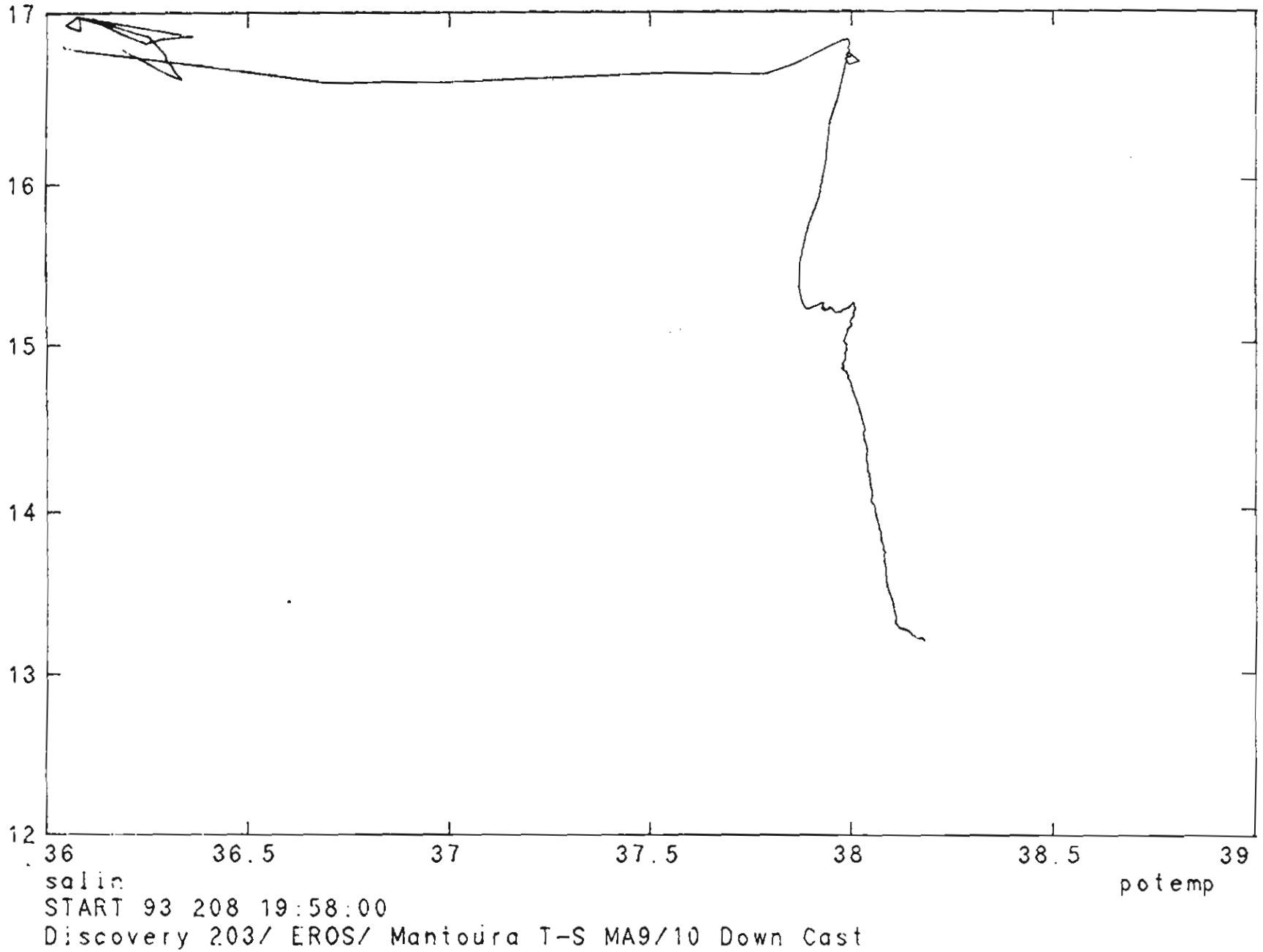
Discovery 203/ EROS/ Mantoura T-S MC1/1 Down Cast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potemp
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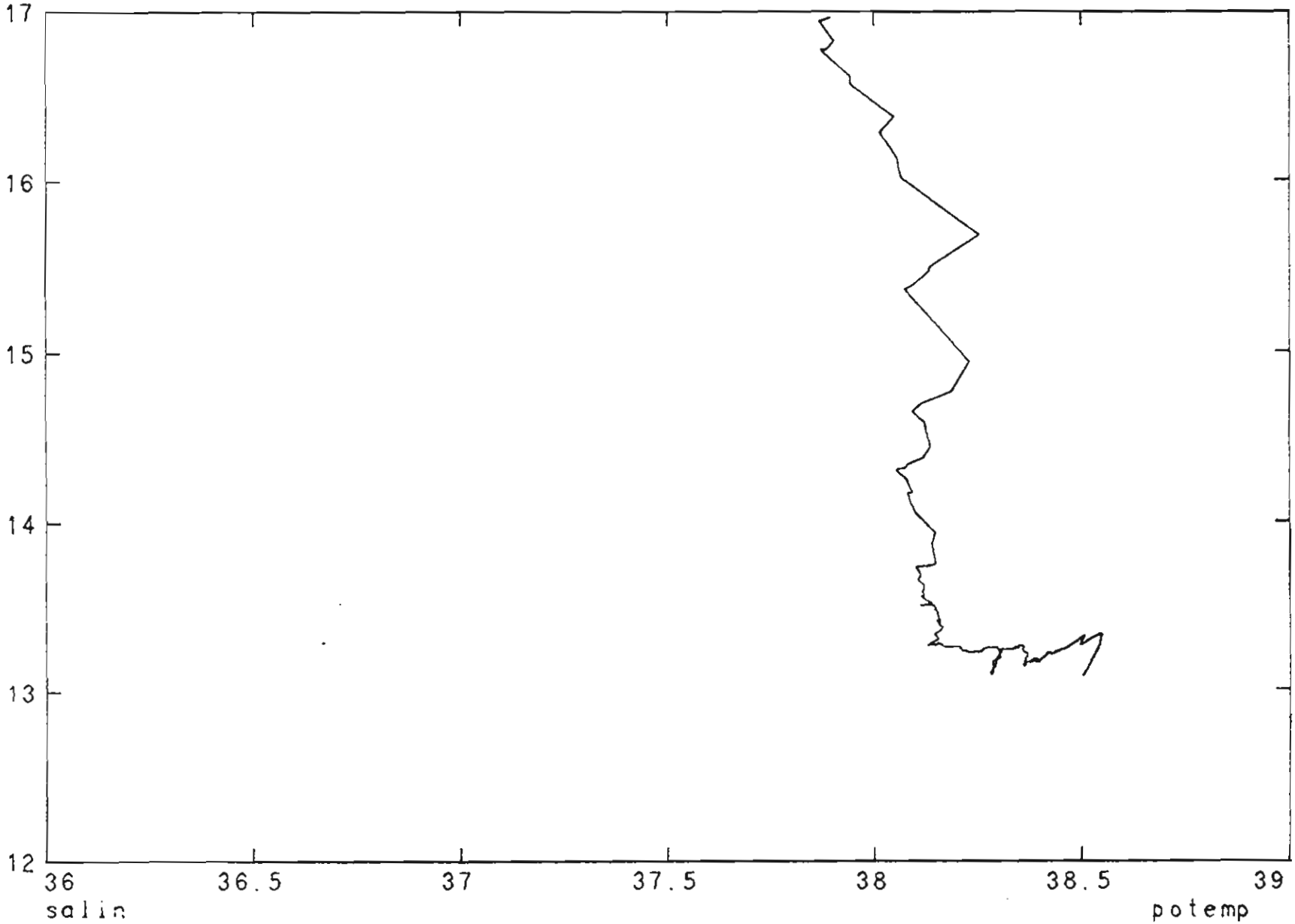
Discovery 203/ EROS/ Mantoura T-S MA9/10 Down Cast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potemp
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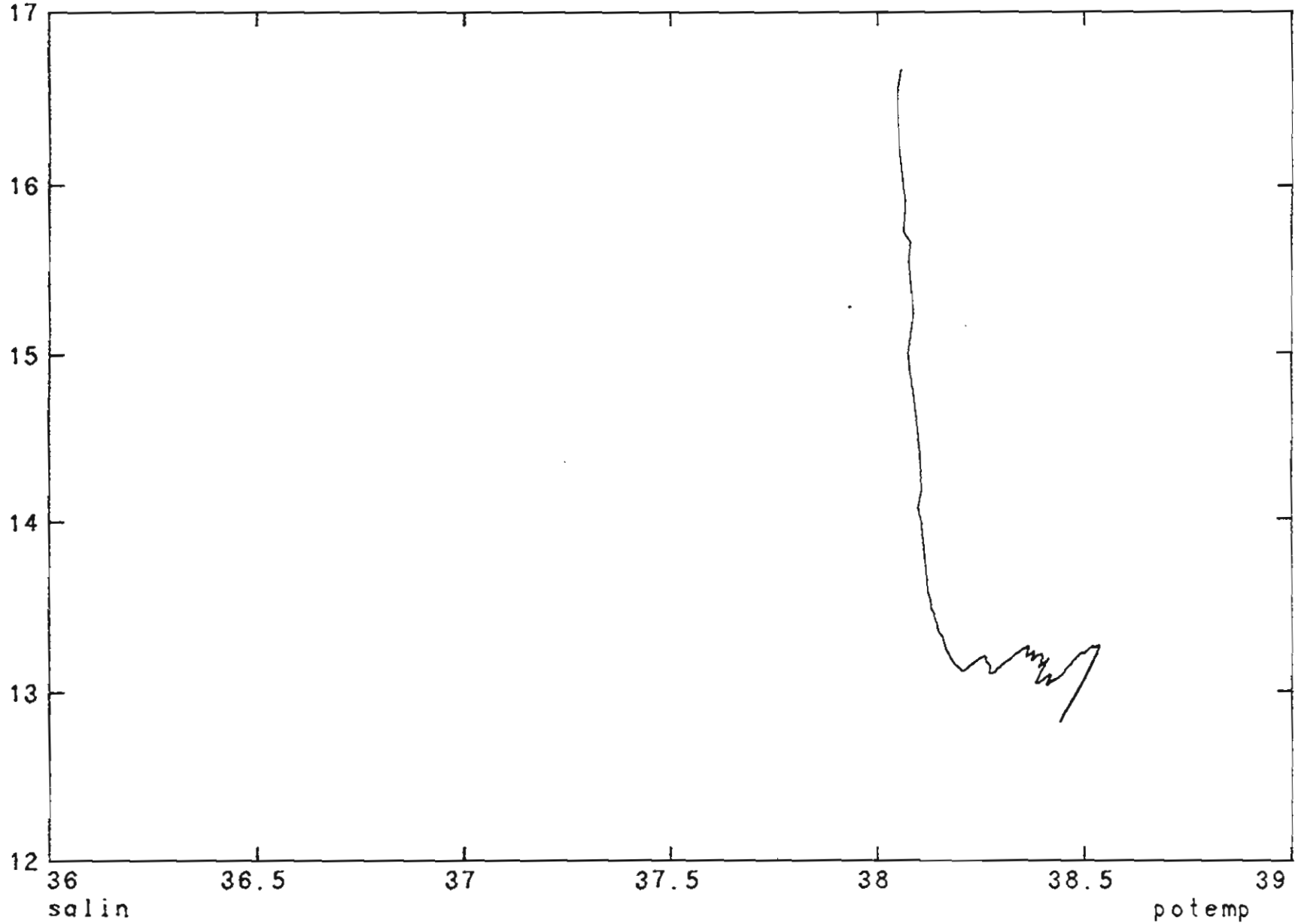
Discovery 203/ EROS/ Mantoura T-S MC3/1 Down Cast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potemp
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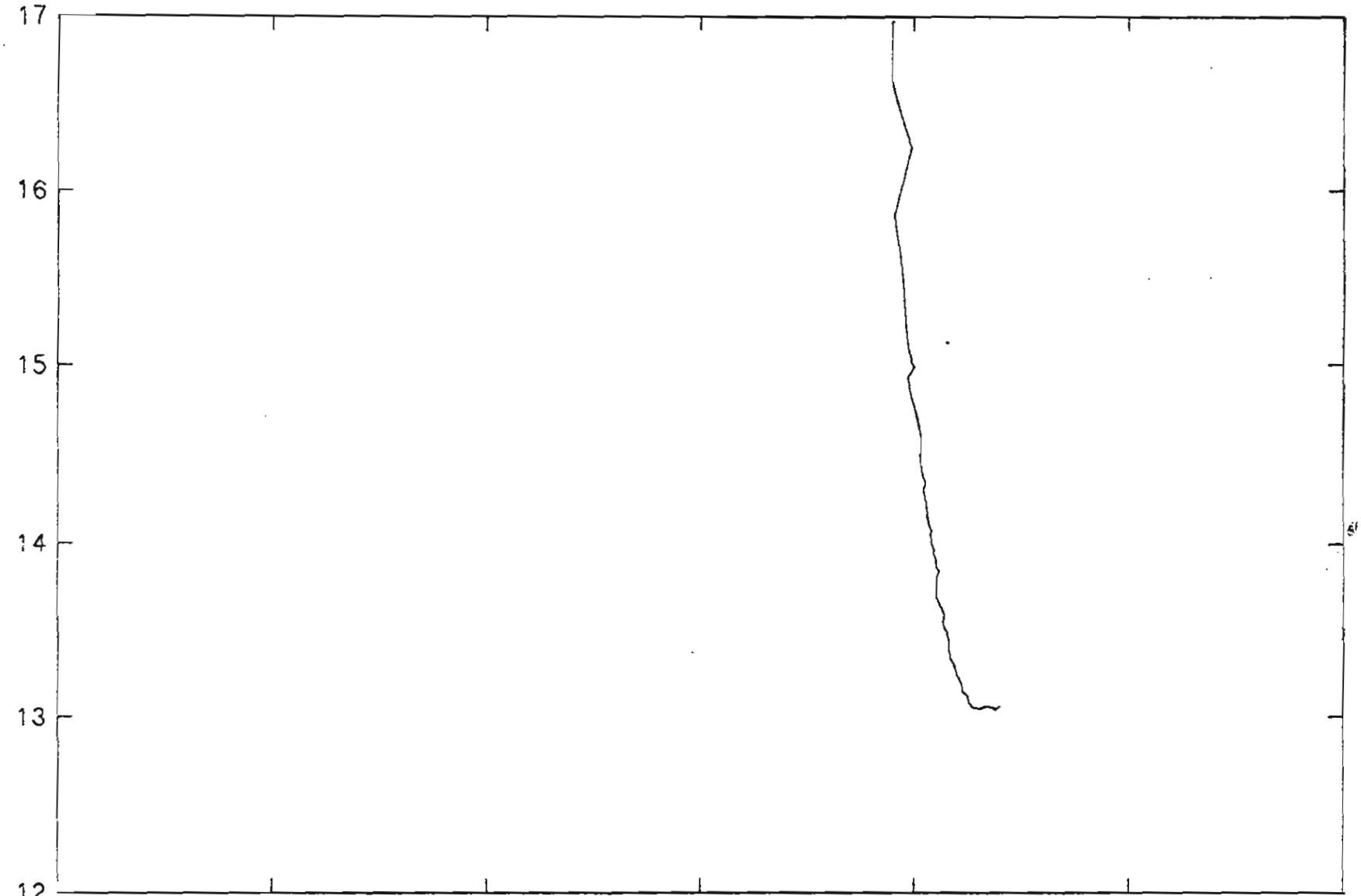
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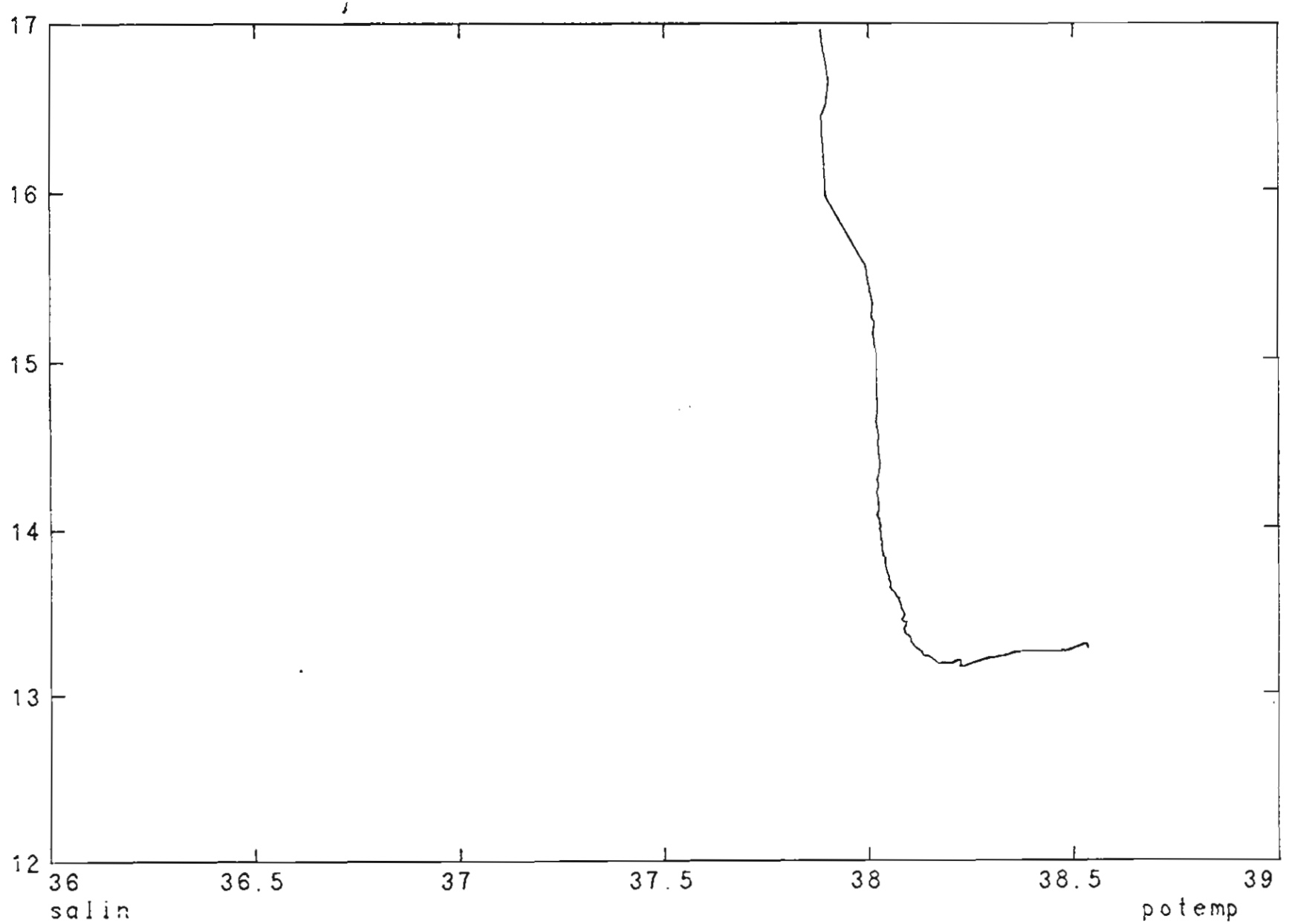
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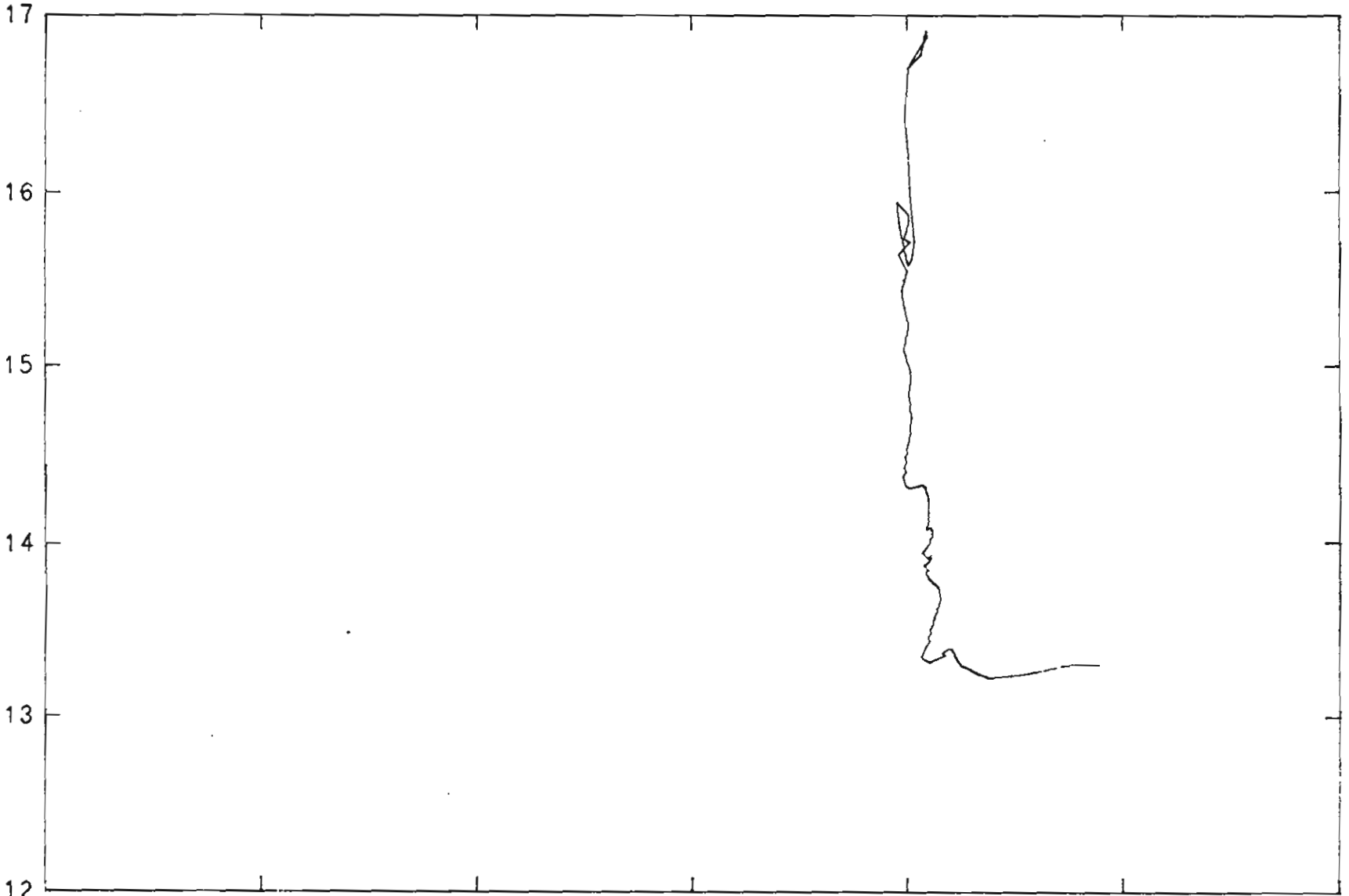
Discovery 203/ EROS/ Mantoura T-S MC4/1 Down Cast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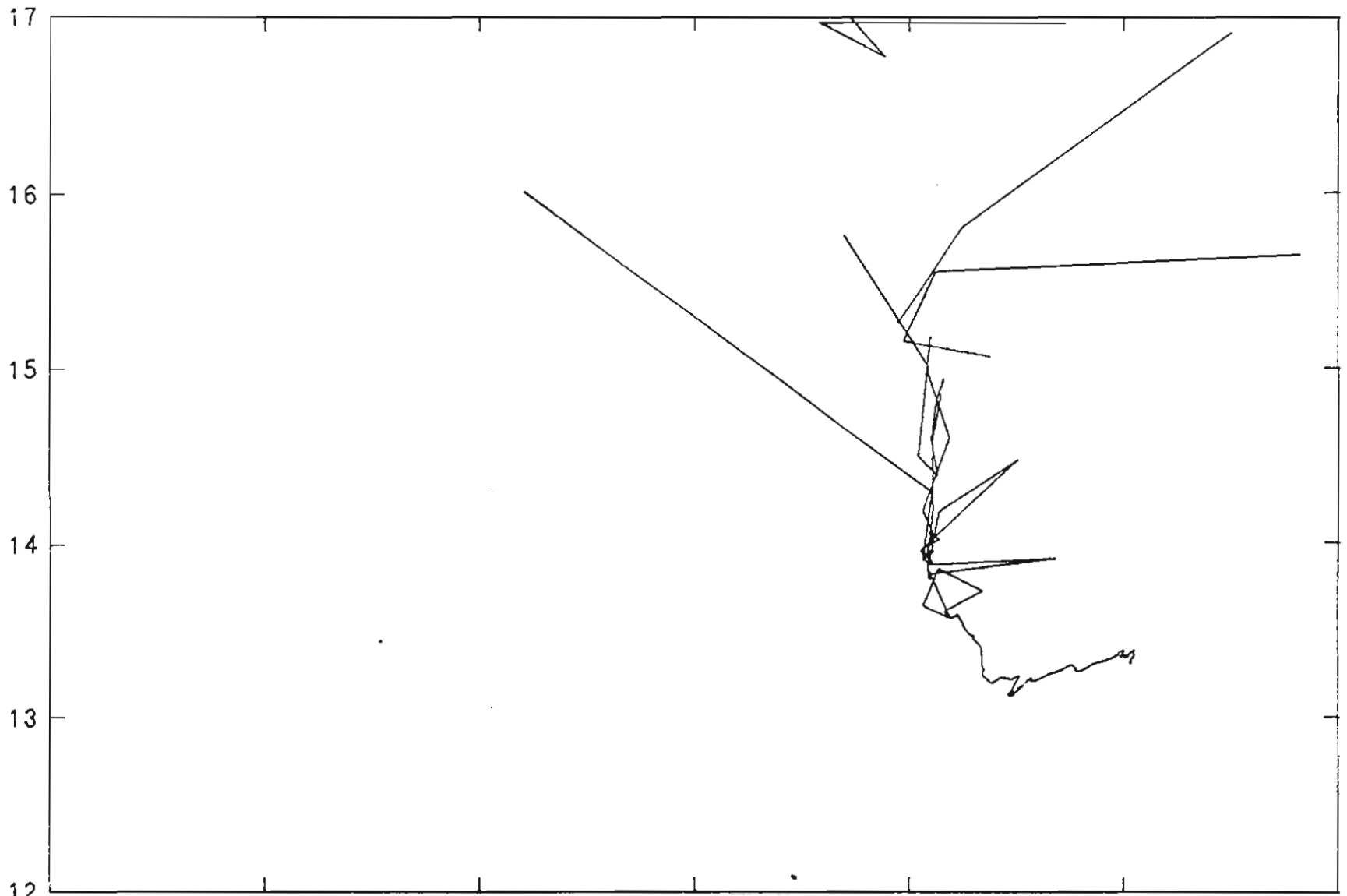
Discovery 203/ EROS/ Mantoura T-S MF3/1 Down Cast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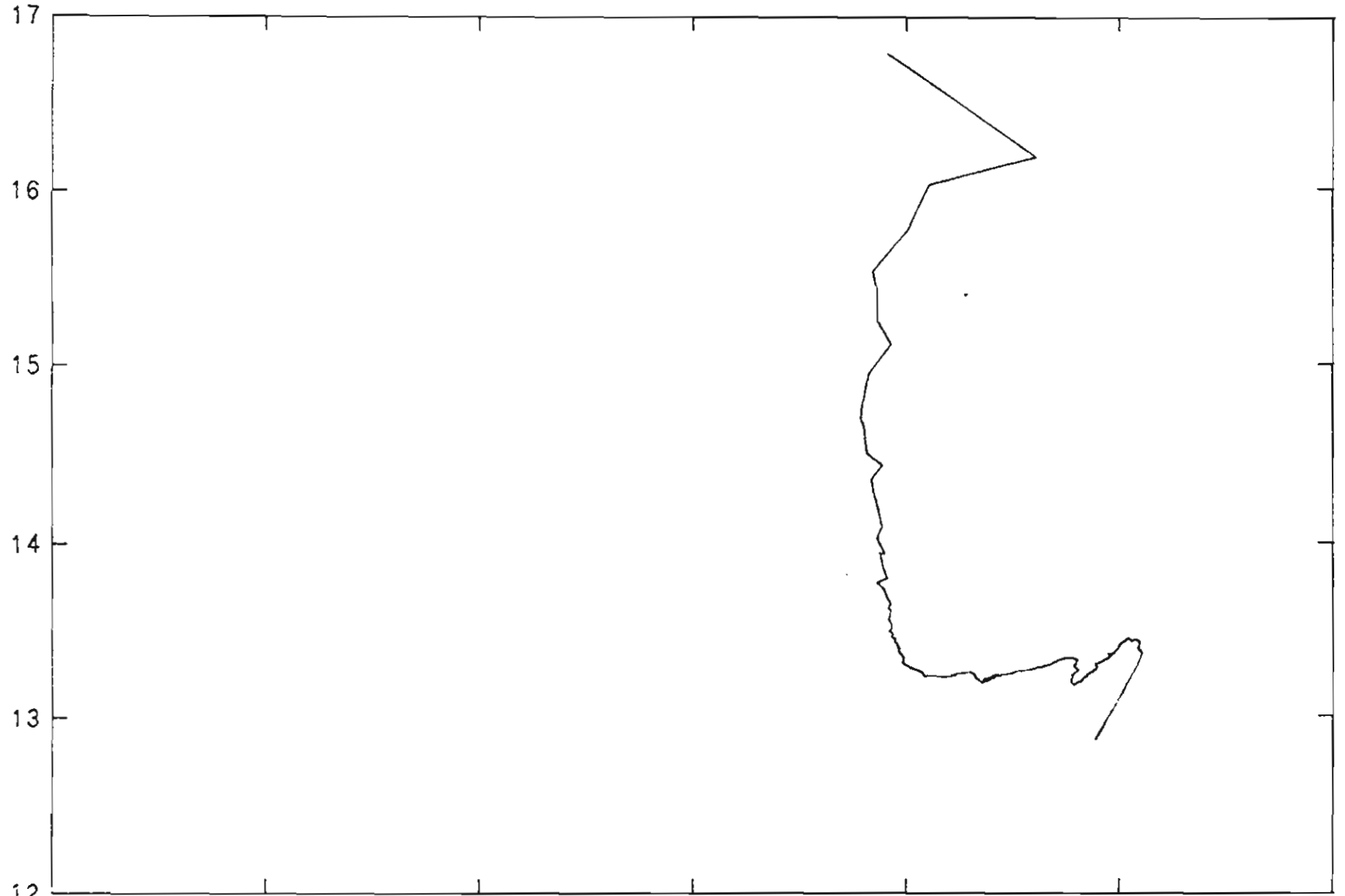
Discovery 203/ EROS/ Mantoura T-S MF1/2 Down Cast



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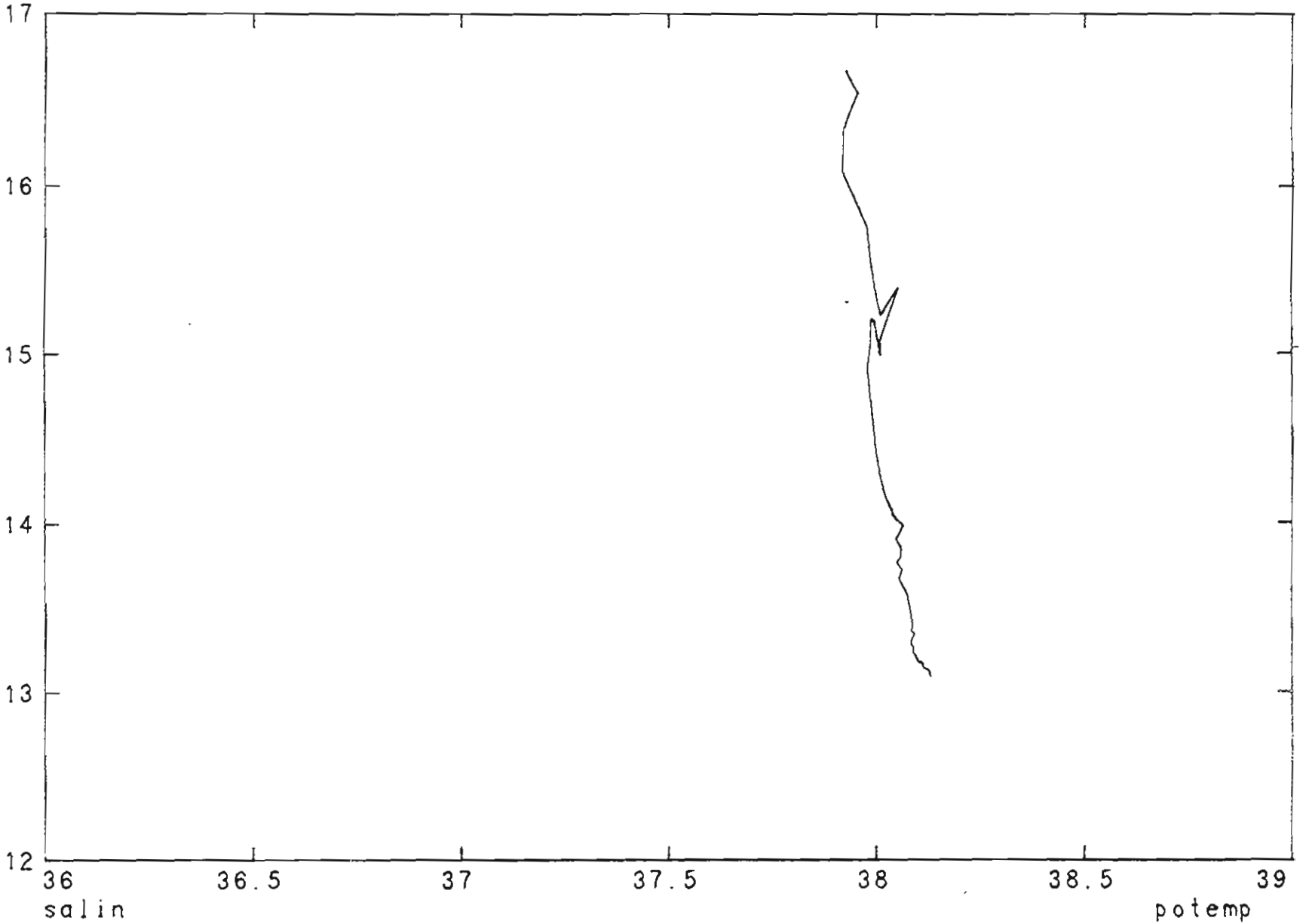
Discovery 203/ EROS/ Mantoura T-S MF2/1 Up Cast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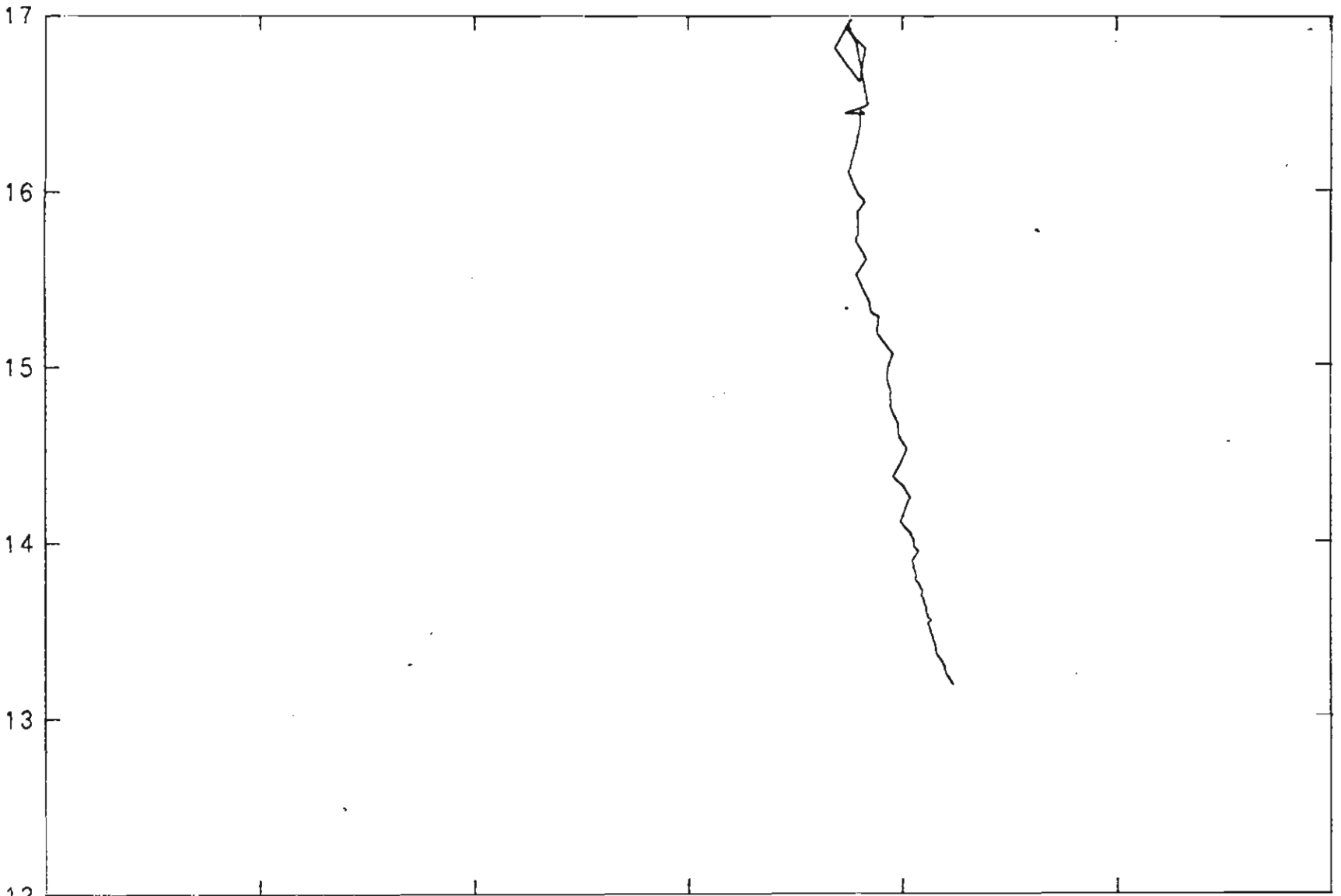
START 93 210 18:52.00
Discovery 203/ EROS/ Mantoura T-S ME1/1 Down Cast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START 93 210 15:40:00
Discovery 203/ EROS/ Mantoura T-S ME2/1 Down Cast

10 CTD BOTTLE SPREADSHEETS

This section shows a print out of the LOTUS spreadsheets distributed to EROS participants . The Cast Number, postion, time (GMT) and bottom depth are shown in the header section of each spread sheet. The CTD data listed correspond to 10 second averages made during the uphaul, at the depths at which the GO/FLO or Niskin bottles have been fired. The Salinity data has already been calibrated against Guildline salinometer, and the temperature data against reversing digital thermometers. The 'oxygen ' data was obtained from the Beckman Electrode, which was calibrated against Winkler titration during Leg 2. However, during bottle firing on the upcast, the oxygen electrode is prone to drift, and so these uphaul values should be treated with some caution. The Appaprent Oxygen Utilisation (AOU) data were derived from the difference between the electrode derived oxygen and the saturation oxygen solubility vs T & S relationship. The fluorescence data is for chlorophyll fluorescence obtained on a Chelsea fluorometer, and is expressed in relative fluoresence units. Finally, the downwelling irradiance of Photosynthetically active radiation (PAR) is listed as natural logarithm of the PAR values. PAR calibrations will be available from PML in September 1993.

10.1 CTD bottle spreadsheets - Leg 1

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D1-1 TM+BGC CTD No: D103X001

Date: 02-07-93 Time: 17:45 GMT

Lat: 35 57.18N Lon: 6 15.66W Bottom Depth: 123 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1,2	101.39	36.0811	14.2177	14.2027	235.0812	21.1651	35.7692	3.0399
3,4	60.55	36.2126	15.0113	15.0020	248.4499	3.5687	31.2848	3.0176
5,6	40.94	36.2576	15.6660	15.6595	255.1110	-6.3896	60.3286	1.3869
7,8	26.73	36.2636	16.7471	16.7426	274.2659	-30.7174	126.1857	1.0262
9,10	19.26	36.2042	17.9292	17.9259	275.1483	-36.9376	292.5245	0.8778
11,12	14.36	36.3137	20.5424	20.5397	255.2339	-28.4001	88.9389	0.7468

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D1-2 CTD No: D103X002

Date: 02-07-93 Time: 19:05 GMT

Lat: 35 57.49N Lon: 6 17.08W Bottom Depth: 119 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
2	74.55	36.2535	15.3341	15.3225	248.5287	1.8255	37.8984	3.0225
4	50.89	36.2591	15.7229	15.7148	251.0064	-2.5639	64.0266	3.0322
6	30.98	36.2294	17.0342	17.0290	270.2195	-27.9589	211.2637	2.9870
8	20.54	36.3086	20.2999	20.2960	255.5050	-27.6647	78.7263	1.2699
10	10.57	36.3275	20.7625	20.7604	257.7084	-31.7930	49.0962	1.0478
12	1.61	36.3289	20.8111	20.8108	250.2172	-24.5020	42.7118	0.8706

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D2-1 BGC +Bioptic CTD No: D103X003

Date: 02-07-93 Time: 21:25 GMT

Lat: 35 59.02N Lon: 6 4.33W Bottom Depth: 178 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1,2	75.51	36.1172	14.1880	14.1769	244.3915	11.9501	21.8175	3.0414
3,4	50.86	36.1590	14.9545	14.9467	243.3552	9.0305	32.8695	3.0542
5,6	30.69	36.3282	18.4892	18.4837	262.3838	-26.8405	492.4179	3.0591
7,8	21.30	36.3285	19.0015	18.9976	264.3578	-31.0505	535.9250	3.0518
9,10	10.84	36.3231	20.0067	20.0046	254.9448	-25.9044	255.6626	3.0386
11,12	1.72	36.3399	21.0242	21.0238	254.4719	-29.6347	69.0443	3.0249

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D3-2 Bioptic CTD No: D103X005

Date: 03-07-93 Time: 09:05 GMT

Lat: 35 58.07N Lon: 5 47.86W Bottom Depth: 322 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	98.82	37.5986	14.0703	14.0555	230.4663	24.1332	29.9159	2.9209
2	61.57	37.0134	14.6805	14.6711	233.4950	18.9339	33.3813	0.9229
3	41.50	36.6553	14.9075	14.9011	246.4741	5.3758	29.6888	0.7231
4	31.97	36.2939	15.8283	15.8233	254.1278	-6.2499	41.5180	0.6497
5	21.81	36.3453	17.1863	17.1826	269.7896	-28.4018	53.8054	0.5300
6	6.73	36.3304	17.2664	17.2652	265.5681	-24.5271	28.6763	0.2892

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D3-3 Radion CTD No: D103X006

Date: 03-07-93 Time: 10:50 GMT

Lat: 35 57.72N Lon: 5 47.84W Bottom Depth: 275 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1-6	249.64	38.3494	13.2562	13.2200	212.3058	45.3032	23.9535	3.0688

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D3-4 BGC + Bioptic CTD No: D103X007

Date: 03-07-93 Time: 20:35 GMT

Lat: 35 57.80N Lon: 5 48.39W Bottom Depth: 278 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	258.70	38.0950	13.4959	13.4580	217.5394	39.2289	17.9823	3.0567
2	208.17	37.9877	13.5807	13.5501	215.4470	41.0529	15.0715	3.0664
3	179.90	37.9877	13.5688	13.5425	219.0466	37.5147	16.9918	3.0737
4	143.21	37.8080	13.7357	13.7146	214.5201	41.4649	22.8716	3.0779
5	123.47	37.0122	14.4607	14.4421	233.0981	20.4397	19.9650	3.0786
6	103.08	36.8366	14.6445	14.6288	240.8707	12.0149	24.5651	3.0762
7	84.59	36.6826	14.8153	14.8024	237.9397	14.3284	21.7414	3.0737
8	63.90	36.2563	15.5541	15.5441	250.7864	-1.5171	31.4899	3.0713
9	53.42	36.2799	16.0520	16.0434	260.7772	-13.9563	55.7402	3.0687
10	44.13	36.2808	16.2282	16.2211	266.7714	-20.7954	65.2883	3.0640
11	24.86	36.3000	16.4514	16.4474	265.7247	-20.8382	85.7982	3.0588
12	13.85	36.4342	17.9214	17.9190	270.7616	-32.8452	45.7093	3.0542

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D3-5 TM + Radion CTD No: DI03X008

Date: 03-07-93 Time: 22:20 GMT

Lat: 35 57.87N Lon: 5 48.04W Bottom Depth: 331 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	257.92	38.2084	13.3786	13.3410	212.6176	44.5789	11.9190	3.0566
3	183.82	38.0894	13.4819	13.4550	209.6545	47.1953	7.6910	3.0713
5	123.53	37.9236	13.6982	13.6801	214.6996	41.2945	18.1783	3.0762
7	83.69	37.1397	14.7247	14.7119	235.8923	16.1187	29.1582	3.0786
9	43.97	36.4058	16.9440	16.9367	259.8007	-17.3806	52.2627	3.0737
11	19.59	36.4267	17.6751	17.6717	266.7407	-27.7034	42.6232	3.0602
2,4,6,8, 10,12	15.11	36.4262	17.6491	17.6465	264.5668	-25.4110	34.0581	3.0543

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D5-1 BGC CTD No: DI03X009

Date: 04-07-93 Time: 06:05 GMT

Lat: 36 1.08N Lon: 5 21.72W Bottom Depth: 827 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	770.14	38.4592	13.0428	12.9298	217.4678	41.0840	12.6581	3.0832
2	603.77	38.4732	13.0941	13.0058	217.9141	40.3452	13.6784	3.0859
3	405.18	38.4762	13.0834	13.0247	217.2443	41.0663	10.4551	3.0859
4	305.22	38.4704	13.2031	13.1588	204.1188	53.5733	9.5786	3.0859
5	203.06	38.3872	13.1428	13.1135	200.7725	57.3697	10.6495	3.0859
6	153.30	38.3462	13.1640	13.1419	206.6257	51.4716	9.1583	3.0859
7	104.11	38.2575	13.2917	13.2766	214.9988	42.5727	6.4709	3.0855
8	82.60	38.2472	13.3144	13.3025	218.3103	39.1590	15.6307	3.0786
9	64.22	38.1572	13.4708	13.4615	218.5904	38.2084	21.1966	3.0485
10	53.70	37.9289	13.9609	13.9530	222.6172	32.0191	54.1749	2.9502
11	33.67	37.3735	14.4466	14.4415	236.6977	16.3460	3.0806	0.9391
12	14.67	36.8905	15.4055	15.4032	245.3877	3.6400	10.9459	0.6884

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D5-2 TM + Radion CTD No: DI03X010

Date: 04-07-93 Time: 12:15 GMT

Lat: 36 1.03N Lon: 5 22.09W Bottom Depth: 746 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1,2,4,6,8, 10,12	736.11	38.4603	13.0402	12.9324	209.3618	49.2017	0.5498	3.0835
3	403.55	38.4869	13.1927	13.1339	200.9430	56.7769	6.8940	3.0884
5	154.43	38.2832	13.2350	13.2127	201.5288	56.2978	9.7440	3.0835
7	84.27	37.9598	13.7147	13.7023	208.2091	47.6424	11.3191	1.2291
9	54.44	37.4705	14.6081	14.5999	226.2187	25.8613	23.1863	0.8309
11	24.93	36.3659	16.2049	16.2009	248.0521	-2.0925	14.7740	0.4994

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D5-3 Bioptic CTD No: DI03X011

Date: 04-07-93 Time: 14:20 GMT

Lat: 36 0.92N Lon: 5 22.16W Bottom Depth: 787 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	151.40	38.3228	13.1826	13.1608	202.1220	55.9152	3.2120	3.0687
2	104.77	38.0956	13.4896	13.4744	212.5288	44.2710	11.7216	3.0622
3	83.80	37.9183	13.8138	13.8014	217.0651	38.3423	26.9151	3.0120
4	54.43	37.7590	14.2597	14.2515	221.8286	31.5553	74.0153	0.9332
5	33.95	36.9293	15.6562	15.6508	240.8178	6.9301	90.0494	0.6636
6	14.39	36.3874	16.2821	16.2798	249.7809	-4.2215	37.7622	0.4095

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D7-1 Bioptic CTD No: DI03X012

Date: 04-07-93 Time: 22:00 GMT

Lat: 35 59.46N Lon: 4 4.94W Bottom Depth: 1327 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	122.14	36.5341	15.9779	15.9583	244.8278	1.9657	25.9585	3.0493
2	84.64	36.5092	16.9409	16.9267	253.1296	-10.8468	35.1442	3.0518
3	64.65	36.5060	17.5644	17.5534	256.7749	-17.3503	42.8870	3.0468
4	44.43	36.5320	18.9186	18.9106	267.3947	-34.0123	91.2172	3.0371
5	34.27	36.5604	20.0440	20.0375	253.0311	-24.4677	53.6685	3.0298
6	14.64	36.5599	20.5692	20.5664	238.8616	-12.4668	26.9321	3.0176

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D7-2 BGC CTD No: DI03X013

Date: 04-07-93 Time: 23:30 GMT

Lat: 35 59.39N Lon: 4 4.88W Bottom Depth: 1328 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	1200.79	38.4341	13.0000	12.8216	209.5489	49.2689	18.0922	0.0000
2	800.47	38.4481	13.0122	12.8948	213.2652	45.4660	12.9027	0.0000
3	606.06	38.4655	13.0700	12.9816	211.4478	46.9505	9.9852	0.0000
4	402.79	38.4829	13.1786	13.1199	198.3540	59.4464	7.2172	0.0000
5	303.27	38.4460	13.1910	13.1470	193.1292	64.6656	9.9970	0.0000
6	203.97	38.1756	13.3764	13.3467	197.6263	59.6346	12.6394	0.0000
7	163.75	37.1049	15.0930	15.0675	224.7932	25.4412	20.2951	0.0000
8	144.05	36.6481	15.7272	15.7043	242.0789	5.7516	19.2910	0.0000
9	104.96	36.4756	16.3210	16.3039	249.7253	-4.4825	20.0336	0.0000
10	70.86	36.5046	17.1961	17.1842	262.9346	-21.8247	39.8514	0.0000
11	47.26	36.5214	18.5943	18.5859	276.1624	-41.3527	38.5554	0.0000
12	2.93	36.6148	21.4019	21.4013	243.3404	-20.3790	13.3138	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D7-3 TM CTD No: DI03X014

Date: 05-07-93 Time: 01:55 GMT

Lat: 35 59.38N Lon: 4 4.89W Bottom Depth: 1329 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	1200.60	38.4308	12.9996	12.8211	217.3334	41.4922	2.0355	0.0000
2	1000.76	38.4385	12.9980	12.8503	210.9157	47.9059	0.5878	0.0000
3	796.74	38.4494	13.0180	12.9012	215.7599	42.9385	0.5466	0.0000
4	602.02	38.4691	13.0891	13.0011	209.2111	49.0812	0.5884	0.0000
5	409.92	38.4836	13.1927	13.1330	200.6141	57.1110	0.5911	0.0000
6	184.90	37.9517	13.6625	13.6353	206.7610	49.3728	1.9506	0.0000
7	168.93	37.6162	14.1119	14.0866	213.6779	40.6814	1.2336	0.0000
8	152.92	36.9907	15.2314	15.2075	221.7574	27.9704	7.6048	0.0000
9	124.44	36.5448	15.8149	15.7950	224.5981	22.9652	12.6144	0.0000
10	84.29	36.5144	16.8009	16.7869	232.1014	10.8250	21.2463	0.0000
11	54.25	36.5158	18.3177	18.3081	262.4744	-26.4394	35.5939	0.0000
12	24.15	36.5555	20.2748	20.2702	225.9950	1.6170	7.2790	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D8-2 BGC CTD No: DI03X015

Date: 06-07-93 Time: 15:56 GMT

Lat: 37 59.67N Lon: 1 58.78E Bottom Depth: 2440 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2406.54	38.4309	13.1676	12.7924	224.3861	33.5558	0.7987	0.0000
2	1800.38	38.4302	13.0708	12.7968	225.3448	33.1065	1.0981	0.0000
3	1201.62	38.4276	12.9879	12.8094	218.9444	39.9482	0.8813	0.0000
4	802.26	38.4557	13.0458	12.9280	210.6373	47.9045	0.7301	0.0000
5	602.82	38.4828	13.1322	13.0440	208.3750	49.6686	0.9240	0.0000
6	354.26	38.5458	13.4557	13.4035	198.6996	57.5562	0.7039	0.0000
7	273.77	38.5037	13.4496	13.4094	198.0554	58.2992	1.4042	0.0000
8	140.91	38.1863	13.1205	13.1003	232.4792	26.1049	1.9749	0.0000
9	68.35	37.7743	14.2390	14.2287	260.6161	-7.1513	35.6855	0.0000
10	39.91	37.2709	15.4331	15.4269	287.7907	-39.4784	9.3757	0.0000
11	24.93	37.1111	20.0408	20.0361	252.7955	-24.9629	2.4924	0.0000
12	4.30	37.1113	23.1842	23.1833	224.8891	-9.4383	1.7385	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D8-3 Bioptic CTD No: DI03X017

Date: 06-07-93 Time: 19:22 GMT

Lat: 37 59.91N Lon: 1 59.87E Bottom Depth: 2426 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	122.91	38.1436	13.3136	13.2958	214.7468	42.8931	2.7782	3.0736
2	94.41	37.9980	13.6067	13.5929	214.6081	41.7404	6.1495	3.0786
3	79.46	37.9029	13.9018	13.8901	222.7301	32.2498	25.0007	3.0809
4	54.10	37.4020	14.4997	14.4915	262.3230	-9.5916	68.6989	3.0800
5	34.70	37.1727	16.2716	16.2659	289.5999	-45.1628	5.7220	3.0786
6	13.89	37.1021	22.2057	22.2028	220.0134	-0.8320	2.1559	3.0669

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D8-4 TM CTD No: DI03X018

Date: 06-07-93 Time: 20:33 GMT

Lat: 37 59.93N Lon: 1 59.88E Bottom Depth: 2466 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2455.50	38.4295	13.1757	12.7921	217.8163	40.0855	0.9279	0.0000
2	1999.51	38.4288	13.0995	12.7928	218.4078	39.8946	0.9677	0.0000
3	1001.99	38.4377	13.0020	12.8541	214.4691	44.3326	1.0315	0.0000
4	602.38	38.4799	13.1309	13.0427	204.4604	53.5948	**********	0.0000
5	403.27	38.5368	13.3801	13.3208	197.4704	59.1921	2195.1280	0.0000
6	346.91	38.5436	13.4356	13.3845	197.9355	58.4285	**********	0.0000
7	245.01	38.4756	13.3976	13.3617	194.2461	62.4238	2537.4330	0.0000
8	162.36	38.2623	13.1444	13.1210	220.7293	37.6064	2056.9700	0.0000
9	88.80	37.9460	13.6628	13.6498	216.1623	39.9788	**********	0.0000
10	68.91	37.6866	14.2617	14.2514	251.9706	1.5167	**********	0.0000
11	46.78	37.3573	14.9874	14.9802	270.3169	-19.9498	2107.8280	0.0000
12	18.70	37.1122	22.3367	22.3329	212.1784	6.4854	2160.8480	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D9-1 BGC CTD No: DI03X019

Date: 07-07-93 Time: 11:31 GMT

Lat: 38 41.70N Lon: 4 41.57E Bottom Depth: 2607 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2607.21	38.4259	13.2028	12.7931	219.5910	38.1744	4.2235	0.0000
2	1200.64	38.4289	13.0095	12.8310	214.0532	44.7231	3.1473	0.0000
3	602.33	38.4970	13.2252	13.1366	201.7687	55.7653	2.4840	0.0000
4	451.76	38.5228	13.3679	13.3014	200.8697	55.8787	2.1922	0.0000
5	225.84	38.1570	13.0027	12.9704	238.4159	20.8370	3.7238	0.0000
6	154.18	37.9661	13.4780	13.4555	234.0593	23.0082	3.2364	0.0000
7	107.25	37.5391	13.9494	13.9335	242.1714	13.1409	12.9932	0.0000
8	86.53	37.3334	14.0335	14.0207	260.1268	-4.9198	19.4317	0.0000
9	61.53	37.2854	14.5801	14.5707	259.5147	-7.0055	51.5660	0.0000
10	44.65	37.1494	15.6587	15.6516	273.1104	-25.7081	7.3527	0.0000
11	30.10	37.0885	17.2097	17.2046	271.1120	-30.9142	5.3406	0.0000
12	14.23	37.2150	23.5557	23.5527	214.4492	-0.5080	3.8546	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D9-2 Bioptic CTD No: DI03X020

Date: 07-07-93 Time: 14:42 GMT

Lat: 38 41.70N Lon: 4 41.26E Bottom Depth: 2607 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	154.21	37.9831	13.5008	13.4783	233.7252	23.1966	4.5914	3.0591
2	104.38	37.5359	13.9917	13.9762	243.1446	11.9561	15.8752	3.0202
3	84.16	37.3317	14.0374	14.0249	266.7099	-11.5204	19.1500	1.1829
4	63.89	37.2897	14.9801	14.9702	271.8579	-21.3500	23.5138	0.8122
5	34.30	37.0946	17.1837	17.1779	272.7638	-32.4559	3.1978	0.3911
6	14.09	37.2293	23.7901	23.7871	216.5297	-3.4689	3.8506	0.2744

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D9-3 TM CTD No: DI03X021

Date: 07-07-93 Time: 15:42 GMT

Lat: 38 41.79N Lon: 4 40.63E Bottom Depth: 840 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2585.95	38.4281	13.1983	12.7923	220.7526	37.0331	2.6986	0.0000
2	1997.56	38.4294	13.1049	12.7984	219.3991	38.8745	2.2639	0.0000
3	1500.64	38.4278	13.0354	12.8097	221.9501	36.6915	2.5029	0.0000
4	1001.38	38.4445	13.0335	12.8855	215.4052	43.2192	1.6593	0.0000
5	603.16	38.4974	13.2100	13.1214	206.4002	51.2125	1.8837	0.0000
6	443.84	38.5176	13.3445	13.2792	204.4123	52.4662	4.4179	0.0000
7	241.88	38.2515	13.1094	13.0746	226.1033	32.4335	2.0762	0.0000
8	164.68	37.9893	13.3552	13.3314	232.9687	24.7017	2.8912	0.0000
9	128.68	37.7570	13.8126	13.7936	231.4378	24.2317	6.1910	0.0000
10	100.50	37.4492	13.8787	13.8639	244.2655	11.5530	18.8132	0.0000
11	77.47	37.3133	14.1935	14.1819	255.7297	-1.3085	18.5436	0.0000
12	19.76	37.1044	19.6966	19.6930	248.1820	-18.9045	4.6564	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D10-1 BGC CTD No: DI03X022

Date: 09-07-93 Time: 05:02 GMT

Lat: 35 50.09N Lon: 11 15.15E Bottom Depth: 460 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	437.65	38.6661	13.7981	13.7323	218.4610	35.8418	2.3794	3.0506
2	352.93	38.6443	13.7566	13.7038	211.6718	42.8781	1.3749	3.0640
3	303.39	38.6731	13.8986	13.8530	218.0427	35.7365	1.9323	3.0688
4	253.54	38.6758	14.0250	13.9867	224.9968	28.1364	1.7457	3.0713
5	204.08	38.5913	14.1878	14.1569	222.2170	30.2261	4.0765	3.0737
6	153.94	38.1542	13.9979	13.9748	244.3872	9.7049	2.8698	3.0713
7	123.70	37.6600	14.1103	14.0918	249.8124	4.4861	6.0766	3.0643
8	94.37	37.3942	14.5058	14.4915	254.4050	-1.6922	18.0117	3.0314
9	82.08	37.1744	14.9085	14.8958	259.8382	-8.7971	17.5675	1.4720
10	54.70	37.0837	15.5460	15.5373	268.8189	-20.7706	7.3869	0.9158
11	34.67	37.0259	16.9365	16.9307	259.2802	-17.7350	6.7262	0.6460
12	14.50	37.1118	23.2505	23.2474	224.7315	-9.5292	5.1288	0.3704

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D10-2 Bioptic CTD No: DI03X023

Date: 09-07-93 Time: 06:22 GMT

Lat: 35 50.01N Lon: 11 15.01E Bottom Depth: 458 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	152.81	38.3236	14.1240	14.1010	232.6790	20.5059	3.4443	3.0469
2	113.97	37.5788	14.1903	14.1732	252.0714	1.9478	9.0566	3.0225
3	94.22	37.3903	14.5132	14.4989	257.0490	-4.3673	22.2176	1.4435
4	64.46	37.1214	15.1901	15.1800	263.6758	-13.9452	10.3777	0.8678
5	44.61	37.0257	16.0889	16.0816	269.5048	-23.9808	9.5962	0.6292
6	14.54	37.1101	23.2349	23.2319	212.7946	2.4680	5.4536	0.2508

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D10-3 TM CTD No: DI03X024

Date: 09-07-93 Time: 07:33 GMT

Lat: 37 50.09N Lon: 11 15.00E Bottom Depth: 461 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	449.69	38.6585	13.7666	13.6991	210.0834	44.3926	4.1138	3.0540
2	283.45	38.6688	13.8942	13.8517	210.8402	42.9682	3.7474	3.0664
3	213.75	38.6429	14.1333	14.1009	216.7944	35.8430	3.3415	3.0688
4	163.42	38.3787	14.1739	14.1492	229.7511	23.0951	5.3032	3.0640
5	128.77	37.7300	14.0280	14.0088	248.3125	6.2953	6.9598	3.0402
6	80.38	37.2256	14.7056	14.6933	253.5304	-1.5572	23.9291	0.9987
7	54.53	37.1031	15.3204	15.3119	260.1605	-11.0417	11.1235	0.6810
8	34.74	37.0438	17.4590	17.4531	258.2237	-19.0971	7.8616	0.5187
9	14.75	37.1047	23.2024	23.1993	217.3199	-1.9290	7.2242	0.4000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D11-1 Bioptic CTD No: DI03X025

Date: 09-07-93 Time: 11:15 GMT

Lat: 37 44.08N Lon: 11 27.13E Bottom Depth: 613 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	153.98	38.1793	13.8679	13.8450	236.0581	18.6577	5.9967	3.0322
2	124.82	37.8726	14.0142	13.9955	238.3895	16.0638	6.5988	1.5056
3	94.41	37.4256	14.4169	14.4026	246.6785	6.4332	31.1650	1.0664
4	74.55	37.1859	15.5877	15.5759	260.8216	-13.1310	17.6352	0.8103
5	54.14	37.0456	15.9607	15.9519	267.7008	-21.5944	8.9675	9.9975
6,7,8,9,10	34.57	37.0445	18.3146	18.3084	260.3757	-25.0741	5.2268	9.9975
11	24.30	37.1379	22.4582	22.4533	233.6478	-15.4830	8.2940	9.9975
12	14.63	37.1465	23.1118	23.1087	230.6919	-15.0139	7.1207	9.9975

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D11-2 BGC CTD No: DI03X026

Date: 09-07-93 Time: 13:02 GMT

Lat: 37 43.9N Lon: 11 26.94E Bottom Depth: 616 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	605.97	38.7213	13.8509	13.7590	198.6422	55.3042	6.3686	3.0615
2	452.31	38.7142	13.8166	13.7485	207.0547	47.0778	2.5963	3.0693
3	303.17	38.6983	13.9144	13.8687	204.4065	49.2530	2.3191	3.0737
4	202.81	38.5455	14.0260	13.9954	214.0652	39.2681	3.3536	3.0719
5	154.28	38.1718	13.8596	13.8367	230.9129	23.8575	4.4371	3.0591
6	129.42	37.8993	14.0175	13.9982	241.1870	13.2070	7.5003	3.0250
7	104.53	37.5033	14.2890	14.2733	248.4272	5.2095	17.4901	1.2907
8	82.47	37.2606	14.9793	14.9665	262.6902	-12.1336	40.5562	0.9525
9	64.20	37.0917	15.4950	15.4848	256.2875	-8.0034	13.1993	0.7249
10	44.17	37.0186	17.0207	17.0133	255.9194	-14.7521	5.2000	0.4769
11	24.32	37.0791	20.4297	20.4250	246.2034	-19.9304	8.6266	0.3594
12	9.48	37.1459	23.0710	23.0690	212.1516	3.6802	7.9429	9.9975

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: 11-03

Date: 09-07-93 Time: 15:05 GMT

Lat: 37 44.10N Lon: 11 27.08E Bottom Depth: 613 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	613.01	38.7228	13.8496	13.7566	207.3282	46.6223	8.3175	3.0664
2	553.10	38.7232	13.8432	13.7595	209.2610	44.7215	8.2114	3.0713
3	453.30	38.7218	13.8331	13.7648	208.6665	45.3699	7.5612	3.0737
4	377.94	38.7006	13.8428	13.7860	207.9746	46.0456	6.9333	3.0762
5	277.87	38.6733	13.9366	13.8947	210.8153	42.7707	4.3015	3.0762
6	211.74	38.5540	14.0121	13.9803	211.4785	41.9115	2.4443	3.0762
7	181.37	38.2449	13.8320	13.8050	229.7574	25.0389	5.1547	3.0760
8	145.95	38.0618	14.0732	14.0513	234.6107	19.2435	5.2210	3.0688
9	89.71	37.3287	14.5562	14.5425	244.2439	8.3178	36.3886	1.2866
10	69.80	37.2094	15.4928	15.4817	257.7444	-9.6287	24.4318	0.8999
11	39.20	37.0140	17.5279	17.5212	259.5213	-20.6639	6.6235	0.4929
12	13.73	37.1279	22.9267	22.9239	225.1422	-8.7450	7.2913	9.9975

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D11-4 Bioptic CTD No: DI03X028

Date: 09-07-93 Time: 19:09 GMT

Lat: 37 43.96N Lon: 11 26.83E Bottom Depth: 620 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	154.09	38.1301	13.9270	13.9040	247.0141	7.4778	5.0302	3.0322
2	113.97	37.5928	14.1859	14.1688	258.3666	-4.3469	11.4023	3.0459
3	94.32	37.3344	14.5440	14.5297	265.7223	-13.1083	37.9133	3.0536
4	64.10	37.1713	15.5087	15.4985	269.5651	-21.4687	16.9862	3.0591
5	34.45	37.0076	17.4155	17.4096	267.2493	-27.8728	6.2447	3.0615
6	14.27	37.1360	22.9750	22.9720	222.4784	-6.2732	5.5794	3.6798

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D11-5 TM (v.d.Berg) CTD No: DI03X029

Date: 09-07-93 Time: 20:19 GMT

Lat: 37 43.95N Lon: 11 27.03E Bottom Depth: 620 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	403.23	38.7178	13.8684	13.8077	202.6743	51.1881	4.0750	3.0578
2	303.56	38.7055	13.8874	13.8418	208.8336	44.9516	2.2327	3.0664
3	203.79	38.5739	14.0046	13.9740	214.4481	38.9486	3.9839	3.0713
4	153.80	38.0851	13.9942	13.9713	236.9117	17.3079	5.7499	3.0737
5	104.29	37.5473	14.2399	14.2243	249.2826	4.5341	13.2572	3.0737
6	79.58	37.2911	14.7684	14.7562	259.9456	-8.3882	54.5734	3.0737
7	54.18	37.0451	15.9805	15.9717	258.9172	-12.9048	9.3401	3.0737
8	29.46	37.0449	17.9527	17.9476	249.8734	-12.9693	9.0851	3.0688
9	14.33	37.1386	23.0866	23.0836	223.6894	-7.9069	8.7336	9.9975

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D12-1 Bioptic CTD No: DI03X036

Date: 11-07-93 Time: 11:35 GMT

Lat: 37 34.16N Lon: 11 36.03E Bottom Depth: 621 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	154.37	38.2546	14.4545	14.4309	231.7245	19.9043	27.8045	3.0298
2	123.84	37.6387	14.4623	14.4435	250.7350	1.8146	33.7871	2.9644
3	104.68	37.5137	14.4966	14.4807	255.1235	-2.5509	43.0926	1.2413
4	84.33	37.3770	14.9926	14.9796	263.9150	-13.6038	76.9364	0.9749
5	64.41	37.1421	15.4327	15.4225	266.3425	-17.8316	31.7484	0.7641
6	33.87	37.0727	17.9886	17.9827	240.2850	-3.5803	25.1895	0.4541
7	14.29	37.1788	22.7748	22.7718	228.4741	-11.5666	25.4959	0.2862

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D12-2 H2O2 + Cr CTD No: DI03X037

Date: 11-07-93 Time: 12:41 GMT

Lat: 37 34.00N Lon: 11 36.04E Bottom Depth: 615 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	113.94	37.6410	14.4773	14.4600	252.8020	-0.3311	35.0231	1.4478
2	94.07	37.4897	14.5713	14.5570	252.7105	-0.4757	53.4607	1.1476
3	74.40	37.2717	15.1055	15.0939	264.4022	-14.4861	47.6737	0.8526
4	64.50	37.1925	15.1419	15.1319	266.0867	-16.2283	46.1010	0.7707
5	54.03	37.0902	15.9159	15.9072	267.9972	-21.7437	33.9530	0.6382
6	44.46	37.0677	16.2850	16.2777	266.2978	-21.7676	29.8155	0.5639
7	34.15	37.0697	17.7542	17.7483	266.3265	-28.5695	27.3865	0.4656
8	24.39	37.0883	19.2520	19.2475	262.3215	-31.1416	25.7511	0.4090
9	19.69	37.1741	21.6222	21.6183	235.3238	-13.9612	27.8923	0.3481
10	14.37	37.1509	22.4378	22.4349	228.1327	-9.9063	29.5710	0.3272
11	9.74	37.1842	23.0736	23.0715	222.4097	-6.6354	26.5569	0.2879
12	1.52	37.1753	23.1902	23.1899	224.5307	-9.1822	23.4870	0.2391

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D12-3 BGC CTD No: DI03X038

Date: 11-07-93 Time: 13:51 GMT

Lat: 37 34.27N Lon: 11 35.93E Bottom Depth: 632 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	622.57	38.7382	13.9114	13.8167	203.5062	50.1056	24.4640	3.0664
2	403.26	38.7385	13.9491	13.8881	207.5621	45.8573	22.4203	3.0737
3	204.15	38.6740	14.2817	14.2505	211.9861	39.8559	22.3946	3.0713
4	173.65	38.5561	14.4383	14.4117	219.7476	31.4934	22.4892	3.0688
5	149.01	38.2771	14.3904	14.3677	226.7570	25.1579	25.6257	3.0591
6	134.35	37.7329	14.2706	14.2503	248.9107	4.4591	31.8649	3.0472
7	104.43	37.5670	14.5154	14.4995	257.1888	-4.7940	44.9706	1.4553
8	77.31	37.3616	14.9611	14.9491	264.4205	-13.9296	74.9085	1.0004
9	64.40	37.1928	15.1405	15.1305	259.9590	-10.0941	41.2639	0.8551
10	37.79	37.0890	17.0490	17.0426	263.9245	-22.9900	34.2358	0.5479
11	24.43	37.0930	19.5842	19.5797	239.6809	-9.9150	28.3567	0.4391
12	13.91	37.1858	22.9786	22.9757	213.0323	3.0969	26.2108	0.3674

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D12-4 TM CTD No: DI03X039

Date: 11-07-93 Time: 15:33 GMT

Lat: 37 33.93N Lon: 11 35.84E Bottom Depth: 649 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1,2	642.79	38.7392	13.9186	13.8207	204.4621	49.1113	23.4948	3.0626
3	403.48	38.7371	13.9380	13.8770	208.5480	44.9302	24.9269	3.0735
4	204.32	38.6789	14.2387	14.2076	207.8159	44.2341	21.3403	3.0737
5,6	178.64	38.6335	14.3515	14.3242	219.2867	32.2683	20.3973	3.0735
7	148.53	38.3208	14.4282	14.4055	222.8050	28.8527	26.6870	3.0688
8	133.40	37.7680	14.2685	14.2484	247.5748	5.7502	28.4214	3.0640
9	79.25	37.3596	14.8254	14.8132	262.2483	-11.0807	72.5932	1.3229
10	39.46	37.0902	16.9473	16.9407	264.0791	-22.6777	33.2255	0.7235
11	19.50	37.1890	22.2636	22.2596	223.5139	-4.6668	29.5733	9.9975

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D12A-1 BGC + TM CTD No: DI03X034

Date: 11-07-93 Time: 06:13 GMT

Lat: 37 16.81N Lon: 11 58.18E Bottom Depth: 83 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1,2	71.31	37.7438	14.6459	14.6350	250.7793	0.6871	84.5337	1.1272
3,4	60.27	37.5968	14.9344	14.9251	279.4033	-29.1430	73.8252	0.9261
5,6	44.34	37.3617	15.6550	15.6479	268.0494	-20.9503	37.6165	0.7584
7,8	34.60	37.1953	16.5916	16.5859	266.4470	-23.5476	21.5575	0.6392
9,10	24.74	37.2770	18.6013	18.5969	264.4059	-30.6860	22.7082	0.5193
11,12	13.84	37.2365	23.0010	22.9981	231.1898	-15.2082	27.3065	0.3468

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D12A-2 Bioptic CTD No: DI03X035

Date: 11-07-93 Time: 07:21 GMT

Lat: 37 17.08N Lon: 11 57.90E Bottom Depth: 87 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	84.19	37.7810	14.6399	14.6270	264.3959	-12.9575	135.0824	1.2036
2	74.91	37.7339	14.6051	14.5936	267.6357	-15.9501	102.6267	1.0435
3	64.62	37.6108	14.8611	14.8512	272.3640	-21.7626	97.5201	0.8892
4	49.59	37.4527	15.4289	15.4211	274.6451	-26.5892	51.3628	0.6783
5	34.53	37.2040	16.6361	16.6304	275.7339	-33.0550	26.1583	0.5039
6	14.39	37.2541	23.2754	23.2724	229.6432	-14.7106	23.1569	0.3067

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D14-1 Bioptic CTD No: DI03X030

Date: 10-07-93 Time: 07:41 GMT

Lat: 36 40.51N Lon: 12 19.09E Bottom Depth: 1288 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	153.35	38.6989	14.4722	14.4486	220.0833	30.7673	6.8677	3.0151
2	123.14	38.3975	14.5826	14.5636	228.7474	22.0207	8.1108	2.9893
3	104.15	37.7058	14.4079	14.3921	257.7676	-5.0488	14.7676	1.6063
4	84.51	37.5564	14.4816	14.4688	258.6232	-6.0421	31.9619	1.1229
5	68.67	37.4251	14.6262	14.6157	269.6108	-17.5507	78.6045	0.8762
6	54.83	37.2806	14.8819	14.8734	276.2476	-25.2388	18.0062	0.6736
7	34.41	37.1543	16.4193	16.4137	272.8557	-29.0880	9.0975	0.4791
8	13.94	37.4116	23.1070	23.1041	224.2160	-8.8506	9.0772	0.3735

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D14-2 BGC CTD No: DI03X031

Date: 10-07-93 Time: 08:37 GMT

Lat: 36 40.48N Lon: 12 19.00E Bottom Depth: 1287 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	1200.46	38.7197	13.8123	13.6269	207.3446	46.8012	6.2134	0.0000
2	801.53	38.7304	13.8065	13.6844	210.6391	43.5195	4.3823	0.0000
3	403.07	38.7653	14.0174	13.9562	189.3199	63.7115	5.7648	0.0000
4	323.35	38.7642	14.2721	14.2226	212.1601	39.5890	4.8688	0.0000
5	203.53	38.7262	14.4318	14.4005	217.6336	33.3761	5.3689	0.0000
6	124.23	38.3156	14.7337	14.7145	237.2233	12.9213	5.5759	0.0000
7	94.18	37.5825	14.4583	14.4440	263.4637	-10.8057	25.5561	0.0000
8	69.16	37.4401	14.6523	14.6418	263.1434	-11.2374	82.3678	0.0000
9	54.17	37.3107	15.0285	15.0201	261.4715	-11.2356	17.1013	0.0000
10	39.32	37.1548	16.0738	16.0674	266.4638	-21.0613	9.0633	0.0000
11	25.03	37.1699	18.9258	18.9213	252.5652	-20.1008	8.3173	0.0000
12	14.21	37.3652	22.8453	22.8424	224.1812	-7.7747	5.8951	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D14-3 TM CTD No: DI03X032

Date: 10-07-93 Time: 10:26 GMT

Lat: 36 40.50N Lon: 12 19.22E Bottom Depth: 1288 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	1297.43	38.7189	13.8194	13.6184	199.8544	54.2564	8.2540	0.0000
2	1201.04	38.7211	13.8118	13.6263	206.4791	47.6670	7.2177	0.0000
3	1001.09	38.7238	13.7973	13.6438	207.8281	46.3878	7.1517	0.0000
4	702.16	38.7395	13.8375	13.7307	203.2244	50.7618	5.4473	0.0000
5	403.16	38.7677	14.0504	13.9891	206.7706	46.0896	5.4522	0.0000
6	328.97	38.7660	14.2684	14.2181	209.5993	42.1654	8.3111	0.0000
7	254.03	38.7439	14.3844	14.3454	212.1584	39.0601	8.8998	0.0000
8	153.87	38.6917	14.4811	14.4575	215.4349	35.3822	8.8944	0.0000
9	114.10	38.1385	14.7501	14.7324	234.7141	15.6230	14.5658	0.0000
10	69.03	37.4827	14.6078	14.5972	264.2644	-12.2016	94.3115	0.0000
11	46.20	37.2645	15.0661	15.0589	263.7057	-13.5843	16.9516	0.0000
12	29.10	37.1474	17.0438	17.0389	265.3678	-24.4946	10.6561	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D14-4 Bioptic CTD No: DI03X033

Date: 10-07-93 Time: 16:57 GMT

Lat: 36 40.49N Lon: 12 19.17E Bottom Depth: 1288 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	154.02	38.6935	14.4783	14.4547	225.2055	25.6228	14.9657	3.0615
2	124.29	38.5070	14.5749	14.5558	235.1683	15.4683	15.1747	3.0615
3	104.31	37.7008	14.4573	14.4415	264.5099	-12.0320	23.6877	3.0591
4	84.42	37.5028	14.4467	14.4339	264.1398	-11.2990	57.1578	3.0443
5	69.12	37.4153	14.5208	14.5103	266.1572	-13.5528	107.6083	2.9772
6	54.52	37.2871	14.9492	14.9408	274.5230	-23.8585	36.2514	1.1462
7	34.45	37.1576	16.2546	16.2490	273.3393	-28.7993	23.5048	0.8442
8	14.84	37.2475	22.9513	22.9483	236.9626	-20.8081	19.9414	0.6286

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D15-1 BGC CTD No: DI03X040

Date: 12-07-93 Time: 23:05 GMT

Lat: 39 59.94N Lon: 6 0.47E Bottom Depth: 2782 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2788.51	38.4343	13.2355	12.7940	219.2217	38.3591	16.9970	0.0000
2	1998.97	38.4366	13.1233	12.8162	219.3553	38.8097	18.4487	0.0000
3	1000.82	38.4556	13.0626	12.9144	212.8666	45.5869	18.3849	0.0000
4	751.80	38.4879	13.1664	13.0555	207.7800	50.0765	12.9162	0.0000
5	504.91	38.5345	13.3849	13.3103	201.9926	54.6487	15.3760	0.0000
6	303.33	38.3364	13.2002	13.1562	223.9592	33.9641	17.4140	0.0000
7	233.48	38.1192	12.8833	12.8501	246.6683	13.2790	16.1266	0.0000
8	154.02	37.9548	13.1324	13.1103	254.8353	4.2225	19.8446	0.0000
9	69.46	37.3751	14.3273	14.3169	242.7220	10.9220	49.1326	0.0000
10	54.10	37.2680	14.9809	14.9725	259.6845	-9.1472	31.7281	0.0000
11	38.58	37.1401	16.4237	16.4174	263.0203	-19.2521	22.0190	0.0000
12	18.54	37.2118	21.7946	21.7909	229.9893	-9.3517	19.5239	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D15-2 Bioptic CTD No: DI03X041

Date: 13-07-93 Time: 01:53 GMT

Lat: 39 59.92N Lon: 6 0.07E Bottom Depth: 2782 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
4	154.14	37.8526	13.1268	13.1047	256.1856	2.9052	22.2556	0.0000
5	104.54	37.5745	13.8003	13.7849	260.7225	-4.6990	20.1569	0.0000
6	84.09	37.5057	14.1092	14.0966	244.1667	10.3809	25.6863	0.0000
7	69.38	37.3679	14.2629	14.2525	255.8186	-1.8366	50.3716	0.0000
8	54.79	37.2682	14.7079	14.6995	259.1198	-7.2246	41.8921	0.0000
10	34.58	37.1214	16.4843	16.4786	257.7518	-14.2407	19.6043	0.0000
11	14.46	37.2023	21.5431	21.5403	226.6391	-5.0019	17.7992	0.0000
12	1.44	37.2565	22.5704	22.5702	229.8788	-12.2928	17.8829	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D15-3 TM CTD No: DI03X042

Date: 13-07-93 Time: 03:08 GMT

Lat: 39 59.90N Lon: 6 0.06E Bottom Depth: 2782 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2824.34	38.4341	13.2413	12.7936	215.3372	42.2134	13.8969	0.0000
2	2782.88	38.4340	13.2347	12.7942	217.1679	40.4174	13.2258	0.0000
3	1998.61	38.4347	13.1147	12.8077	216.5054	41.7081	15.3930	0.0000
4	1499.48	38.4403	13.0652	12.8393	216.7936	41.6707	15.1706	0.0000
5	1001.03	38.4558	13.0653	12.9171	205.2935	53.1453	15.5359	0.0000
6	534.97	38.5320	13.3816	13.3024	194.0958	62.5669	14.5741	0.0000
7	315.75	38.3458	13.2097	13.1638	216.9993	40.8590	15.5862	0.0000
8	249.14	38.1221	12.8793	12.8439	235.4688	24.4948	16.1209	0.0000
9	133.69	37.8385	13.7063	13.6866	237.0004	19.0878	14.5450	0.0000
10	65.99	37.2993	14.3820	14.3721	249.4823	4.0037	51.1067	0.0000
11	41.25	37.1960	15.9991	15.9924	271.1871	-25.4901	15.5848	0.0000
12	19.98	37.2692	22.3631	22.3590	215.8943	2.4684	14.3879	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D16-3 TM CTD No: DI03X045

Date: 13-07-93 Time: 20:20 GMT

Lat: 40 59.48N Lon: 5 58.56E Bottom Depth: 2615 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2654.88	38.4316	13.2112	12.7930	215.9508	41.7615	0.8622	0.0000
2	2614.49	38.4314	13.2045	12.7933	211.9434	45.8042	1.5226	0.0000
3	2398.19	38.4308	13.1675	12.7935	214.6071	43.3353	1.2337	0.0000
4	1792.56	38.4318	13.0785	12.8055	213.8896	44.5185	0.7252	0.0000
5	1399.40	38.4359	13.0449	12.8349	215.8839	42.6946	1.4697	0.0000
6	1100.12	38.4410	13.0275	12.8643	213.5280	45.1337	0.6691	0.0000
7	401.92	38.5098	13.2683	13.2094	205.0243	52.2640	0.7195	0.0000
8	224.51	38.4561	13.3191	13.2864	204.1155	52.9939	1.4060	0.0000
9	183.89	38.3889	13.2797	13.2530	212.8683	44.5544	0.8493	0.0000
10	153.32	38.3545	13.3523	13.3300	211.8001	45.2991	1.4032	0.0000
11	71.77	38.0309	13.6890	13.6785	253.8953	1.9755	30.8332	0.0000
12	24.61	37.8169	20.7446	20.7399	231.1124	-7.0977	1.9829	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D16-4 Bioptic CTD No: DI03X046

Date: 14-07-93 Time: 07:10 GMT

Lat: 40 55.80N Lon: 5 53.29E Bottom Depth: 2534 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
3	153.82	38.3309	13.2543	13.2320	219.1377	38.5111	3.5314	3.0529
4	124.56	38.2805	13.4310	13.4129	224.5947	32.2135	4.8092	3.0493
5	103.97	38.1832	13.3527	13.3376	232.2918	25.0805	7.7835	3.0179
6	89.19	38.1266	13.3671	13.3542	234.3504	23.0378	16.8124	1.7385
7	79.05	38.0810	13.4526	13.4411	240.2155	16.8001	40.6821	1.2177
8	64.38	37.9928	13.7973	13.7878	270.8031	-15.4294	16.8878	0.9051
9	49.28	37.9339	14.9694	14.9617	277.5001	-27.9314	9.4563	0.6244
10	33.82	37.8290	20.5821	20.5756	239.0708	-14.4160	5.0381	0.3706
11	14.50	37.7810	20.7609	20.7581	229.5294	-5.5330	3.9276	0.1968

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D16-1 Bioptic CTD No: DI03X043

Date: 13-07-93 Time: 13:53 GMT

Lat: 41 0.00N Lon: 6 0.07E Bottom Depth: 2615 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	153.84	38.3788	13.3313	13.3090	214.5337	42.6359	11.0931	3.0562
2	123.27	38.2831	13.2792	13.2614	221.9662	35.6293	10.2082	3.0380
3	105.03	38.2488	13.4539	13.4386	225.8798	30.8602	11.6230	3.0095
4	88.91	38.1450	13.2895	13.2766	233.6038	24.1603	20.4860	1.3927
5	79.39	38.1281	13.3502	13.3387	238.3889	19.0851	27.9471	1.2587
6	64.23	38.0657	13.7123	13.7028	271.2882	-15.5926	222.2589	0.9975
7	49.49	37.8107	14.5712	14.5636	270.2095	-18.4738	20.4361	0.6876
8	34.60	37.8730	20.5273	20.5207	236.0277	-11.2092	7.8906	0.4751
9	14.44	37.8408	20.6612	20.6584	237.9752	-13.6557	6.5898	0.8215

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: D16-2 BGC CTD No: DI03X044

Date: 13-07-93 Time: 15:00 GMT

Lat: 41 0.05N Lon: 6 0.03E Bottom Depth: 2617 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	UpWell. Irrad (ln)
1	2452.20	38.4325	13.1766	12.7934	215.8678	42.0239	5.5309	0.0000
2	1500.11	38.4361	13.0569	12.8309	214.0903	44.4246	3.1150	0.0000
3	1001.34	38.4440	13.0202	12.8722	205.8486	52.8469	3.7643	0.0000
4	502.05	38.4903	13.1577	13.0843	203.7729	54.1251	2.9137	0.0000
5	395.49	38.5007	13.2162	13.1585	200.2184	57.3565	1.5709	0.0000
6	253.56	38.4454	13.1514	13.1148	213.5020	44.5011	0.9366	0.0000
7	154.03	38.3784	13.3500	13.3276	209.0591	48.0139	1.7041	0.0000
8	88.46	38.1464	13.2908	13.2780	224.1669	33.5878	5.6915	0.0000
9	65.94	38.0485	13.7665	13.7568	262.3930	-6.9496	214.6481	0.0000
10	58.53	37.9907	14.0995	14.0907	264.5128	-10.6803	67.5426	0.0000
11	44.83	37.8332	14.8099	14.8030	271.2887	-20.7767	7.8322	0.0000
12	24.26	37.8410	20.5939	20.5892	228.1017	-3.5102	2.1866	0.0000

10.2 CTD bottle spreadsheets - Leg 2

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/1 CTD No: DI03X048

Date: 17-07-93 Time: 22:34 GMT

Lat: 40 59.46N Lon: 6 0.07E Bottom Depth: 2614 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	304.12	38.4717	13.1793	13.1351	213.5019	44.3131	5.7841	2.9905
2	254.07	38.4449	13.1402	13.1035	219.0287	39.0339	6.4838	3.0145
3	203.84	38.4015	13.1212	13.0918	225.1699	33.0629	3.1675	3.0249
4	153.65	38.3633	13.2359	13.2137	222.4116	35.2813	4.8621	3.0322
5	123.73	38.3053	13.2178	13.1999	224.8293	33.0519	6.4439	3.0362
6	104.41	38.2224	13.0639	13.0489	238.8866	19.9373	9.7766	3.0373
7	84.21	38.1342	13.1542	13.1421	248.1846	10.3062	15.1067	3.0395
8	62.34	37.9936	13.7696	13.7605	237.8429	17.6718	443.5477	3.0414
9	49.60	37.9284	14.5570	14.5494	271.3246	-19.7008	21.1292	3.0415
10	34.44	37.9906	20.2764	20.2698	224.3670	1.3164	6.3527	3.0385
11	19.21	37.9428	20.7399	20.7362	227.0654	-3.1978	4.6419	3.0279
12	9.94	37.7448	20.8286	20.8267	238.0593	-14.2875	4.4704	3.0182

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/2 CTD No: DI03X049

Date: 18-07-93 Time: 01:05 GMT

Lat: 40 58.41N Lon: 6 1.36E Bottom Depth: 2618 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	14.33	37.8476	21.1112	21.1084	209.9220	12.5851	5.3188	2.9750
7-12	9.67	37.8416	21.4023	21.4004	229.0052	-7.6425	6.6097	2.9724

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/3 CTD No: DI03X050

Date: 18-07-93 Time: 01:44 GMT

Lat: 40 58.60N Lon: 6 1.32E Bottom Depth: 2617 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	50.86	37.9399	15.3813	15.3732	272.8270	-25.2805	17.1780	2.9199
7-12	24.41	37.8523	20.5737	20.5690	234.0366	-9.3786	6.0122	2.9468

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/4 CTD No: DI03X051

Date: 18-07-93 Time: 02:16 GMT

Lat: 40 58.72N Lon: 6 1.39E Bottom Depth: 2618 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	95.34	38.1548	13.1547	13.1410	232.1829	26.2720	11.6351	2.9200
7-12	64.37	37.9952	13.7361	13.7267	248.6514	7.0333	678.7139	2.9784

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/5 CTD No: DI03X052

Date: 18-07-93 Time: 02:50 GMT

Lat: 40 58.76N Lon: 6 1.29E Bottom Depth: 2618 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	124.70	38.2516	13.0909	13.0730	224.8213	33.8131	10.3894	2.9452
2	104.39	38.1978	13.0838	13.0688	226.6486	32.1103	9.5071	2.9685
3	84.33	38.1115	13.2495	13.2374	240.5181	17.5090	30.5997	2.9856
4	64.67	37.9957	13.6975	13.6880	240.8713	15.0117	450.8972	3.0004
5	54.57	37.9487	14.8005	14.7921	276.2603	-25.8801	23.0559	3.0075
6	44.41	37.8323	16.1779	16.1707	271.3092	-27.4116	12.0013	3.0122
7	34.41	38.0378	19.8232	19.8167	233.3922	-5.9071	10.1527	3.0127
8	24.44	37.9371	20.6131	20.6084	233.4063	-9.0198	6.5831	3.0097
9	19.31	37.8653	20.8201	20.8163	229.1468	-5.4992	7.4895	3.0038
10	14.51	37.7697	20.9188	20.9160	226.5624	-3.1851	5.2380	2.9967
11	9.33	37.8427	21.3265	21.3246	223.2833	-1.6229	7.1925	2.9881
12	1.13	37.7635	22.7376	22.7373	214.1813	2.1321	6.4787	2.9580

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/6 CTD No: DI03X053

Date: 18-07-93 Time: 05:01 GMT

Lat: 40 58.42N Lon: 6 2.11E Bottom Depth: 2620 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	2498.73	38.4312	13.1870	12.7957	199.1991	58.6407	3.3625	0.0000
2	2248.09	38.4309	13.1444	12.7958	203.5785	54.4852	2.5237	0.0000
3	1998.13	38.4311	13.1110	12.8042	205.6734	52.5652	3.9777	0.0000
4	1748.58	38.4328	13.0836	12.8176	204.6380	53.7419	3.5686	0.0000
5	1499.43	38.4330	13.0528	12.8270	205.4958	53.0455	5.9335	0.0000
6	1250.58	38.4360	13.0299	12.8434	203.2992	55.3580	6.6006	0.0000
7	1000.96	38.4466	13.0410	12.8929	198.6178	59.9637	5.5017	0.0000
8	801.42	38.4621	13.0752	12.9573	196.2586	62.1178	7.9421	0.0000
9	601.87	38.4802	13.1370	13.0489	193.9456	64.0770	7.6748	0.0000
10	402.50	38.5015	13.2327	13.1739	194.4120	63.0752	5.2241	0.0000
11	303.31	38.5240	13.3901	13.3456	182.7342	73.8968	3.1949	0.0000
12	202.65	38.4133	13.1868	13.1575	205.0847	52.7847	3.8866	-0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/7 CTD No: DI03X054

Date: 18-07-93 Time: 08:05 GMT

Lat: 40 57.56N Lon: 6 2.08E Bottom Depth: 2627 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	203.83	38.4375	13.2812	13.2516	205.8239	51.5131	5.3791	2.9065
2	154.06	38.3821	13.2897	13.2674	211.7050	45.6762	4.8370	2.8859
3	124.09	38.3232	13.3527	13.3347	213.2061	43.9414	4.0161	1.3668
4	103.98	38.1679	13.0971	13.0823	233.9983	24.7384	11.8370	1.0877
5	94.32	38.1210	13.2228	13.2092	243.5987	14.5533	21.1276	0.9278
6	84.11	38.0754	13.4325	13.4203	246.3696	10.7595	46.2117	0.7631
7	75.82	38.0119	13.6907	13.6796	246.2569	9.6353	258.9875	0.5927
8	64.15	37.9525	13.8987	13.8892	258.4726	-3.5555	144.5784	0.3038
9	44.33	37.7560	15.8043	15.7971	263.7536	-17.9667	13.8263	-0.0005
10	24.62	37.9354	20.7840	20.7792	225.7091	-2.0088	6.3809	-0.1940
11	14.35	37.6832	21.0987	21.0959	222.0519	0.7202	6.7478	-0.2884
12	9.41	37.7213	21.6727	21.6708	222.9939	-2.5366	5.4528	-0.3540

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/8 CTD No: DI03X055

Date: 18-07-93 Time: 09:40 GMT

Lat: 40 56.86N Lon: 6 2.41E Bottom Depth: 2626 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-3	113.70	38.2399	13.1454	13.1291	219.2373	39.1290	11.6718	0.9014
4-6	74.15	38.0492	13.5317	13.5209	238.9944	17.6612	80.8714	0.4090
7-9	9.23	37.7194	21.8110	21.8092	224.1214	-4.2011	5.5191	-0.3932

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/9 CTD No: DI03X056

Date: 18-07-93 Time: 10:52 GMT

Lat: 40 56.25N Lon: 6 2.77E Bottom Depth: 2629 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	125.30	38.2822	13.1914	13.1734	210.7156	47.3410	11.4227	0.9897
2	104.01	38.2234	13.1930	13.1780	222.8318	35.3114	9.2347	0.8203
3	84.22	38.1105	13.2641	13.2520	237.1597	20.7926	26.3805	0.6451
4	64.15	37.9501	13.9382	13.9287	255.0219	-0.3032	172.3956	0.3040
5	53.99	37.9276	15.4347	15.4261	264.4772	-17.1708	18.4353	0.1829
6	44.19	37.7389	16.1692	16.1620	262.9246	-18.8469	16.3288	0.0736
7	34.43	37.9857	20.2977	20.2911	229.2463	-3.6432	10.2736	0.0053
8	24.17	37.9259	20.7940	20.7893	222.2953	1.3772	8.1899	-0.2470
9	19.27	37.7557	21.0685	21.0647	225.5137	-2.7163	7.0578	-0.3104
10	14.03	37.6471	21.3594	21.3566	219.7854	1.9993	7.4534	-0.3522
11	9.51	37.7187	21.8274	21.8255	226.3161	-6.4587	6.9066	-0.4172
12	1.26	37.7236	23.4174	23.4172	206.4714	7.3526	11.0962	-0.6259

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/10 CTD No: DI03X057

Date: 18-07-93 Time: 12:05 GMT

Lat: 40 56.00N Lon: 6 2.60E Bottom Depth: 2631 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	74.27	38.0301	13.6518	13.6409	253.7495	2.3149	292.5855	0.4174
7-12	9.64	37.7249	21.4728	21.4709	211.3931	9.8434	8.4054	-0.4059

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/11 CTD No: DI03X058

Date: 18-07-93 Time: 13:21 GMT

Lat: 40 55.35N Lon: 6 2.54E Bottom Depth: 2633 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	120.68	38.2846	13.3604	13.3429	202.1240	55.0452	7.1665	1.0039
2	100.35	38.1999	13.2627	13.2482	220.2570	37.5587	9.2817	0.8203
3	80.18	38.0695	13.4348	13.4231	239.3434	17.7835	51.9632	0.5467
4	59.87	37.9480	14.3280	14.3189	253.2617	-0.5187	32.2454	0.1370
5	50.07	37.9131	15.8700	15.8619	260.4952	-15.2583	16.2778	0.0112
6	40.02	37.8990	19.1961	19.1887	248.6109	-18.3075	12.4946	-0.1184
7	30.16	37.9882	20.6253	20.6195	222.3659	1.9036	7.2029	-0.1996
8	19.85	37.7269	21.1969	21.1930	229.5438	-7.2194	5.5452	-0.2909
9	15.21	37.6740	21.4675	21.4645	223.7019	-2.3786	4.9286	-0.3455
10	10.61	37.7018	21.8405	21.8384	229.3971	-9.5688	4.7155	-0.3917
11	5.33	37.6832	23.3186	23.3175	206.5446	7.6952	6.7126	-0.4729
12	1.70	37.7079	23.6535	23.6531	211.0365	1.9378	8.7337	-0.5577

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/12 CTD No: DI03X059

Date: 18-07-93 Time: 14:23 GMT

Lat: 40 55.11N Lon: 6 2.54E Bottom Depth: 2634 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1,2	200.55	38.3869	13.0491	13.0203	217.5225	41.1128	6.3314	2.8881
3,4	175.15	38.4023	13.2559	13.2305	211.4056	46.1202	8.5992	2.8713
5,6	150.12	38.3767	13.3565	13.3347	211.8172	45.2244	7.1095	1.3642
7	120.12	38.2835	13.3538	13.3364	217.3605	39.8449	7.6431	1.0446
8	90.03	38.1275	13.1936	13.1807	236.6363	21.6584	22.5612	0.7569
9	80.30	38.0723	13.4391	13.4274	245.6379	11.4621	75.9068	0.6049
10	70.41	37.9840	13.7911	13.7807	251.3615	4.0580	279.5235	0.3758

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/13 CTD No: DI03X060

Date: 18-07-93 Time: 17:50 GMT

Lat: 40 53.87N Lon: 6 2.75E Bottom Depth: 2641 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	119.96	38.2969	13.4665	13.4489	207.3841	49.2140	11.7850	2.9160
2	100.12	38.2043	13.4003	13.3857	219.8860	37.2045	13.4680	1.7330
3	80.14	38.0991	13.3266	13.3151	236.6484	20.9950	44.2827	1.1484
4	60.38	37.9447	14.2177	14.2086	261.6486	-8.3432	42.4286	0.7007
5	50.25	37.9259	15.5203	15.5123	257.1790	-10.2839	20.8453	0.5571
6	40.46	37.9592	17.9789	17.9718	250.5657	-15.0767	13.2752	0.4433
7	30.10	37.9799	20.3735	20.3677	225.9659	-0.6643	9.6743	0.3736
8	20.53	37.8017	20.8102	20.8062	215.3835	8.3872	13.5010	0.3452
9	15.26	37.7245	20.8856	20.8826	227.5195	-3.9496	11.1876	0.3089
10	10.35	37.7198	21.7164	21.7143	213.7844	6.5042	10.8497	0.2696
11	5.23	37.7282	22.1160	22.1149	218.0341	0.6942	12.3097	0.1936
12	1.65	37.7053	23.4166	23.4163	207.9512	5.8984	12.4259	0.1264

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/14 CTD No: DI03X061

Date: 18-07-93 Time: 22:27 GMT

Lat: 40 53.33N Lon: 6 2.72E Bottom Depth: 2646 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	120.05	38.3021	13.4715	13.4540	214.0623	42.5010	10.6834	2.9273
2	100.30	38.1985	13.4295	13.4149	228.5407	28.4069	17.1618	2.9591
3	80.00	38.0728	13.4641	13.4524	245.3717	11.5975	68.4730	2.9784
4	60.12	37.9877	13.9340	13.9250	271.4431	-16.7620	86.8404	2.9931
5	50.31	37.8598	14.7719	14.7641	274.3312	-23.6718	31.2944	3.0017
6	40.25	37.7007	16.5208	16.5142	266.4001	-23.9160	19.1291	3.0070
7	30.19	37.9090	20.5362	20.5303	237.4656	-12.7305	11.4672	3.0078
8	20.22	37.6296	21.3333	21.3293	227.1237	-5.2131	10.6606	3.0033
9	15.20	37.5499	21.2036	21.2006	237.9091	-15.3803	11.4752	2.9991
10	10.45	37.5431	21.3118	21.3098	237.2398	-15.1317	11.7433	2.9921
11	4.88	37.6427	22.3808	22.3798	228.1964	-10.3757	11.7360	2.9819
12	1.30	37.5673	23.4691	23.4689	217.6376	-3.8117	10.1771	2.9500

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/16 CTD No: DI03X062

Date: 19-07-93 Time: 08:29 GMT

Lat: 40 50.36N Lon: 6 5.25E Bottom Depth: 2654 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1,2	200.62	38.3722	13.1093	13.0804	221.9690	36.3735	10.5289	2.8649
3,4	174.41	38.3438	13.1440	13.1189	227.1283	31.0777	12.4930	2.8452
5,6	150.00	38.3098	13.2438	13.2221	226.0187	31.7189	13.1544	1.3650
7,8	119.96	38.2327	13.3127	13.2953	225.5570	31.9447	13.4404	1.0303
9,10	99.36	38.1598	13.4064	13.3920	228.7589	28.3707	20.9855	0.8373
11	89.75	38.0826	13.3487	13.3358	233.1477	24.4067	34.4379	0.7253
12	79.98	38.0557	13.4985	13.4868	246.0342	10.7833	100.7734	0.5521

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/17 CTD No: DI03X063

Date: 19-07-93 Time: 09:10 GMT

Lat: 40 50.39N Lon: 6 5.25E Bottom Depth: 2654 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	83.85	38.0717	13.4587	13.4465	233.5502	23.4484	83.0407	0.5970
2	70.05	38.0243	13.6819	13.6716	255.2722	0.6458	67.2528	0.3495
3	60.08	37.9413	14.2680	14.2589	270.7012	-17.6450	44.2439	0.1894
4	50.02	37.8515	15.0926	15.0848	267.6838	-18.5943	25.3311	0.0563
5	39.83	37.7474	17.1475	17.1408	266.8702	-27.3448	18.1488	-0.0990
6	29.83	37.7758	20.7858	20.7800	227.0255	-3.1221	10.4263	-0.1618
7	20.26	37.5708	21.0114	21.0075	233.1858	-9.9181	13.2582	-0.2752
8	10.33	37.4169	21.1261	21.1241	234.6122	-11.6010	10.5763	-0.3830
9	2.21	37.5655	23.1454	23.1450	217.6162	-2.5862	13.2345	-0.5480

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/18 CTD No: DI03X064

Date: 19-07-93 Time: 10:52 GMT

Lat: 40 49.96N Lon: 6 4.98E Bottom Depth: 2654 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	99.52	38.1525	13.4048	13.3903	222.3819	34.7682	30.8414	0.7002
2	95.02	38.1243	13.4123	13.3985	231.5304	25.6259	39.1252	0.6476
3	89.89	38.0842	13.3445	13.3315	237.3240	20.2498	41.9262	0.5889
4	87.21	38.0531	13.3047	13.2921	241.8972	15.9349	45.2771	0.5574
5	84.11	38.0642	13.4008	13.3886	240.8557	16.4563	51.8093	0.5207
6	81.23	38.0677	13.4643	13.4525	237.9708	19.0051	75.8693	0.4828
7	79.27	38.0710	13.5083	13.4968	243.4310	13.3111	88.9421	0.4516
8	75.98	38.0509	13.5783	13.5672	251.0726	5.3384	100.8302	0.3967
9	73.05	38.0257	13.6141	13.6034	246.4729	9.7934	137.3430	0.3492
10	70.08	38.0224	13.7933	13.7830	258.9325	-3.5852	171.4426	0.3031
11	65.14	38.0114	14.2061	14.1963	270.0699	-16.8105	48.3727	0.2330
12	60.22	37.9381	14.4678	14.4586	271.9990	-19.9435	35.7971	0.1519

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/19 CTD No: DI03X065

Date: 19-07-93 Time: 11:54 GMT

Lat: 40 49.82N Lon: 6 4.79E Bottom Depth: 2655 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	1750.17	38.4294	13.0737	12.8076	199.3843	59.0533	7.0328	0.0000
2	1249.66	38.4307	13.0163	12.8301	199.5937	59.1437	7.9821	0.0000
3	749.75	38.4735	13.1185	13.0082	189.2057	68.9247	5.3999	0.0000
4-7	340.07	38.5391	13.4284	13.3783	181.2093	75.1989	4.4474	0.0000
8	149.75	38.2916	13.2517	13.2301	206.7973	50.9282	6.1873	0.0000
9	74.95	38.0543	13.4610	13.4501	212.0190	44.9955	55.4694	0.0000
10	49.80	37.8576	15.1888	15.1810	248.7848	-0.1756	18.6749	0.0000
11	24.61	37.4952	21.0564	21.0516	203.1682	20.0191	6.0993	0.0000
12	3.24	37.5442	22.6085	22.6079	201.2477	15.8302	6.1940	0.0000

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/20 CTD No: DI03X066

Date: 19-07-93 Time: 16:57 GMT

Lat: 40 49.56N Lon: 6 5.45E Bottom Depth: 2658 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	119.93	38.2622	13.4642	13.4467	215.1368	41.5284	6.0565	2.8600
2	79.68	38.0661	13.4598	13.4483	219.6572	37.3447	43.1090	0.9891
3	65.63	38.0025	13.8844	13.8747	227.5768	27.3345	121.3672	0.7256
4	59.91	38.0046	14.5453	14.5362	271.0869	-19.5235	23.2382	0.6318
5,6	10.26	37.4569	21.3840	21.3819	214.5082	7.4267	4.8782	0.1563

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/21 CTD No: DI03X067

Date: 20-07-93 Time: 01:27 GMT

Lat: 40 47.77N Lon: 6 7.45E Bottom Depth: 2668 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	9.69	37.5753	22.4638	22.4618	214.7869	2.8024	4.0372	3.0054
7-12	5.12	37.6036	22.6819	22.6808	218.2109	-1.4859	4.8202	2.9886

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/22 CTD No: DI03X068

Date: 20-07-93 Time: 02:06 GMT

Lat: 40 47.60N Lon: 6 7.72E Bottom Depth: 2669 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	50.20	37.6980	15.3564	15.3484	260.4135	-12.3779	13.9600	2.9268
7-12	19.27	37.4444	20.9774	20.9736	225.5785	-2.0084	4.5193	2.9477

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/23 CTD No: DI03X069

Date: 20-07-93 Time: 02:30 GMT

Lat: 40 47.50N Lon: 6 7.73E Bottom Depth: 2669 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	89.91	38.0984	13.4044	13.3914	235.2125	22.0261	49.6350	2.9361
7-12	74.27	37.9993	13.7956	13.7846	247.4237	7.9484	97.6411	2.9687

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/24 CTD No: DI03X070

Date: 20-07-93 Time: 08:43 GMT

Lat: 40 46.12N Lon: 6 6.79E Bottom Depth: 2673 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-4	74.10	38.0475	13.6510	13.6402	238.6834	17.3570	83.8820	0.3936

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/25 CTD No: DI03X071

Date: 20-07-93 Time: 10:04 GMT

Lat: 40 45.77N Lon: 6 6.85E Bottom Depth: 2675 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	199.20	38.3464	13.1619	13.1332	213.4888	44.6190	8.2862	2.9346
2	149.08	38.2625	13.2005	13.1790	217.4962	40.5446	8.9438	1.1190
3	119.52	38.1584	13.2382	13.2210	224.2864	33.7246	11.3889	0.8512
4	99.87	38.1501	13.3963	13.3818	221.0775	36.1204	8.6747	0.6666
5	89.88	38.0827	13.4534	13.4403	222.5030	34.5059	25.1600	0.5468
6	74.99	38.0372	13.8512	13.8401	250.5866	4.4399	112.8609	0.3211
7	64.53	37.9431	14.2141	14.2044	263.2924	-9.9664	16.6867	0.1668
8	54.10	37.8316	15.6818	15.6731	264.5153	-18.2552	13.7828	0.0288
9	39.48	37.9650	20.4009	20.3933	218.9879	6.2221	4.0734	-0.1053
10	19.23	37.6266	21.6336	21.6297	217.5426	3.1901	3.2960	-0.3039
11	9.83	37.5643	21.9552	21.9533	221.2634	-1.7043	3.8421	-0.3150
12	4.72	37.5635	21.9443	21.9433	224.0151	-4.4124	4.2527	-0.4246

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA1/26 CTD No: DI03X072

Date: 20-07-93 Time: 11:36 GMT

Lat: 40 45.58N Lon: 6 7.24E Bottom Depth: 2675 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	2499.14	38.4288	13.1856	12.7943	201.2027	56.6483	6.8285	0.0928
2	2250.03	38.4284	13.1436	12.7947	201.5168	56.5549	4.7984	0.0928
3	1999.18	38.4283	13.1078	12.8008	201.2625	56.9975	4.0421	0.0928
4	1748.64	38.4270	13.0697	12.8039	200.5010	57.9615	2.6952	0.0903
5	1498.12	38.4272	13.0408	12.8154	198.9068	59.7072	2.9552	0.0830
6	1248.46	38.4294	13.0138	12.8277	197.4331	61.3200	3.3552	-0.1331
7	999.47	38.4461	13.0419	12.8940	193.9557	64.6221	2.0704	-0.0659
8	797.72	38.4697	13.1139	12.9963	183.0832	75.0776	2.1397	0.0293
9	598.51	38.4962	13.2024	13.1144	188.1390	69.5155	3.0090	-0.1716
10	398.59	38.5257	13.3566	13.2980	181.9355	74.8670	2.7574	-0.0764
11	298.29	38.5050	13.3922	13.3485	183.9060	72.7445	2.1978	-0.1499
12	199.17	38.3481	13.1728	13.1440	196.2144	61.8338	2.8924	-0.1649

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA2/1 CTD No: DI03X082

Date: 23-07-93 Time: 17:52 GMT

Lat: 41 41.91N Lon: 5 36.45E Bottom Depth: 2432 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	200.03	38.4589	13.1779	13.1489	210.5989	47.2440	9.9169	2.9752
2	149.49	38.4198	13.1646	13.1430	214.5825	43.3929	10.8099	2.9907
3	119.39	38.3414	13.0087	12.9917	226.0806	32.8415	11.9211	2.9858
4	99.54	38.3193	13.0200	13.0058	228.1540	30.7444	12.3243	2.9604
5	89.89	38.2985	13.0611	13.0483	231.0988	27.6164	18.7134	2.9173
6	80.41	38.2538	13.0600	13.0485	233.9558	24.8377	39.2578	1.3964
7	69.81	38.2124	13.1184	13.1084	237.0658	21.4873	72.7910	1.1288
8	60.59	38.1790	13.2357	13.2270	245.8215	12.1692	176.4559	0.9156
9	49.83	38.1264	13.6914	13.6840	274.5457	-18.8391	63.6230	0.6932
10	37.59	38.1061	19.6966	19.6895	227.2330	0.6856	12.5111	0.4839
11	19.67	38.0980	19.7661	19.7624	229.6669	-2.0262	11.0500	0.3092
12	2.02	38.0999	19.8705	19.8701	227.8489	-0.6434	11.8537	-0.0459

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA2/2 CTD No: DI03X083

Date: 23-07-93 Time: 19:13 GMT

Lat: 41 41.53N Lon: 5 36.80E Bottom Depth: 2432 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	2465.52	38.4300	13.1810	12.7954	198.3814	59.4917	4.4726	0.0830
2	2249.22	38.4303	13.1437	12.7949	199.1925	58.8757	4.2918	0.0831
3	1998.63	38.4297	13.1023	12.7956	199.8711	58.4151	5.3979	0.0830
4	1747.95	38.4291	13.0690	12.8033	199.6267	58.8357	4.1319	0.0781
5	1497.99	38.4283	13.0350	12.8096	198.4299	60.2132	5.3062	0.0032
6	1248.65	38.4280	13.0031	12.8171	199.0012	59.8105	4.8371	0.0094
7	999.48	38.4393	13.0108	12.8631	184.7494	74.0034	4.4128	-0.0217
8	799.54	38.4586	13.0605	12.9429	191.7179	66.7419	3.7523	-0.0380
9	599.84	38.4808	13.1267	13.0389	181.9433	76.1323	3.5142	-0.0178
10	400.00	38.5028	13.2177	13.1593	188.4884	69.0754	6.6715	-0.0097
11	300.05	38.4962	13.2286	13.1849	191.7180	65.7992	4.9991	0.0122
12	199.73	38.4513	13.1664	13.1376	195.6456	62.2695	5.7743	-0.0445

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA3/1 CTD No: DI03X084

Date: 24-07-93 Time: 01:08 GMT

Lat: 42 9.83N Lon: 5 22.04E Bottom Depth: 2287 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	19.34	38.1205	19.3153	19.3117	213.2225	16.2735	8.3456	2.9940
7-12	5.44	38.1272	19.5238	19.5228	219.2216	9.3895	7.0603	1.2762

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA3/2 CTD No: DI03X085

Date: 24-07-93 Time: 01:54 GMT

Lat: 42 9.55N Lon: 5 22.26E Bottom Depth: 2290 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	50.09	38.1361	13.6549	13.6476	257.7306	-1.8515	100.0718	2.9736
7-12	40.25	38.1139	17.9617	17.9546	222.5498	12.7963	30.5613	2.9952

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA3/3 CTD No: DI03X086

Date: 24-07-93 Time: 02:29 GMT

Lat: 42 9.46N Lon: 5 22.30E Bottom Depth: 2290 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	79.79	38.2910	13.1744	13.1629	214.0671	44.0647	15.0651	2.9612
7-12	56.86	38.1924	13.1824	13.1742	222.7651	35.4836	183.2443	2.9955

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA3/4 CTD No: DI03X087

Date: 24-07-93 Time: 05:00 GMT

Lat: 42 9.28N Lon: 5 22.08E Bottom Depth: 2291 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-3	53.01	38.1626	13.3608	13.3531	228.9521	28.4109	170.2363	0.7444
4-8	5.39	38.1273	19.4957	19.4947	213.6814	15.0474	14.0069	0.0095

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA3/5 CTD No: DI03X088

Date: 24-07-93 Time: 06:13 GMT

Lat: 42 9.21N Lon: 5 22.03E Bottom Depth: 2290 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-4	79.67	38.2692	13.0595	13.0481	222.9098	35.8615	19.5768	0.9725
5-8	56.57	38.1742	13.2825	13.2743	234.4464	23.3070	269.4553	0.6055
9-12	4.71	38.1270	19.4908	19.4899	218.1283	10.6214	14.5377	-0.2663

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA3/6 CTD No: DI03X089

Date: 24-07-93 Time: 07:45 GMT

Lat: 42 9.53N Lon: 5 22.13E Bottom Depth: 2290 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	2319.37	38.4303	13.1558	12.7952	195.2814	62.7231	9.2142	0.0928
2	2000.40	38.4294	13.1042	12.7970	195.5100	62.7672	9.8635	0.0903
3	1749.71	38.4288	13.0699	12.8039	196.1338	62.3247	8.4835	0.0886
4	1499.30	38.4286	13.0389	12.8132	195.1066	63.5151	8.1818	0.0879
5	1249.04	38.4303	13.0136	12.8274	193.3889	65.3637	9.4954	0.0827
6	999.59	38.4451	13.0358	12.8880	189.9123	68.6990	9.9594	0.0635
7	799.31	38.4666	13.0931	12.9754	188.8809	69.3945	11.1807	0.0102
8	599.42	38.4992	13.2013	13.1132	186.0300	71.6251	10.0590	0.0250
9	399.63	38.5264	13.3156	13.2570	183.5608	73.4541	7.9334	0.0224
10	299.91	38.5355	13.3837	13.3398	185.7494	70.8964	7.1493	-0.0104
11	199.93	38.4878	13.3051	13.2760	190.4934	66.6379	9.1605	-0.0178
12	149.98	38.4403	13.2469	13.2252	197.1578	60.3536	9.4435	-0.1617

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA3/7 CTD No: DI03X090

Date: 24-07-93 Time: 10:50 GMT

Lat: 42 9.86N Lon: 5 23.35E Bottom Depth: 2292 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	148.70	38.3859	13.0839	13.0626	210.6662	47.7877	10.1318	1.3157
2	119.54	38.3480	13.0491	13.0320	214.8026	43.8960	12.2166	1.0156
3	99.36	38.3453	13.2468	13.2325	211.5155	46.1492	12.5468	0.8355
4	79.54	38.3000	13.2330	13.2215	214.5928	43.2171	18.3948	0.6573
5	70.10	38.2429	13.1902	13.1801	212.7293	45.3973	62.4157	0.5556
6	55.49	38.1724	13.2731	13.2651	232.8463	24.9591	413.1173	0.2646
7	49.53	38.1477	13.5544	13.5472	252.1387	4.2418	147.4137	0.1330
8	41.32	38.1268	14.1409	14.1347	255.7492	-2.3406	94.4217	-0.0150
9	29.82	38.0807	18.4940	18.4887	224.5488	8.5141	20.6106	-0.1415
10	19.79	38.0850	18.9476	18.9440	225.3326	5.7720	17.5367	-0.2685
11	9.36	38.1245	19.3238	19.3221	232.1798	-2.7253	14.9969	-0.3982
12	4.73	38.1103	19.4517	19.4508	232.8951	-3.9589	10.8322	-0.4787

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA4/1 CTD No: DI03X091

Date: 24-07-93 Time: 14:03 GMT

Lat: 42 26.25N Lon: 5 14.14E Bottom Depth: 2115 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	150.07	38.4665	13.3290	13.3071	204.5497	52.4915	10.9895	2.9812
2	120.27	38.4434	13.3366	13.3191	205.7680	51.2705	11.1275	1.4305
3	99.75	38.4257	13.3277	13.3132	206.7720	50.3413	11.9087	1.1411
4	79.88	38.3769	13.2582	13.2467	209.5438	48.0106	14.0910	0.9715
5	69.98	38.3490	13.2299	13.2198	210.4120	47.3353	25.2961	0.8271
6	59.94	38.3378	13.2250	13.2164	214.9283	42.8627	30.8085	0.6939
7	45.22	38.3076	13.2422	13.2357	216.9449	40.8046	151.6966	0.4547
8	32.26	38.1877	13.4405	13.4358	250.2149	6.6928	964.0944	0.0895
9	25.24	38.1263	14.3344	14.3306	264.7837	-12.3518	110.5401	-0.0907
10	18.07	38.0767	15.7723	15.7694	254.5418	-9.0840	26.5896	-0.2229
11	10.12	38.0147	17.2877	17.2860	238.7492	-0.2471	12.4232	-0.3281
12	5.30	38.0139	17.8254	17.8245	217.0808	19.0109	9.0631	-0.4103

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA4/2 CTD No: DI03X092

Date: 24-07-93 Time: 15:28 GMT

Lat: 42 25.74N Lon: 5 15.27E Bottom Depth: 2133 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	1999.45	38.4295	13.1063	12.7993	193.4636	64.8019	8.6817	0.0854
2	1749.41	38.4296	13.0733	12.8073	192.5540	65.8849	3.5599	0.0830
3	1500.20	38.4318	13.0503	12.8244	190.1734	68.3832	4.5049	0.0830
4	1249.16	38.4326	13.0206	12.8343	192.6384	66.0736	4.7637	0.0745
5	999.48	38.4487	13.0491	12.9012	191.3217	67.2141	4.1653	0.0621
6	799.01	38.4661	13.0892	12.9715	191.2463	67.0505	4.0246	-0.1689
7	600.74	38.4889	13.1591	13.0710	185.5431	72.3499	2.8185	-0.0111
8	399.57	38.5267	13.3059	13.2473	183.5844	73.4802	3.1265	-0.0464
9	300.24	38.5375	13.3740	13.3299	181.6286	75.0648	1.8308	-0.0686
10	199.99	38.4764	13.2320	13.2029	191.3958	66.1358	2.1450	-0.0916
11	150.03	38.4191	13.1311	13.1095	197.9421	60.2103	3.1123	-0.1002
12	38.98	38.2037	13.7542	13.7485	234.7753	20.4853	172.9902	0.0692

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/1 CTD No: DI03X097

Date: 26-07-93 Time: 01:04 GMT

Lat: 42 44.04N Lon: 5 4.81E Bottom Depth: 1592 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	14.49	37.9559	18.6744	18.6718	232.1322	0.3240	8.2692	3.0279
7-12	4.93	37.9519	18.6731	18.6722	240.9382	-8.4707	7.3538	3.0136

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/2 CTD No: DI03X098

Date: 26-07-93 Time: 01:44 GMT

Lat: 42 43.85N Lon: 5 4.82E Bottom Depth: 1566 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	29.67	38.0088	13.8822	13.8778	245.3238	9.5890	17.3962	3.0076
7-12	19.26	38.0319	16.8829	16.8797	244.5866	-4.2640	9.5744	3.0176

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/3 CTD No: DI03X099

Date: 26-07-93 Time: 02:17 GMT

Lat: 42 43.70N Lon: 5 4.70E Bottom Depth: 1501 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	79.78	38.1968	13.2646	13.2531	217.5125	40.2980	9.3817	2.9935
7-12	46.54	38.0802	13.3882	13.3814	232.0175	25.3351	125.0107	3.0179

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/4 CTD No: DI03X100

Date: 26-07-93 Time: 05:00 GMT

Lat: 42 43.37N Lon: 5 4.50E Bottom Depth: 1418 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-7	45.00	38.0621	13.3495	13.3430	231.2059	26.3775	113.9852	0.8337
8-12	4.67	37.9745	18.1088	18.1079	221.1151	13.7796	7.0834	0.1771

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/5 CTD No: DI03X101

Date: 26-07-93 Time: 06:09 GMT

Lat: 42 42.93N Lon: 5 3.97E Bottom Depth: 1422 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-4	79.93	38.1497	13.1178	13.1064	211.8339	46.8233	7.3268	1.0732
5-8	50.42	38.0755	13.2673	13.2600	221.0096	36.9824	46.2342	0.6894
9-12	4.66	37.9753	18.1903	18.1895	232.7024	1.8330	4.8268	-0.0313

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/6 CTD No: DI03X102

Date: 26-07-93 Time: 08:11 GMT

Lat: 42 41.69N Lon: 5 4.24E Bottom Depth: 1529 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	1551.29	38.4302	13.0382	12.8042	193.2709	65.3522	3.4596	0.0610
2	1249.74	38.4376	13.0401	12.8536	191.9242	66.6767	3.0974	0.0586
3	999.36	38.4603	13.0981	12.9499	186.9129	71.3461	3.4998	0.0325
4	899.21	38.4715	13.1310	12.9979	188.5766	69.4915	3.6080	0.0316
5	799.22	38.4828	13.1660	13.0479	183.6261	74.2403	3.6028	0.0324
6	697.88	38.4945	13.2017	13.0987	188.0824	69.5785	3.9359	0.0231
7	599.87	38.5145	13.2765	13.1880	181.4409	75.7970	2.9261	0.0266
8	499.92	38.5354	13.3596	13.2858	179.6947	77.0765	2.1348	0.0071
9	398.84	38.5488	13.4205	13.3616	182.2053	74.2284	2.3990	0.0035
10	299.95	38.5343	13.4179	13.3738	183.5260	72.9443	1.7755	-0.0081
11	201.31	38.4438	13.3246	13.2953	195.7403	61.3599	3.3684	-0.1248
12	4.75	37.9790	18.2477	18.2469	220.1337	14.1448	4.8473	0.1039

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/7 CTD No: DI03X103

Date: 26-07-93 Time: 11:59 GMT

Lat: 42 42.28N Lon: 5 5.23E Bottom Depth: 1566 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	199.59	38.4579	13.3179	13.2888	191.6449	65.4680	4.0331	3.0017
2	180.02	38.3695	13.1332	13.1073	205.3748	52.8464	4.6393	2.9765
3	139.84	38.3472	13.3260	13.3057	201.9388	55.3093	3.5300	1.2497
4	99.31	38.2168	13.2389	13.2245	216.7775	41.1358	4.3760	0.8589
5	79.85	38.1536	13.1789	13.1674	222.9984	35.3313	12.7683	0.6777
6	69.36	38.1389	13.2481	13.2381	226.0674	31.9232	28.0860	0.5691
7	59.45	38.1079	13.2754	13.2669	230.4417	27.4554	63.8949	0.4468
8	50.26	38.0849	13.3267	13.3194	231.6849	25.9812	108.1684	0.3447
9	40.02	38.0501	13.5127	13.5068	247.6032	9.1497	40.5373	0.2309
10	23.90	38.0139	15.0801	15.0763	255.9728	-7.0705	9.6158	0.1139
11	10.18	38.0124	18.1538	18.1520	229.1097	5.5339	5.6563	-0.0536
12	5.34	38.0116	18.1753	18.1743	236.0958	-1.5453	6.3694	0.0126

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA5/8 CTD No: DI03X104

Date: 26-07-93 Time: 13:37 GMT

Lat: 42 41.09N Lon: 5 5.17E Bottom Depth: 1574 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	374.44	38.5509	13.4400	13.3848	183.7590	72.5702	3.1238	3.0249
7-10	43.82	38.0622	13.3913	13.3849	237.1940	20.1712	154.3837	0.3086
11-12	4.64	38.0126	18.1793	18.1784	228.2570	6.2744	5.4443	-0.0471

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA6/1 CTD No: DI03X116

Date: 28-07-93 Time: 10:24 GMT

Lat: 42 55.84N Lon: 4 59.48E Bottom Depth: 685 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	704.67	38.4907	13.1969	13.0929	187.5496	70.1425	7.5845	3.0364
2	499.82	38.5322	13.3684	13.2946	182.0380	74.6928	7.8097	3.0395
3	299.57	38.5036	13.3645	13.3206	185.7307	71.0663	7.9542	3.0395
4	199.25	38.3972	13.2634	13.2344	194.8793	62.6155	9.1079	3.0273
5	149.64	38.3250	13.3146	13.2928	196.9831	60.3604	7.2219	2.9023
6	99.50	38.1854	13.2641	13.2497	218.0151	39.8168	17.6853	0.9395
7	79.73	38.1230	13.2665	13.2550	229.7359	28.1840	41.2642	0.7225
8	59.65	38.0756	13.4792	13.4705	242.7550	14.1310	105.1293	0.4452
9	49.83	38.0598	13.6726	13.6653	240.5116	15.3979	106.3793	0.3197
10	40.18	38.0298	14.2054	14.1994	248.6268	4.6069	51.5270	0.2270
11	20.21	38.0237	16.2119	16.2085	242.3679	1.0855	15.8645	0.0165
12	4.61	38.0181	16.9486	16.9478	241.9358	-1.8943	9.3617	-0.4066

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA7/1 CTD No: DI03X110

Date: 28-07-93 Time: 01:09 GMT

Lat: 43 5.52N Lon: 4 56.27E Bottom Depth: 111 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	9.64	37.2751	16.8320	16.8304	239.1243	2.5395	117.1760	2.9957
7-12	0.65	35.5089	16.8239	16.8238	248.5758	-4.2709	191.4951	0.7746

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA7/2 CTD No: DI03X111

Date: 28-07-93 Time: 01:42 GMT

Lat: 43 5.34N Lon: 4 56.23E Bottom Depth: 110.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	39.91	38.0860	13.5035	13.4977	240.3967	16.3463	18.7307	2.9764
7-12	19.91	38.0543	14.5072	14.5042	255.0668	-3.3898	15.4458	2.9956

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA7/3 CTD No: DI03X112

Date: 28-07-93 Time: 02:17 GMT

Lat: 43 5.57N Lon: 4 56.09E Bottom Depth: 110 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	79.81	38.1567	13.1712	13.1598	225.1261	33.2389	13.8939	2.9909
7-12	59.53	38.1191	13.1874	13.1788	232.3934	25.9475	23.7171	3.0102

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA7/4 CTD No: DI03X113

Date: 28-07-93 Time: 05:03 GMT

Lat: 43 5.65N Lon: 4 55.27E Bottom Depth: 108.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-3	60.21	38.0941	13.3075	13.2988	231.7969	25.9548	40.3718	1.2437
4-6	5.02	36.9050	16.8666	16.8658	239.4080	2.6384	124.7195	0.1508

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA7/5 CTD No: DI03X114

Date: 28-07-93 Time: 06:06 GMT

Lat: 43 5.46N Lon: 4 56.55E Bottom Depth: 111.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-4	64.99	38.1210	13.2558	13.2464	223.9235	34.0554	64.0796	0.9374
5-8	4.99	37.4450	16.7140	16.7132	233.4788	8.4827	98.4036	-0.1507
9-12	1.00	34.0999	16.8932	16.8931	242.6596	3.4128	71.2205	-0.4013

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA7/6 CTD No: DI03X115

Date: 28-07-93 Time: 08:01 GMT

Lat: 43 5.24N Lon: 4 56.44E Bottom Depth: 111 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	110.36	38.2186	13.2015	13.1856	205.6763	52.4298	11.9559	1.5142
2	79.96	38.1485	13.1691	13.1577	227.4370	30.9523	18.2151	0.9074
3	59.82	38.1155	13.2864	13.2777	228.8903	28.9373	63.8058	0.6506
4	49.26	38.0982	13.3918	13.3847	236.9210	20.3837	29.5251	0.4980
5	40.44	38.0766	13.5907	13.5848	244.5675	11.7383	23.9444	0.3751
6	29.56	38.0594	14.4384	14.4340	248.4776	3.5359	22.0422	0.2190
7	19.95	37.9470	16.1149	16.1117	246.2303	-2.2059	32.7888	0.0536
8	9.78	37.4627	16.6533	16.6517	247.9772	-5.7597	90.1610	-0.1797
9-12	4.88	37.3333	16.8235	16.8227	251.3143	-9.6967	58.2972	-0.3419

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA8/1 CTD No: DI03X117

Date: 28-07-93 Time: 13:45 GMT

Lat: 43 12.46N Lon: 4 50.52E Bottom Depth: 95 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	95.84	38.2150	13.2037	13.1899	210.4522	47.6481	14.8697	1.3396
2	80.10	38.1733	13.2054	13.1939	225.3101	32.8486	20.4035	1.0174
3	69.73	38.1386	13.2071	13.1971	227.3451	30.8604	24.0063	0.8869
4	59.68	38.1077	13.3143	13.3056	229.7029	27.9915	68.0552	0.7336
5	49.96	38.1019	13.3305	13.3233	230.8020	26.8165	92.1198	0.5784
6	39.28	38.0681	13.5855	13.5798	238.1283	18.2183	50.7274	0.4241
7	29.66	38.0476	13.8399	13.8355	245.3066	9.7615	57.0461	0.2901
8	17.62	37.9760	14.7824	14.7796	248.5999	1.8281	56.7924	0.0724
9	12.50	37.8085	15.2845	15.2826	249.2423	-1.0254	167.7213	-0.0635
10	5.00	37.5507	16.3650	16.3642	240.5074	2.9278	60.7343	-0.3083
11	0.44	30.8600	18.8215	18.8215	216.3896	5.4683	99.4290	-0.5973
12	0.19	30.7641	18.8416	18.8415	666.6937	-424.7888	**********	-0.6213

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/3 CTD No: DI03X075

Date: 22-07-93 Time: 01:05 GMT

Lat: 43 17.73N Lon: 4 48.74E Bottom Depth: 59 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	7.27	37.7458	15.3728	15.3717	266.1858	-18.3031	37.4985	3.0006
7-12	0.47	35.4915	17.0119	17.0118	256.7977	-13.3481	50.6555	1.0209

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/4 CTD No: DI03X076

Date: 21-07-93 Time: 01:34 GMT

Lat: 43 17.77N Lon: 4 48.48E Bottom Depth: 59 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	14.77	37.9776	15.1947	15.1924	261.7030	-13.3059	29.3495	2.9883
7-12	9.96	37.9720	15.1819	15.1803	270.3058	-21.8376	27.8657	2.9956

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/5 CTD No: DI03X077

Date: 21-07-93 Time: 01:55 GMT

Lat: 43 17.64N Lon: 4 48.77E Bottom Depth: 60 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	40.29	38.1124	13.2935	13.2877	242.4270	15.3685	197.7587	2.9960
7-12	20.02	37.9971	14.9216	14.9185	247.1145	2.5928	24.1489	3.0102

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/6 CTD No: DI03X078

Date: 22-07-93 Time: 07:03 GMT

Lat: 43 16.33N Lon: 4 49.80E Bottom Depth: 80 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-3	39.57	38.1109	13.2664	13.2607	238.7194	19.2205	65.5059	0.6747
4-6	29.77	38.0868	13.3979	13.3936	248.5469	8.7443	48.7945	0.4537
7-9	3.13	37.8709	15.1992	15.1987	249.3822	-0.8443	15.2900	-0.3864

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/7 CTD No: DI03X079

Date: 22-07-93 Time: 09:44 GMT

Lat: 43 17.55N Lon: 4 48.79E Bottom Depth: 62.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1,2	64.28	38.1466	13.1642	13.1550	218.8557	39.5625	14.0365	0.9734
3,4	49.00	38.1359	13.1884	13.1814	229.7411	28.5672	30.4434	0.5775
5,6	32.98	38.1125	13.2738	13.2691	229.1402	28.7579	137.3628	0.2016
7,8	26.38	38.1099	13.3009	13.2971	222.0918	35.6685	217.6017	0.0380
9,10	9.63	37.9580	15.2573	15.2558	252.0485	-3.9266	14.3550	-0.3525
11,12	1.98	37.9538	15.2687	15.2684	255.6302	-7.5575	10.9104	-0.6150

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/8 CTD No: DI03X080

Date: 22-07-93 Time: 11:34 GMT

Lat: 43 17.27N Lon: 4 53.47E Bottom Depth: 71 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1,2	69.49	38.1910	13.1996	13.1897	225.2041	32.9563	18.4848	0.9078
3,4	39.42	38.1354	13.2013	13.1957	239.0310	19.2101	42.6482	0.5166
5,6	30.27	38.1099	13.2879	13.2835	238.4450	19.3839	54.9875	0.3652
7,8	8.03	37.7483	14.9742	14.9730	256.0822	-6.2519	51.4931	-0.2169
9,10	4.25	36.5108	15.3883	15.3876	257.4659	-7.7733	28.7926	-0.3922
11,12	1.66	35.0527	15.5687	15.5684	253.5243	-2.4818	27.3524	-0.6044

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/9 CTD No: DI03X081

Date: 22-07-93 Time: 13:54 GMT

Lat: 43 16.32N Lon: 4 53.08E Bottom Depth: 80.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	49.77	38.1437	13.1900	13.1829	248.8068	9.4805	19.2743	0.6813
2	40.14	38.1286	13.2689	13.2631	251.4777	6.4201	43.6011	0.4981
3	30.07	38.0815	13.3689	13.3645	257.9558	-0.5046	99.8739	0.3331
4	24.98	38.0672	13.5859	13.5822	262.1691	-5.8231	54.2875	0.2757
5	20.10	38.0289	13.7142	13.7112	267.3973	-11.6530	35.4079	0.2315
6	14.95	37.9790	14.5978	14.5955	271.5518	-20.2104	11.8350	0.1990
7	9.81	37.9562	14.9433	14.9417	265.8441	-16.1808	13.0896	0.1333
8	4.91	35.9133	15.8211	15.8203	260.9768	-12.4860	23.4837	0.0049
9	2.95	34.6625	15.8216	15.8211	264.8682	-14.4722	30.1968	-0.2126
10-12	0.94	32.6605	15.8317	15.8316	270.8543	-17.4264	28.5032	-0.5230

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MA9/10 CTD No: DI03X109

Date: 27-07-93 Time: 19:58 GMT

Lat: 43 16.59N Lon: 4 52.81E Bottom Depth: 78.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-12	1.64	35.1391	16.7268	16.7265	235.9657	9.3467	64.7854	0.9065

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MC1/1 CTD No: DI03X093

Date: 25-07-93 Time: 05:08 GMT

Lat: 42 0.01N Lon: 3 41.86E Bottom Depth: 984 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	988.95	38.4514	13.0493	12.9030	191.6296	66.9007	2.1493	-0.1470
2	399.02	38.5336	13.3555	13.2968	188.8786	67.9171	1.9656	0.0287
3	249.81	38.4906	13.2991	13.2627	196.4961	60.6622	2.1202	-0.0066
4	123.86	38.3432	13.2396	13.2217	207.0396	50.6664	2.9782	-0.4040
5	99.99	38.2462	13.1468	13.1324	207.9417	50.4072	7.3321	-0.4374
6	90.02	38.2307	13.2265	13.2135	215.9221	42.0336	5.7260	-0.0576
7	80.17	38.1752	13.1930	13.1814	216.3295	41.8916	22.8933	0.0003
8	63.20	38.0759	13.3422	13.3331	227.6925	29.9067	235.6231	0.0156
9	50.07	38.0412	15.3238	15.3158	245.3311	2.3407	22.9501	0.0043
10	40.12	37.8399	18.5017	18.4945	218.9210	14.4448	10.0150	0.0396
11	20.03	37.9860	19.2143	19.2106	215.7614	14.3453	6.9106	0.0747
12	5.36	37.9820	19.2030	19.2020	222.6092	7.5508	5.9731	0.1119

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MC2/1 CTD No: DI03X094

Date: 25-07-93 Time: 10:04 GMT

Lat: 42 18.02N Lon: 3 58.25E Bottom Depth: 1350 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	1337.77	38.4324	13.0155	12.8155	198.0620	60.6770	2.2283	0.0562
2	799.94	38.4604	13.0660	12.9483	187.0401	71.3879	2.4361	0.0398
3	599.93	38.4884	13.1569	13.0689	182.6582	75.2472	3.0352	0.0439
4	379.47	38.5211	13.2888	13.2332	183.0030	74.1601	2.3298	0.0032
5	100.04	38.3685	13.2747	13.2602	190.1984	67.2835	2.8046	-0.0709
6	80.00	38.2907	13.1485	13.1370	204.3972	53.8709	5.4263	-0.3789
7	70.25	38.2409	13.1145	13.1045	212.0298	46.4975	12.7498	-0.3498
8	55.48	38.2129	13.2251	13.2171	213.7944	44.1973	37.1718	-0.2810
9	44.57	38.1492	13.3178	13.3114	226.7684	30.8405	182.2748	-0.2637
10	35.29	38.0874	15.1745	15.1690	237.6423	10.6856	38.1009	-0.1302
11	19.98	37.8001	18.9054	18.9017	213.7541	17.9250	8.8862	0.0723
12	5.26	37.7126	19.8071	19.8061	215.5908	12.4002	6.0321	0.1097

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MC3/1 CTD No: DI03X095

Date: 25-07-93 Time: 14:50 GMT

Lat: 42 37.08N Lon: 4 13.52E Bottom Depth: 742 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	778.88	38.4924	13.1988	13.0836	187.6949	69.9843	4.1388	3.0371
2	597.27	38.5197	13.2964	13.2082	189.6279	67.4979	2.7725	3.0411
3	449.09	38.5371	13.3847	13.3185	187.3612	69.2769	3.2350	3.0420
4	299.87	38.5152	13.3580	13.3140	188.0788	68.7334	3.7214	3.0420
5	149.45	38.3895	13.2050	13.1834	199.6278	58.1849	2.7576	3.0078
6	99.25	38.2889	13.2479	13.2336	206.2073	51.5425	4.8737	1.1973
7	79.49	38.1996	13.2307	13.2193	209.1099	48.8738	11.1666	0.9727
8	69.60	38.1623	13.2376	13.2276	216.0908	41.9170	22.7888	0.8405
9	55.06	38.0596	13.3560	13.3481	236.6758	20.8777	100.1040	0.6178
10	47.05	38.0445	13.5318	13.5250	247.8805	8.7820	180.6192	0.4813
11	24.71	37.7070	17.8178	17.8134	235.2746	1.2880	13.7819	0.2050
12	4.79	37.6050	19.2111	19.2102	229.4189	1.2244	7.8116	-0.0380

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MC4/1 CTD No: DI03X096

Date: 25-07-93 Time: 19:25 GMT

Lat: 42 55.53N Lon: 4 29.77E Bottom Depth: 480 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	482.11	38.5251	13.3390	13.2679	178.0115	78.8838	2.4660	3.0347
2	399.60	38.5183	13.3564	13.2976	184.3081	72.5075	2.7944	3.0371
3	299.55	38.4774	13.2981	13.2544	185.9393	71.2452	3.6737	3.0395
4	200.16	38.2643	13.2254	13.1964	205.1739	52.7337	3.3823	3.0396
5	149.89	38.2104	13.2166	13.1949	215.1148	42.9256	4.4584	3.0420
6	99.91	38.1645	13.1959	13.1816	224.4114	33.8113	7.9069	3.0420
7	80.02	38.1448	13.2258	13.2142	220.9684	37.1296	16.0508	3.0420
8	60.28	38.1009	13.3115	13.3027	224.7509	32.9691	45.8504	3.0432
9	44.17	38.0725	13.5497	13.5432	237.2448	19.2802	63.7799	3.0438
10	28.31	38.0234	14.0689	14.0647	244.9592	8.9774	16.5116	3.0420
11	18.20	37.8970	16.8425	16.8395	229.2146	11.4904	9.6990	3.0418
12	4.84	37.7058	19.3574	19.3565	214.9606	14.9248	6.5414	3.0304

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/1 CTD No: DI03X120

Date: 30-07-93 Time: 01:04 GMT

Lat: 42 47.49N Lon: 3 44.43E Bottom Depth: 137 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	19.01	37.8425	19.1457	19.1422	226.1212	4.4738	15.0325	2.9956
7-12	5.25	37.8525	20.5234	20.5224	218.0827	6.7788	10.6823	2.9849

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/2 CTD No: DI03X121

Date: 30-07-93 Time: 01:38 GMT

Lat: 42 47.80N Lon: 3 44.79E Bottom Depth: 137 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	49.74	38.0986	13.2752	13.2681	238.5155	19.3976	155.5331	2.9391
7-12	39.88	38.0678	13.6095	13.6037	260.1373	-3.9147	148.9976	2.9593

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/3 CTD No: DI03X122

Date: 30-07-93 Time: 02:06 GMT

Lat: 42 48.15N Lon: 3 44.83E Bottom Depth: 134 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-6	78.97	38.1306	13.0685	13.0572	229.0162	29.9320	19.2637	2.9633
7-12	59.28	38.1177	13.1218	13.1133	236.2286	22.4595	34.2991	2.9907

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/4 CTD No: DI03X123

Date: 30-07-93 Time: 05:23 GMT

Lat: 42 47.95N Lon: 3 45.51E Bottom Depth: 135 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-3	50.29	38.0875	13.3235	13.3162	238.5174	19.1613	129.0394	0.8147
4-6	4.87	37.8491	20.3013	20.3004	211.2483	14.5219	9.4677	0.1594

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/5 CTD No: DI03X124

Date: 30-07-93 Time: 06:17 GMT

Lat: 42 47.22N Lon: 3 44.51E Bottom Depth: 139 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-4	60.16	38.1075	13.1507	13.1421	228.5407	30.0115	54.4215	0.7935
5-8	36.01	38.0344	14.0863	14.0809	231.6632	22.1678	74.9220	0.3480
9-12	4.81	37.8540	20.0575	20.0566	214.7029	12.0613	10.6387	0.0148

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/6 CTD No: DI03X125

Date: 30-07-93 Time: 10:04 GMT

Lat: 42 47.45N Lon: 3 44.82E Bottom Depth: 138 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
2	129.61	38.1852	13.0676	13.0491	214.9692	43.8950	6.8620	2.9557
3	110.04	38.1815	13.0643	13.0486	216.4662	42.4216	6.2386	1.3583
4	90.00	38.1489	13.0705	13.0577	219.2936	39.6143	10.3573	0.9364
5	70.13	38.1148	13.0944	13.0844	221.9063	36.9309	25.5267	0.7276
6	60.08	38.1075	13.1478	13.1392	231.0233	27.5442	51.1640	0.5710
7	49.93	38.0947	13.2195	13.2123	224.6935	33.5182	124.6157	0.4921
8	39.91	38.0763	13.3657	13.3599	231.2116	26.2646	119.1683	0.3507
9	29.85	38.0397	13.9992	13.9948	243.5737	10.6920	85.2732	0.1010
10	19.65	37.9586	17.0873	17.0839	231.2617	8.2323	13.7274	-0.0073
12	9.68	37.8505	20.0819	20.0801	212.3616	14.3067	7.0651	-0.1623
12	4.65	37.8507	20.1578	20.1569	224.0867	2.2693	6.4388	-0.2582
1	0.54	37.8496	20.3242	20.3241	217.1701	8.5061	5.3927	-0.3978

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/7 CTD No: DI03X126

Date: 30-07-93 Time: 13:57 GMT

Lat: 42 50.64N Lon: 3 45.37E Bottom Depth: 118.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	109.77	38.1923	13.0764	13.0607	215.3079	43.4984	6.4766	2.9310
2	99.92	38.1836	13.0596	13.0453	215.5225	43.3868	8.3516	2.8808
3	89.93	38.1752	13.0523	13.0394	219.9319	39.0296	7.5461	1.3808
4	80.10	38.1624	13.0337	13.0223	221.3233	37.7570	10.4649	1.1045
5	70.07	38.1282	12.9971	12.9872	221.7112	37.6179	18.2451	0.9388
6	59.89	38.1225	13.0473	13.0388	223.6521	35.4208	41.6707	0.8034
7	49.97	38.1137	13.0732	13.0661	223.7505	35.2002	116.9190	0.6266
8	40.51	38.0897	13.1195	13.1137	232.8906	25.8552	295.0078	0.4293
9	29.43	38.0702	13.7544	13.7501	252.1137	3.3577	65.8774	0.1896
10	20.08	37.9602	17.2940	17.2906	233.0782	5.4737	12.1261	0.0435
11	10.33	37.8833	19.1994	19.1975	228.2715	2.0392	9.2179	-0.1617
12	0.85	37.8462	20.5360	20.5359	225.7254	-0.9065	7.6297	-0.3725

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/8 CTD No: DI03X127

Date: 30-07-93 Time: 18:54 GMT

Lat: 42 51.20N Lon: 3 46.76E Bottom Depth: 104.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	79.52	38.1572	13.0132	13.0019	226.8379	32.3589	13.0607	2.9332
2	59.16	38.1096	13.0613	13.0529	233.5974	25.4224	91.7547	2.9188
3	39.99	38.0730	13.5379	13.5321	258.3804	-1.7954	98.8715	1.1540
4	30.17	38.0078	14.6696	14.6650	251.6733	-0.7346	34.2766	0.9806
5	24.35	38.0212	17.0834	17.0793	227.6588	11.7621	13.5078	0.9127
6	19.47	37.9242	18.2682	18.2647	227.9888	6.2772	8.8760	0.8558
7	15.87	37.9017	18.9626	18.9597	234.3869	-3.0933	9.4273	0.8381
8	12.27	37.8936	19.2568	19.2545	226.0570	3.9967	9.5860	0.8173
9	8.07	37.8872	19.3946	19.3931	222.5765	6.9039	9.6277	0.7703
10	3.89	37.8496	20.2820	20.2813	224.6708	1.1778	8.1239	0.6837
11	2.60	37.8562	20.8117	20.8112	217.3635	6.3297	8.6751	0.6773
12	1.42	37.8559	20.8036	20.8034	217.4963	6.2296	7.6854	0.6319

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/9 CTD No: DI03X128

Date: 30-07-93 Time: 22:45 GMT

Lat: 42 51.44N Lon: 3 47.16E Bottom Depth: 103 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	79.98	38.1725	13.0388	13.0274	224.4729	34.5642	8.2178	2.9616
2	60.29	38.1196	13.0515	13.0429	228.0423	31.0134	44.8680	2.9794
3	39.46	38.0778	13.3896	13.3839	253.2342	4.1145	110.7633	2.9970
4	35.73	38.0488	14.0189	14.0136	248.1096	6.0414	44.1902	3.0085
5	29.55	38.0153	14.5225	14.5180	248.8086	2.8523	31.5246	3.0129
6	24.93	37.9866	16.2946	16.2905	245.2694	-2.1496	15.8668	3.0154
7	19.34	37.9492	17.7025	17.6992	224.3010	12.4301	10.4583	3.0151
8	16.35	37.9362	17.9817	17.9789	230.3567	5.1527	8.8379	3.0135
9	12.22	37.8921	19.6310	19.6287	225.7832	2.6988	9.8840	3.0102
10	8.15	37.8651	19.8788	19.8773	234.5950	-7.1075	7.5756	3.0038
11	3.89	37.8638	19.9448	19.9440	230.2715	-3.0554	8.7485	2.9635
12	1.36	37.8632	19.9378	19.9376	229.9962	-2.7506	7.8199	0.8989

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/10 CTD No: DI03X129

Date: 31-07-93 Time: 06:11 GMT

Lat: 42 50.52N Lon: 3 46.47E Bottom Depth: 117 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	80.09	38.1643	13.0672	13.0557	216.1996	42.7011	11.4201	1.0314
2	59.39	38.1428	13.0636	13.0552	223.4933	35.4608	9.6538	0.7650
3	39.93	38.1091	13.1525	13.1468	229.3957	29.1444	62.9292	0.4946
4	35.27	38.1013	13.1994	13.1944	230.0685	28.2378	131.1427	0.4133
5	29.96	38.0737	13.4952	13.4909	244.8931	11.9125	149.2803	0.2829
6	25.36	38.0605	13.7610	13.7573	246.8014	8.6515	72.0626	0.1819
7	19.81	38.0333	14.7881	14.7850	242.1822	8.1290	33.1379	0.0754
8	15.93	37.9402	17.9160	17.9132	229.2430	6.5517	14.5286	0.0104
9	12.09	37.8899	18.8163	18.8141	210.7094	21.2274	9.2178	-0.0379
10	8.05	37.8886	18.9162	18.9148	226.1256	5.3845	11.2722	-0.1376
11	4.09	37.8878	18.9137	18.9129	232.0435	-0.5215	9.6473	-0.2343
12	1.04	37.8877	18.9315	18.9313	227.0119	4.4342	9.5164	-0.4430

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/11 CTD No: DI03X130

Date: 31-07-93 Time: 08:21 GMT

Lat: 42 50.07N Lon: 3 46.83E Bottom Depth: 120.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	80.21	38.1806	13.0848	13.0733	222.6660	36.1152	7.6883	0.7911
2	59.47	38.1332	13.0699	13.0614	229.7923	29.1443	15.0250	0.5422
3	39.97	38.0988	13.2020	13.1963	238.6484	19.6483	147.8377	0.2582
4	34.63	38.0943	13.2597	13.2547	241.9848	16.0167	159.3955	0.1556
5	30.18	38.0773	13.4112	13.4068	246.6214	10.6160	122.9811	0.0506
6	25.15	38.0388	14.1811	14.1773	254.0117	-0.6689	34.0753	-0.0396
7	20.16	38.0099	15.6487	15.6454	248.2913	-2.1411	15.5202	-0.1301
8	15.92	37.9017	18.7437	18.7408	222.3436	9.8892	9.7430	-0.1929
9	11.71	37.8973	18.8639	18.8618	223.2180	8.5042	10.6853	-0.2662
10	8.46	37.8922	18.9758	18.9743	221.3080	9.9424	11.0560	-0.3208
11	4.25	37.8922	18.9687	18.9679	229.8450	1.4358	7.6990	-0.4003
12	1.40	37.8929	18.9697	18.9694	228.8797	2.3959	6.3312	-0.5232

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/12 CTD No: DI03X131

Date: 31-07-93 Time: 09:14 GMT

Lat: 42 49.84N Lon: 3 46.34E Bottom Depth: 122 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	111.68	38.1969	13.0805	13.0645	209.3711	49.4066	8.2141	1.1781
2	100.08	38.1939	13.0870	13.0727	217.1119	41.6362	8.3146	0.9557
3	89.92	38.1896	13.0957	13.0828	216.4080	42.3013	9.1003	0.8075
4	80.20	38.1832	13.1152	13.1037	222.7513	35.8658	8.4002	0.6920
5	70.16	38.1494	13.0667	13.0567	226.1838	32.7435	11.3080	0.5832
6	60.43	38.1311	13.0594	13.0508	228.0063	30.9890	17.1835	0.4703
7	50.08	38.1211	13.1157	13.1085	232.1201	26.5949	34.1648	0.3474
8	40.11	38.1035	13.2039	13.1981	234.0934	24.1860	167.1662	0.1917
9	32.57	38.0779	13.3999	13.3952	241.3104	15.9847	103.1527	0.0369
10	19.86	37.9730	17.0137	17.0104	233.8383	5.9705	14.4201	-0.1765
11	9.86	37.9081	18.8752	18.8734	221.3221	10.3368	9.8424	-0.3173
12	0.96	37.8876	18.9921	18.9919	224.3503	6.8367	6.8184	-0.5118

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/13 CTD No: DI03X132

Date: 31-07-93 Time: 11:02 GMT

Lat: 42 50.25N Lon: 4 36.47E Bottom Depth: 119 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	99.75	38.1842	13.0543	13.0400	213.7255	45.2108	10.9575	0.9038
2	80.16	38.1775	13.0756	13.0641	219.8652	38.9697	12.9960	0.6573
3	60.27	38.1424	13.0571	13.0485	225.7718	33.2171	19.6242	0.4472
4	50.11	38.1210	13.1025	13.0954	231.4073	27.3767	38.5300	0.3469
5	40.50	38.1058	13.1850	13.1792	235.7807	22.5943	151.4000	0.2332
6	29.98	38.0619	13.6240	13.6196	245.0260	11.1313	75.8242	0.0440
7	25.11	38.0390	13.9811	13.9774	252.5487	1.8106	35.6131	-0.0641
8	20.09	37.9956	15.5018	15.4986	247.4495	-0.5706	18.5324	-0.1606
9	15.20	37.9322	18.2151	18.2124	233.6324	0.8549	12.8554	-0.2546
10	10.15	37.8927	19.1637	19.1618	223.1845	7.2651	10.7397	-0.3434
11	4.83	37.8942	19.2320	19.2311	226.5610	3.5969	10.3301	-0.4544
12	1.06	37.8926	19.2502	19.2500	230.2107	-0.1277	10.0816	-0.6177

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MD1/14 CTD No: DI03X133

Date: 31-07-93 Time: 14:40 GMT

Lat: 42 50.66N Lon: 3 47.03E Bottom Depth: 106.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	80.29	38.1772	13.0595	13.0480	227.1108	31.8093	10.9691	0.7732
2	59.92	38.1272	13.0756	13.0671	231.9899	26.9262	43.5439	0.5509
3	39.78	38.0833	13.4197	13.4139	250.1132	7.0702	157.8437	0.2334
4	34.82	38.0562	13.8650	13.8598	261.0922	-6.1664	48.4723	0.1549
5	29.55	38.0278	14.4637	14.4592	260.5136	-8.5774	26.7441	0.1772
6	25.38	37.9842	16.0706	16.0665	256.2282	-12.0500	19.2199	0.1721
7	20.64	37.8925	19.1078	19.1041	227.1615	3.5255	14.0542	0.1528
8	15.76	37.8847	19.3134	19.3105	214.3723	15.4540	12.4474	0.1062
9	12.26	37.8875	19.3484	19.3461	223.9479	5.7269	14.5235	0.0749
10	8.06	37.8876	19.3465	19.3450	222.6268	7.0561	17.0268	0.0187
11	3.97	37.8880	19.3740	19.3733	224.3092	5.2569	10.3438	-0.0499
12	0.94	37.8882	19.3720	19.3718	232.8808	-3.3065	12.9391	-0.1354

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: ME1/1 CTD No: DI03X119

Date: 29-07-93 Time: 18:52 GMT

Lat: 43 21.77N Lon: 4 0.22E Bottom Depth: 66.5 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-2	57.73	38.1234	13.0964	13.0882	210.4675	48.3452	39.2307	2.9357
3-4	41.63	38.1177	13.1393	13.1333	224.4499	34.1461	469.1503	1.2152
5-6	30.19	38.0882	13.2388	13.2345	249.1825	8.9384	117.3195	0.9416
7-8	17.71	38.0776	13.4978	13.4952	253.3848	3.4012	18.6407	0.7751
9-10	11.65	38.0628	13.7597	13.7580	262.2459	-6.7900	13.1656	0.7007
11-12	4.98	37.9588	16.3722	16.3714	252.7071	-9.9097	9.0547	0.5809

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: ME2/1 CTD No: DI03X118

Date: 29-07-93 Time: 15:40 GMT

Lat: 43 17.38N Lon: 4 25.94E Bottom Depth: 59 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1-2	41.86	38.1121	13.1838	13.1778	217.2211	41.1501	62.7523	0.3881
3-4	34.89	38.0886	13.3188	13.3137	246.3942	11.3072	80.2359	0.2289
5-6	24.94	38.0441	13.7321	13.7284	263.3291	-7.7013	31.5409	0.0589
7-8	15.44	37.9351	15.8135	15.8110	249.3812	-3.9076	29.0062	-0.1247
9-10	10.04	37.8894	16.9014	16.8997	244.7282	-4.2831	31.8325	-0.2319
11-12	1.71	37.8494	18.5410	18.5407	236.9924	-3.8107	18.9628	-0.4800

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MF1/1 CTD No: DI03X105

Date: 27-07-93 Time: 05:05 GMT

Lat: 42 45.03N Lon: 5 59.68E Bottom Depth: 2400 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	2434.15	38.4297	13.1759	12.7956	199.9173	57.9830	3.8167	0.0708
2	1998.22	38.4290	13.1050	12.7982	200.9961	57.2776	4.3422	0.0708
3	1748.55	38.4290	13.0717	12.8058	201.0900	57.3586	3.4970	0.0683
4	1498.89	38.4285	13.0409	12.8153	198.8649	59.7464	3.7670	0.0634
5	1249.54	38.4322	13.0208	12.8345	197.3361	61.3751	2.5449	0.0093
6	999.40	38.4525	13.0676	12.9195	191.4292	67.0032	3.9636	0.0203
7	798.08	38.4717	13.1154	12.9978	192.1908	65.9589	3.1748	0.0126
8	598.82	38.5075	13.2475	13.1593	186.5390	70.8615	3.0247	0.0108
9	399.59	38.5272	13.3420	13.2833	184.8361	72.0397	3.6178	0.0105
10	300.83	38.5144	13.3359	13.2919	190.8864	66.0419	3.7345	-0.0335
11	200.22	38.4946	13.3654	13.3361	191.9484	64.8583	3.6151	-0.1581
12	149.45	38.4708	13.3719	13.3502	194.2913	62.5194	3.4555	-0.2510

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MF1/2 CTD No: DI03X106

Date: 27-07-93 Time: 07:56 GMT

Lat: 42 45.86N Lon: 5 59.17E Bottom Depth: 2392 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	150.42	38.4607	13.3601	13.3381	190.7362	66.1524	3.3863	2.9956
2	130.10	38.4262	13.3286	13.3097	198.0108	59.0971	4.2394	2.9884
3	109.83	38.4097	13.3014	13.2855	200.2037	57.0723	5.0616	2.9450
4	89.29	38.3484	13.2869	13.2740	200.0040	57.4463	9.9252	1.3038
5	70.92	38.2888	13.2279	13.2177	205.7518	52.1028	32.1049	1.0059
6	60.01	38.2445	13.2142	13.2055	211.4955	46.5025	59.3541	0.8070
7	49.83	38.2117	13.2344	13.2272	216.4254	41.5195	189.4134	0.6067
8	39.26	38.1719	13.2310	13.2254	219.9759	38.0508	443.3760	0.3435
9	29.81	38.1629	13.3584	13.3541	236.9734	20.4016	207.5254	0.0609
10	20.35	38.0741	13.7158	13.7128	248.9521	6.7119	22.2271	-0.1649
11	12.88	38.1013	19.5119	19.5095	220.8173	7.8791	6.0483	-0.2928
12	5.52	38.0302	20.6124	20.6113	218.3161	5.9503	6.5059	-0.3865

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MF2/1 CTD No: DI03X107

Date: 27-07-93 Time: 11:45 GMT

Lat: 42 55.75N Lon: 5 35.57E Bottom Depth: 1344 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	1325.18	38.4370	13.0671	12.8686	191.5600	66.8996	4.6547	0.0415
2	899.94	38.4745	13.1571	13.0237	186.7865	71.1399	5.1811	0.0276
3	499.75	38.5431	13.4154	13.3414	178.9018	77.5677	4.0457	-0.0302
4	299.88	38.5299	13.4818	13.4376	183.3614	72.7847	5.0310	-0.0392
5	150.17	38.3075	13.3027	13.2809	200.7557	56.6777	4.9525	-0.1039
6	89.40	38.2072	13.2478	13.2349	204.1183	53.7635	5.6986	-0.0533
7	70.21	38.1555	13.2330	13.2229	222.9712	35.0714	9.8766	0.0084
8	49.86	38.0212	13.2691	13.2619	221.2387	36.8314	66.6468	0.0691
9	40.43	37.9770	13.3937	13.3879	237.1312	20.3580	29.9799	0.0708
10	19.85	37.9565	17.4173	17.4138	237.8742	0.1262	7.8732	0.0903
11	10.35	37.9929	18.4700	18.4682	238.3486	-5.0589	5.8464	0.1058
12	5.32	37.9908	18.4890	18.4880	237.8306	-4.6204	5.6944	0.1364

RRS Discovery Cruise 203 / EROS 2000 / Mantoura (Rev 29/7/93)

Cast No: MF3/1 CTD No: DI03X108

Date: 27-07-93 Time: 16:32 GMT

Lat: 43 6.78N Lon: 5 12.21E Bottom Depth: 222 Metres

Bottle No.	Depth (M)	Salinity (0/00)	Temp (Deg.C)	P-Temp (Deg.C)	Oxygen Electrode (uM)	AOU (uMO2)	Fluor (Rel.Units)	Downw. Irrad (ln)
1	234.08	38.4372	13.3379	13.3038	185.1178	71.9236	5.9611	3.0273
2	149.70	38.2950	13.2847	13.2630	207.2247	50.3231	7.4952	3.0301
3	119.33	38.1897	13.2427	13.2255	219.0247	38.9121	9.8896	3.0179
4	99.44	38.1568	13.2654	13.2510	221.3149	36.5562	15.6442	2.9607
5	79.15	38.1206	13.3086	13.2972	220.1682	37.5348	20.0865	1.2296
6	70.56	38.1083	13.3482	13.3380	227.8857	29.6300	31.1965	1.0689
7	59.47	38.0589	13.4323	13.4236	233.5763	23.5806	72.3863	0.8721
8	48.91	38.0654	13.6459	13.6388	243.3588	12.6795	86.1451	0.6680
9	38.37	38.0584	13.9150	13.9093	242.4121	12.2541	109.9043	0.4603
10	29.46	38.0564	13.9975	13.9931	244.4086	9.8399	81.5024	0.2877
11	10.69	38.0039	14.5006	14.4990	227.9892	23.7992	20.6899	-0.0939
12	4.13	38.0450	18.6059	18.6051	221.0914	11.5369	11.0942	-0.2477

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