NAVAL HYDROGRAPHIC SERVICE

DEPARTAMENT OF OCEANOGRAPHY
Technical Bulletin N° 72

CTD AND XBT PHYSICAL-CHEMICAL DATA, OCEANOGRAPHIC CRUISES:

CAP.OCA BALDA 04-91
(WOCE ARO8_08BD0491_1)

DR. EDUARDO L. HOLMBERG 04-92
(WOCE AR08_08EH0492_1)

EL AUSTRAL 01-92
(WOCE ARO8_08EA0192_1)

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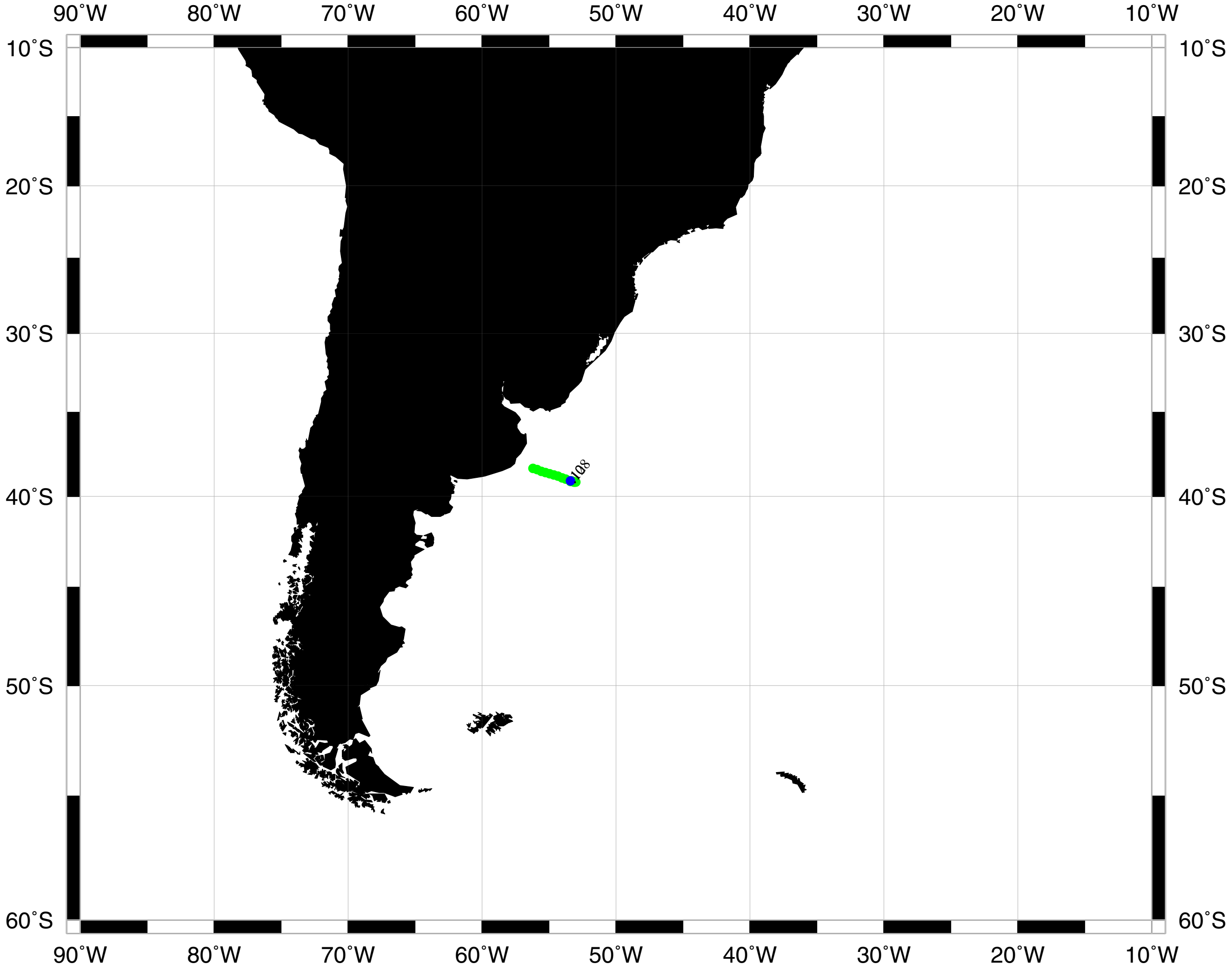
August, 1993
ARMADA ARGENTINA

Station locations for AR08: PIOLA - El Austral 0192



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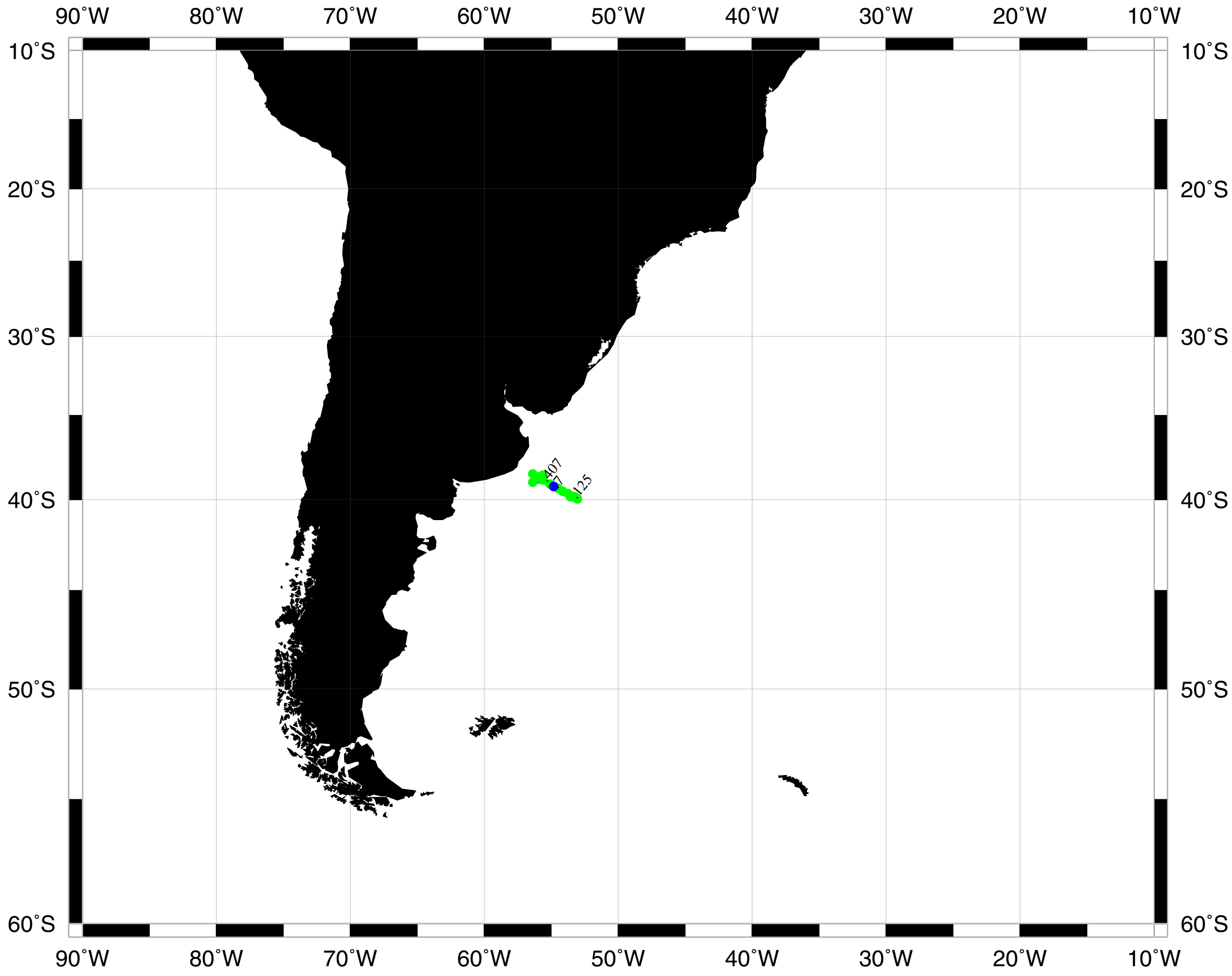
Station locations for AR08: PIOLA - OCA BALDA 0491



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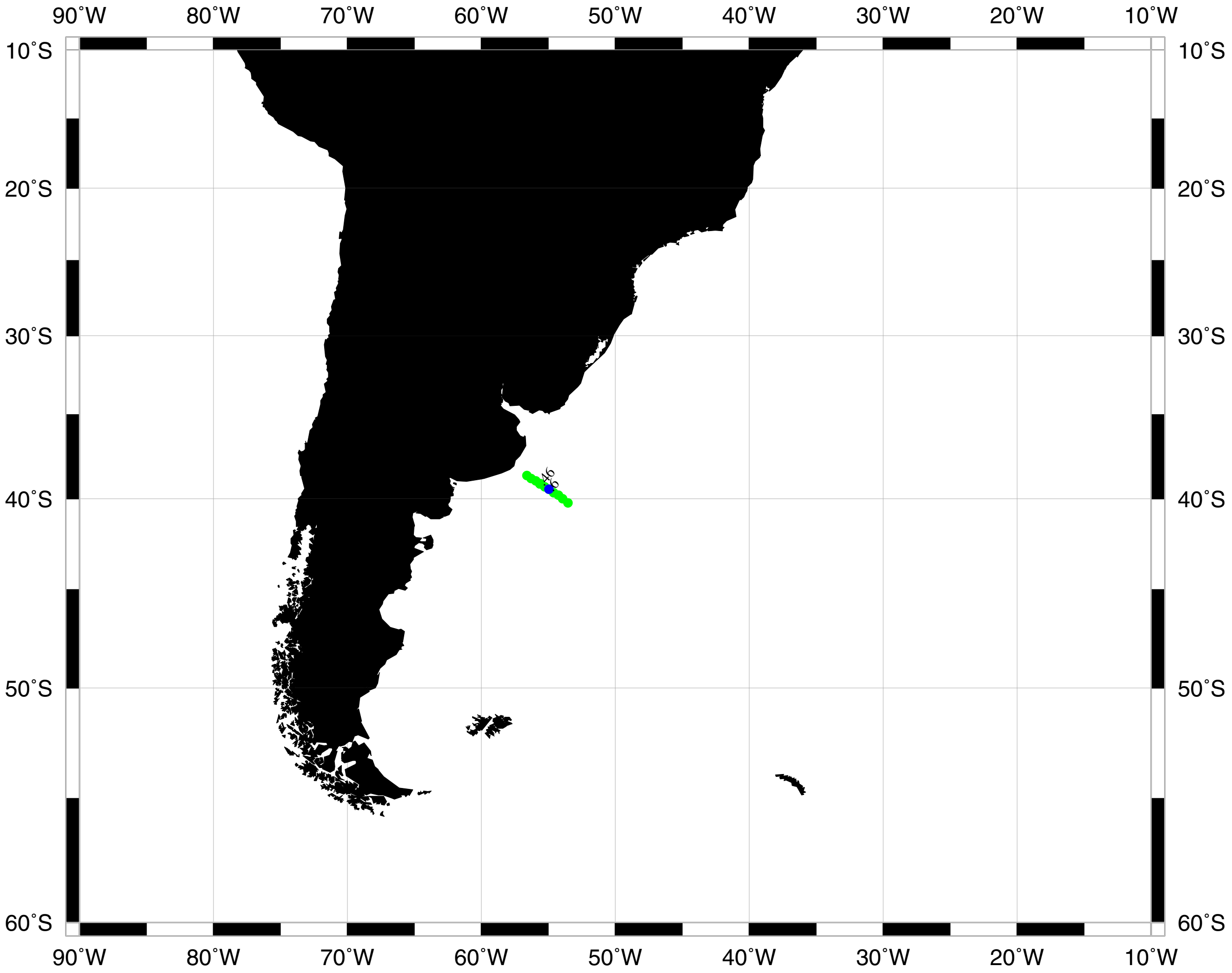
Station locations for AR08: PIOLA - Holmberg, 0492



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1. INTRODUCTION

Researchers from the ***Hydrographic Naval Service*** (SIHN) are working on a project called ***Contour Streams of the South-Occidental Atlantic*** as an Argentinean contribution to the World Ocean Circulation Experiment (WOCE, see Piola and Bianchi, 1992). The WOCE observational phase consists on annually elaborating two oceanographic sections in the 38°S vicinity. The project was initiated September 1991 and will continue until 1996.

The data from the oceanographic cruises that will be presented in this report, have been collected during the time margin for this project. The cruises are: BIP Captain Oca Balda 04/91 (OA-0491), BIP Dr. Eduardo L. Holmberg 04/92 (HO-0492) and BIO El Austral 01/92 (AU-0192).

The observational phase for the cruise consists on conducting periodic testing of the synoptic situation on the Brazil/Malvinas confluence. On each section, a series of oceanographic stations will be conducted, this includes continuous pressure, temperature and conductivity profiling and discrete sampling of salinity, temperature, dissolved oxygen and nutrients. These stations are transversal to the continental talus and are wide-ranging enough to reach the Brazilian stream[3].

The objective of defining the thermohaline characteristics from the denominated ***Talus Front*** has been added to this project. Such front will accomplish a fundamental roll in the maintenance of the high primary productivity of the region and is in the interest of other projects by the ***National Institute for Fishing Investigation and Development*** (INIDEP). The field work includes elaborating transversal cuts to the front and repeated outlining (yo-yo stations) to pressure, temperature and conductivity.

This report will present physical-chemical data and CTD from the oceanographic cruises OA-0491 (Figure 1), HO-0492 (Figure 2) and AU-0192 (Figure 3). Also included are data from bathythermographs (XBT) carried out during the HO-0492 cruise.

2. DATA ACQUISITION SYSTEM

On the three cruises presented in this report a continuous pressure, temperature and conductivity (CTD) profiler was used type NBIS MKIII B brand name Neil Brown Instrument Systems.

The water samples were obtained with a rosette, brand name General Oceanics containing twelve Niskin bottle samples of 5lt each. Six bottles were equipped with protected and unprotected reversing thermometers for determining the ***in-situ*** temperature and thermometric depth. The rosette is installed on the CTD at approximately 120cm from the sensors. This configuration allows us to obtain CTD pressure, temperature and conductivity calibration values from each station and water

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[3] Flow

samples for future chemical analysis. Collecting the CTD data was done by a personal computer (PC) that uses the Oceansoft Mark III Acquisition "MK3ACQ" software from EG&G Marine Instruments, which provides lists, plots and storage of real time data, allowing room for preliminary processing and evaluation of the quality of the data on board.

3. WATER AND THERMOMETER SAMPLES

3.1 Description

Water samples from each oceanographic station were obtained for the purpose of calibrating the CTD data and determining the concentration of dissolved oxygen and nutrients. The data from the reversing thermometers installed on six of the bottles on the rosette, were used to determine ***in-situ*** temperature and depth. The thermometers used were calibrated on the ***Hydrographic Naval Service Laboratories***' grounds. The conductivity of the water samples was determined with a salinometer brand name Plessey model 6230N, standardized with normal water from Wormley (Partida P118 ˆ Nov. 1991). Salinity was calculated with the ***Practical Salinity Scale*** from 1978 (UNESCO, 1981). The dissolved oxygen was determined with a modified Carpenter (1965) technique. On the HO-0492 and AU-0192 cruises, the water samples for determining the nutrients were frozen on board to -20°C for future analysis in the laboratory. These samples were analyzed in the ***National Institute for Fishing Investigation and Development***, using the Grasshoff et al. Method (1983).

See Table 1.

Table 1

Water Samples, parameters determined per cruise

Cruise	Analyzed Parameters	Total Number Of Samples
OA-0491	Salinity, dissolved oxygen, silicates, nitrites, nitrates and phosphates.	156
HO-0492	Salinity, dissolved oxygen, silicates, nitrites, nitrates and phosphates.	158
AU-0192	Salinity, dissolved oxygen, silicates, nitrites, nitrates and phosphates.	118

3.2 QUALITY CONTROL

The quality control for the water samples was carried out considering two aspects:

a) ***Systematic comparison between pressure, temperature and salinity data from the rosette was measured simultaneously with the CTD.***

Differences between the data from the rosette and the CTD were calculated. The calibration of the CTD observations, which are further described below, is based on determining the polynomial that best fits the differences observed between the CTD and the rosette data. The rosette data that exceeds the two standard deviation differences allowed for the corresponding calibration curve are considered doubtful and are not used for the calibration.

b) ***Historical Data Comparison:***

For each cruise the potential temperature distribution was compared vs. salinity, dissolved oxygen, silicates, nitrites and phosphates with the same distributions based on high precision historical data. The contrast was carried out for potential density anomalies of 27.25 and 27.50. Data from the following cruises were used: Atlantis II-107-3 (Guerrero et al. 1982), Atlantis II-107-10 (Piola et al., 1981), Marathon 7-1984 (Camp et al., 1984), Save V-1998 (Scripps Institute Of Oceanography 1989), Geosecs 6-1981 (Geosecs Atlantic Expedition-Vol.1, Bainbridge A., 1981), Puerto Deseado 02-88 and Confluencia 89 (Charo et al, 1991).

The comparison between the dissolved oxygen, nutrients, salinity and temperature data from the three cruises with the historical data is summarized on tables 2 and 3. The tables show the median of every variable over the two isopycnal surfaces: $\sigma_\theta = 27.25$ and $\sigma_\theta = 27.50$.

Table 2

Dissolved oxygen, nutrients, salinity and temperature potential for σ_θ = 27.25

Potential density anomaly (kg/m3)					**σ_θ=27.25**		
Cruise	O_2	SiO_3	NO_3	NO_2	PO_4	θ	S
AII-107-3	5.71	27.1	28.6	0.02	1.98	3.338	34.224
AII-107-10	5.57	35.1	29.9	0.05	2.09	3.275	34.208
MARATHON 7	5.48	29.8	27.3	0.00	1.93	3.708	34.291
SAVE 5	5.56	29.0	30.3	0.01	2.07	3.352	34.245
GEOSECS 6	4.98	26.7	30.0		1.99	4.093	34.290
PD-0288	5.51	36.4	24.1	0.19	1.89	3.004	34.203
CONF 89	5.40	33.5	32.2		2.33	3.582	34.278
OA-0491	**5.89**	**23.4**	**20.5**	**0.05**	**1.89**	**3.103**	**34.217**
HO-0492	**5.65**	**33.0**	**27.1**	**0.03**	**2.23**	**3.320**	**34.242**
AU-0192	**5.83**	**24.7**	**26.1**	**0.00**	**1.68**	**3.023**	**34.207**

Table 3

Dissolved oxygen, nutrients, salinity and temperature potential for $\sigma_\theta = 27.50$

Potential density anomaly (kg/m3)					σ_θ=27.50		
Cruise	O_2	SiO_3	NO_3	NO_2	PO_4	θ	S
AII-107-3	4.43	54.2	31.9	0.00	2.21	2.768	34.475
AII-107-10	4.47	62.0	33.3	0.00	2.31	2.547	34.440
MARATHON 7	4.44	52.1	30.4	0.00	2.10	3.014	34.521
SAVE 5	4.35	57.9	33.5	0.01	2.29	2.704	34.484
GEOSECS 6	4.33	52.0	33.1		2.23	2.818	34.452
PD-0288	4.36	65.0	30.3	0.11	2.36	2.593	34.467
CONF 89	4.55	52.2	33.9		2.45	2.827	34.497
OA-0491	4.45	49.9	21.1	0.05	2.04	2.724	34.487
HO-0492	4.92	50.1	31.9	0.08	2.13	2.866	34.503
AU-0192	4.28	40.1	25.9	0.00	1.62	2.589	34.472

4. PROCESSING THE CTD

4.1 Response time from the sensors

The performance of a latest model CTD is a function of the precision of the sensors and the testing frequency. The testing frequency is limited by the response time from the sensors to temperature changes. The temperature measurements, in particular, are affected even on the fastest sensors (response time is approximately 250ms), an unacceptable inertia for a correct salinity calculation.

On some CTD's this deficiency is partially compensated by combining a quick response thermistor with a high stability thermometer. Unfortunately, this configuration requires an extremely precise adjustment of the electronics associated and could not be accomplished for the purpose of these cruises. For this reason, the thermistor was eliminated and only the platinum thermometer was used. As a consequence of the thermal inertia from the thermometer, there are spurious inversions in the density associated with salinity errors. With the purpose of minimizing this inconvenience, a recursive exponential filter was applied in the form:

$$C(t) = C\,(t - \delta\, t)\, W_o + C_i\, W_1 \qquad (4.1)$$

where $W_o = e^{-\delta t/\Gamma}$

$$W_1 = 1 - W_0,$$

where Γ is the constant for the platinum thermometer time, δt is the testing interval from the CTD (approximately 0.032 seconds for the Mark IIIb), C filtered conductivity and C_i the unfiltered conductivity. The filter must produce an effective conductivity delay comparable to the effects of the thermal inertia quality in a thermometer. Determining the delay to be applied is based on the maximum correlation between the conductivity and temperature perturbations. The delay obtained for the three cruises by this method was 6 units, which is equivalent to about 200ms. .

4.2 Data Editing

The first step in the CTD data processing is editing. For this, with the cooperation of the programming analyst Alfred Rolla from the Argentinean Center for Oceanographic Data (CEADO), an editing program was developed that allows for an analysis of raw pressure, temperature and conductivity. It detects spurious values of such parameters by comparing the differences between the previous values and the current value with a degree of tolerance for each one and a precision range according to the characteristics of the water column. If the difference exceeds the given value, the data is considered questionable and is assigned a mark that will allow the upcoming programs to ignore that data.

4.3 Standardization of the Series

For the second step, the edited data are averaged and calibrated to generate a series of temperature and conductivity data at uniform pressure intervals. First a filter is applied that eliminates the difference in the sensor response time (Ec. 4.1) and converts the raw data into an averaged pressure series. In general, the resulting series does not have a constant pressure interval due to the fact that the velocity while lowering the instrument is not uniform. The following is the temperature and conductivity calibrations that generate a series of data at 2 decibar intervals.

4.4 Calibration

The pressure, temperature and conductivity sensors are calibrated in a sequential form in that order. The applied corrections are in general, functions of pressure but in some instances could also depend on temperature and conductivity.

In general, the pressure and temperature calibrations have the following form:

$$P_c = P_m + P_0 + P_1 P_m + P_2 P^2{}_m + \ldots\ldots + P_n P^n{}_m$$
$$T_c = T_m + T_0 + T_1 P_m + T_2 P^2{}_m + \ldots\ldots + T_n P^n{}_c$$

Where P_c and T_c are corrected pressure and temperature; P_m and Tm are the measured variables; P_i and T_i are the polynomial calibration coefficients with the superscript variable meaning the order of the applied calibration.

The calibration coefficients were obtained by using the least squares method. The order of the approximation polynomials was chosen to try to minimize the standard deviations.

Conductivity Calibration

Conductivity calibration is done in the laboratory, it transforms the conductivity measured by the CTD (G) at conductivity C, taking into consideration the deformation of the materials in the chamber that is proper to each instrument. For the CTD NBIS/EG&G Mark IIIb, the conductivity is

$$C = G\,(1 + \alpha\,(T - T_0) + \beta\,(P - P_0))$$

Where

α = -6.5 E-6 °C
β = 1.5 E-8dbar
T_0 = 2.8 °C
P_0 = 3000dbar

P, T and G are pressure, temperature and conductance measured by the CTD.

A procedure of iterative adjustment has been applied to obtain conductivity coefficients that allow us to eliminate spurious data.

The differences between the data from the water samples and the corresponding CTD are estimated. The coefficients from the conductivity sensors are adjusted (in a way that the sum of the squares of these differences are minimized) using the least squares method.

The differences between the data of each of the water samples and the corresponding data from the sensors, are verified by an editing criteria of the form $\sigma \times F$ that involves the standard deviation by an F factor. It is chosen so the probability of eliminating valid observations is minimized. For a normal distribution, a value of F=2.8 implies that the probability of eliminating valid observations is 0.5%. After extracting the bad values, the rest of the data is readjusted in a similar way until all the values that are not in the criteria are eliminated.

To calibrate the CTD conductivity sensor, the salinity from the water samples is converted to in-situ conductivity C_w.

As we mentioned previously, the CTD conductivity is corrected by the deformation of the materials in the chamber. We must also consider the drift that exists within the stations due to the filth on the sensor and washing every station afterwards. Finally, the conductivity is

$$C_m=G(A+B*SN)+C$$

A and C are the calibration coefficients and B is the conductivity adjustment that depends on the station multiplied by the station number SN. This factor B is optional and is not considered in the data processing for these cruises.

The coefficients, are obtained in a way to minimize the variance σ^2 defined as

$$\sigma^2=1/N*\Sigma(C_w-C_m)^2$$

where C_w is the conductivity of the water sample.

To determine the values that are considered bad and eliminate them, we apply the following test in which factor F (described previously) is taken into consideration such that

$$| C_w - C_m | > F.\sigma$$

On the OA-0491 cruise, pressure was calibrated as a function of a linear dependency to the uncorrected pressure (P_i):

$$P_c = A_p + B_p * P_i$$

P_c is the corrected pressure.

This calibration lead to a conductivity correction also linear dependant on pressure. This conductivity dependency with pressure is unjustifiable from a physical point of view. Therefore, pressure re-calibration proceeded as a function of a constant factor, meaning, independently from pressure.

$$P_c = A_p + P_i$$

The conductivity calibration that resulted from the new pressure calibration is weakly dependant on pressure. As a consequence, this methodology was used for al the cruises.

Station 6 from cruise AU-0192 was independently calibrated from the rest of the stations, this is because in the joint calibration there existed a 0.03 psu difference between the salinity value from the CTD and the value from the bottles.

See table 4, 5 and 6.

Table 4
Calibration Coefficients from the CTD
Cruise Oca Balda 04-91

	Coef 0	Coef 1	Standard deviation	Data Number
Pressure * (dbar)	-1.7		1.40	13
Temperature (°C)	0.0303		0.013	52
Conductivity (mmho)	0.05359	0.9985	0.003	113

(*) Promedio del valor de cubierta

Table 5
Calibration Coefficients from the CTD
Cruise Dr. E. Holmberg 04-92

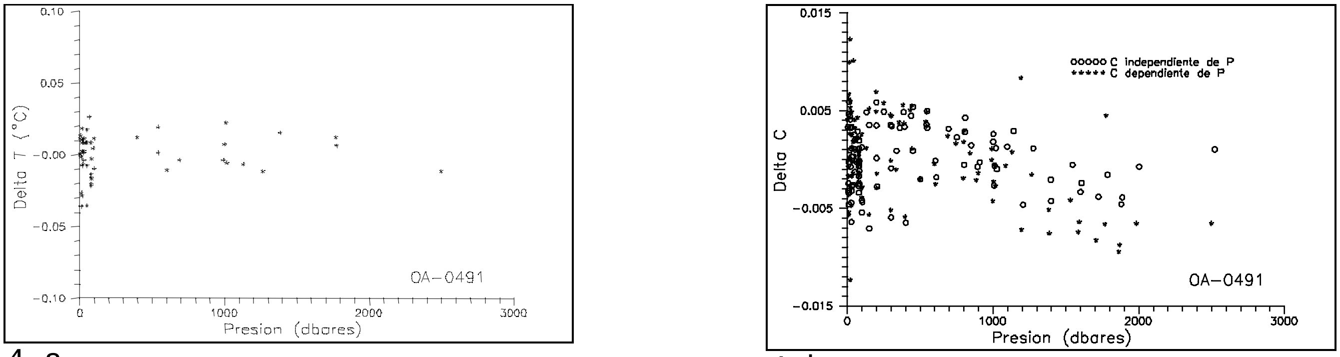
	Coef 0	Coef 1	Standard deviation	Data Number
Pressure (dbar)	-1.9372		5.39	78
Temperature (°C)	0.0275		0.063	84
Conductivity (mmho)	0.04271	0.9988	0.004	53

Table 5
Calibration Coefficients from the CTD
Cruise El Austral 01-92 (*)

Error! Bookmark not defined.	Coef 0	Coef 1	Standard deviation	Data Number
Temperatura (dbar)	0.0377		0.024	35
Conductivity (mmho)	0.07691	0.9984	0.002	114
Conductivity station 6 (mmho)	0.04065	1.0003	0.003	12

(*)The pressure was calibrated according to the cover value according to each station.

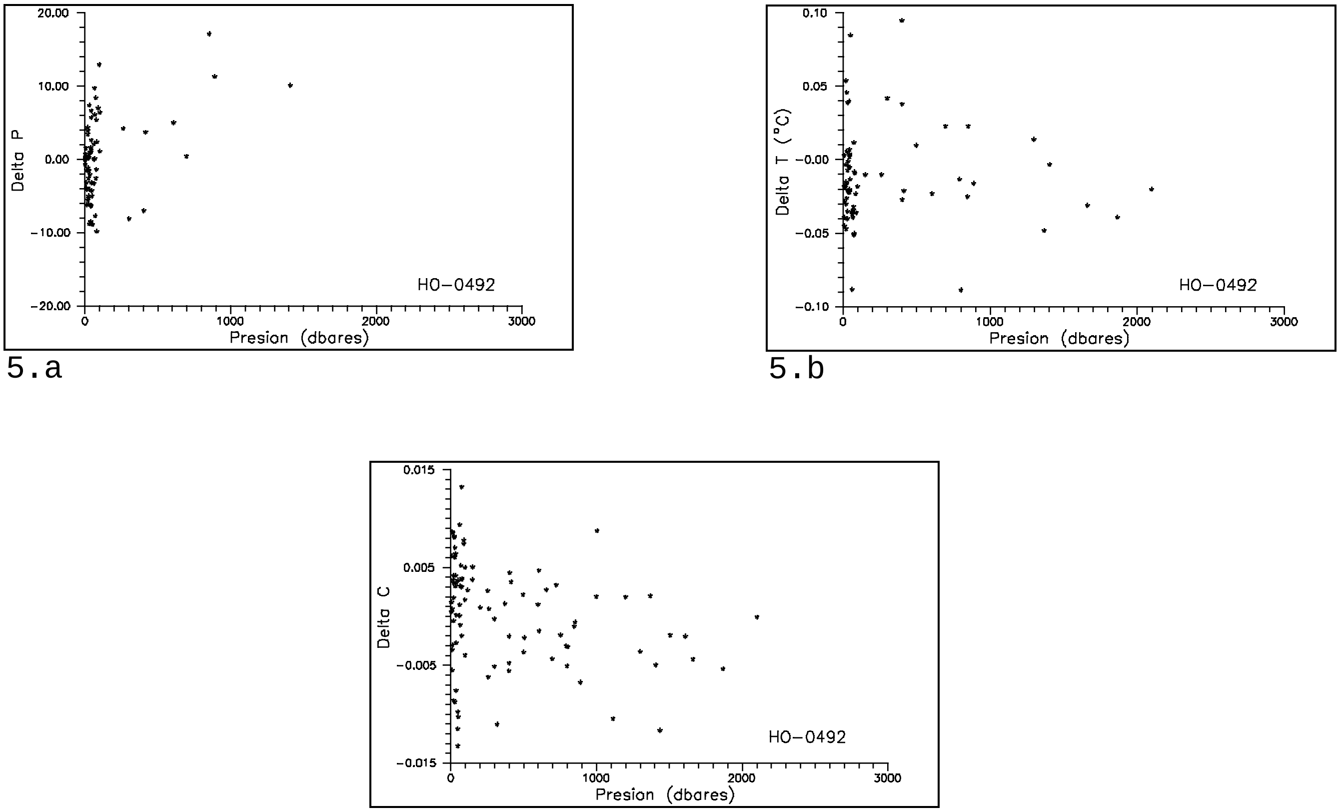
Figures 4, 5 and 6 show the residual distributions of the difference between the parameters measured with the CTD and the corresponding water samples as a function of pressure for each cruise.



4.a

4.b

Figures 4.a and 4.b: Temperature and Conductivity residuals as a function of pressure for cruise OA-0491.

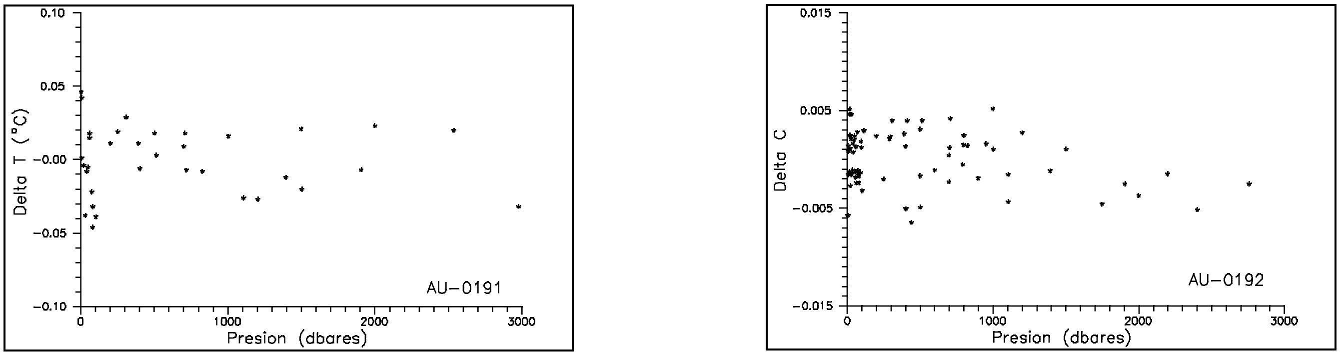


5.a

5.b

5.c

Figures 5,a, 5.b and 5.c: Pressure, Temperature and Conductivity residuals as a function of the pressure for HO-0492.



6.a

6.b

Figures 6.a and 6.b: Temperature and Conductivity residuals as a function of the pressure for the cruise AU-0192.

5. XBT Data

Table 7 shows information referring to bathythermograph launchings that can be dismissed. They were carried out for cruise HO 04-92, these positions are noted in figure 2. The XBT data were manually digitalized from the results.

Table 7

XBT Information

Cruise Dr. E. Holmberg 04-92

XBT #	Fecha	GMT	Lat (S)	Long (W)	T-Seco (°C)	T-Húm. (°C)	V-Dir.	V-Vel. (nudos)	P.Atm. (mbar)
1	09/05/92	20:17	39 16.3	55 19.8	15.5	14.5	065	calma	
2	10/05/92	00:08	39 24.2	55 06.3			090	8.0	
3	10/05/92	02:51	39 30.9	54 58.6					
4	10/05/92	10:20	39 34.2	54 51.4	17.0	16.2	070	15.0	1013.5
5	10/05/92	11:18	39 37.9	54.39.9	16.6	15.9	070	15.0	1013.5
6	10/05/92	15:08	39 42.5	54 27.9					
7	10/05/92	16:12	39 45.4	54 17.2					
8	11/05/92	01:03	40 07.0	53 43.7					
9	11/05/92	02:55	40 11.1	53 30.6	16.0	16.0	060	30.0	1012.0
10	11/05/92	10:19	40 34.2	54 01.4	18.2	18.0	050	12.0	1010.5
11	11/05/92	13:59	40 59.4	54 42.6	16.8	16.5	050	10.0	1009.0
12	11/05/92	17:30	41 18.7	55 28.6	15.5	15.0	090	11.0	
13	11/05/92	21:00	41 40.9	56 12.6	14.5	14.1	060	26.0	1001.3
14	12/05/92	00:48	42 04.2	56 58.3	13.4	13.0	060	15.0	998.0
15	12/05/92	04:31	42 26.4	57 41.0	11.0	10.5	270	4.0	997.5
16	12/05/92	08:25	42 49.1	58 24.6	10.2	10.0	080	10.0	994.5
17	12/05/92	12:26	43 12.5	59 09.1	10.0	10.0	060	10.0	993.0

6. Presenting the Data

6.1 Water Samples

The data from the water samples are presented along with the calibrated CTD information on the instance of the closing of every bottle. For each station the following parameters are presented:

CTD

PR: Pressure in decibars.
TE: Temperature in °C.
SAL: Salinity in Practical Units (UNESCO, 1981a and 1983).
TP: Potential temperature in °C (Bryden, 1973).

ROSETTE

TE-ROS: Temperature in °C.
SAL: Salinity in Practical Units (UNESCO, 1981a).
O2: Dissolved Oxygen concentration in ml./l.
SiO4: Silicate concentration in μmol/kg.
NO3: Nitrate concentration in μmol/kg.
NO2: Nitrite concentration in μmol/kg.
PO4: Phosphate concentration in μmol/kg.

The temperature and salinity values from the bottles were plotted as vertical profiles for each station. Also presented for each cruise are salinity and nutrient plots as a function of potential temperature.

6.2 CTD

For every station a graphical representation of the vertical distributions of potential temperature, salinity and potential density anomalies was presented. This last variable is calculated using the algorithm for the equation for the state of the sea water given by Millero and Poisson (1981). Some stations had differences between the values from the bottle and the corresponding CTD profile, due to the variation observed between ascent and descent, reason why both profiles are presented.

The profiles from the yo-yo stations for cruises OA-0491 (OA04D401-415) and HO-0492 (Ho04D040-054) and the high resolution legs from cruises Oa-0491 (OA04D120-129) and AU-0192 (AU01D010 and AU0120-128) are constructed in the following manner: the first profiles for temperature, salinity and anomalies in the potential density coincide with the scale from the corresponding axis, the resulting ones are translated sequentially at 1°C, 0.25 ups and 0.5 kg/m3 from the previous one.

A table containing predetermined levels of CTD data and a header contains the following information:

- Ship Code: OA (Oca Balda), HO (Dr. Holmberg) and AU (El Austral).
- Date: day, month and year.
- Time: GMT.
- Latitude and longitude in degrees, minutes and hundredths of the minute from the beginning of the station.
- Gravity
- Coriolis Parameter
- Sonic depth
- SAL: Salinity in Practical Units (UNESCO, 1981a and 1983).
- TPOT: potential temperature in °C (Bryden, 1973).
- SIGTH: density anomalies in kg/m3 (UNESCO, 1981b).
- SIG2, SIG4: potential density anomalies at pressures of 2000 and 4000 dbar in kg/m3 (UNESCO, 1981b).
- ALTDIN: Dynamic height at 101 J/Kg.
- PE: Potential energy anomalies at 105 J/m2 (Fofonoff, 1962).
- GRDTP: Vertical gradient for potential temperature (ΛT_2) at 103 °C/dbar.
- GRDS: Vertical gradient for salinity (ΛS_2) at 103/dbar.
- TASADENS.: Density rate ($R\rho = \alpha \Lambda T_2 + \beta \Lambda S_2$)
- BV: BruntVaisala in cycles/hour (Fofonoff, 1985).
- PROF: depth in meters (Saunders and Fofonoff, 1976).

6.3 XBT

The XBT data presented in this report contains lists and plots for temperature as a function of the depth for each launching. The plots are constructed in the following way: the first thermal profile coincides with the temperature scale from the corresponding axis, while the rest are sequentially displaced 1°C from the previous one. The lists present temperature values at variable depth intervals, for different portions from the water column.

Acknowledgements

The project Contour Streams of the South-Occidental Atlantic was financed by the Hydrographic Naval Service. Publication costs for this report were also covered by SIHN. The Argentinean Antarctic Institute loaned a CTD system Neil Brown MKIII B to be used on the three cruises. SMARA, in particular engineer Hector Salgado, cooperated with this project by processing satellite images provided by the AU 01-92 cruise. Digitalization of the XBT was done by Gerardo Collino.

The authors thank engineer Robert Millard from the Woods Hole Oceanographic Institution for his cooperation in adapting post-processing programs for the CTD. These programs were given to our project group. Finally, we acknowledge the people who participated in the cruises and the crew aboard the BIP "Capitan Oca Balda", BIP "Dr. . Holmberg" and BIO "El Austral". Their collaboration, dedication and professionalism contributed greatly to the success of the observational phase of the project.

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El Austral 01-92		
Bianchi, Alejandro	SIHN	Jefe Científico
Balestrini, Carlos	SIHN	Responsable CTD
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López, Fernando	INIDEP	CTD/Nutrientes
Molina, Daniel	SIHN	Oxígeno disuelto
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Negri, Rubén	INIDEP	Fitoplancton
Osiroff, Ana	SIHN/CONICET	Salinidad
Tosonotto, Gabriela	IAA	CTD

CONICET:	Consejo Nacional de Investigaciones Científicas y Técnicas, Buenos Aires.
IAA:	Instituto Antártico Argentino, Buenos Aires.
INIDEP:	Instituto Nacional de Investigación y Desarrollo Pesquero, Mar del Plata.
SIHN:	Servicio de Hidrografía Naval, Buenos Aires.

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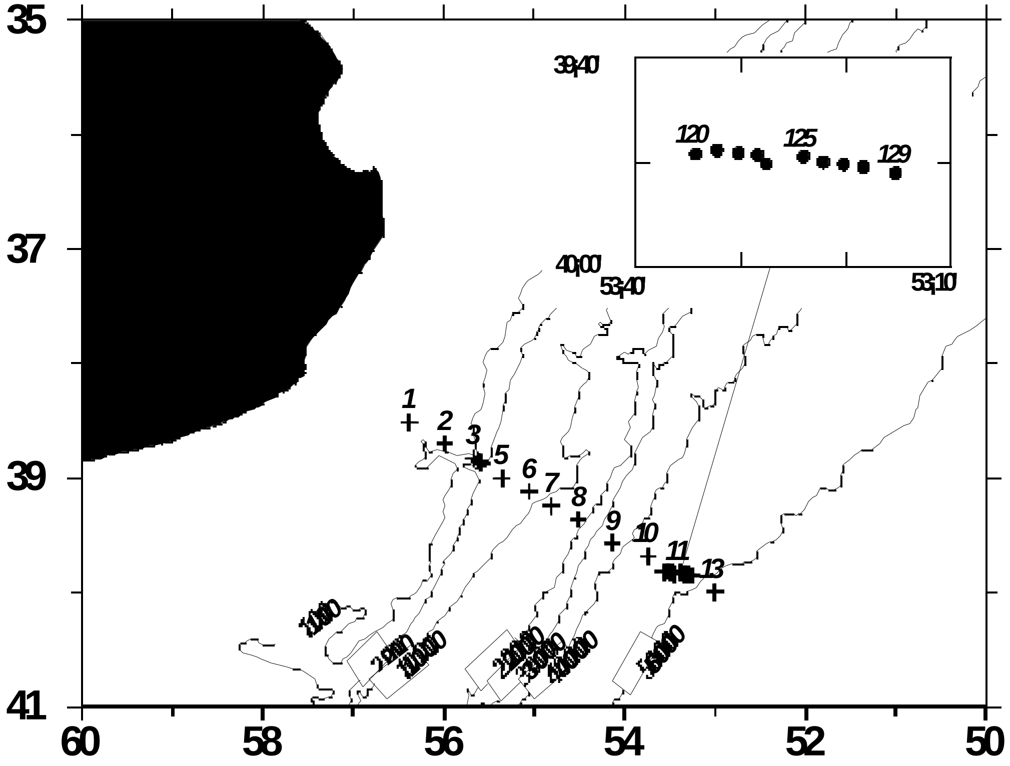


Figure 1. Posición de las estaciones oceanográficas realizadas en la Campaña Cap. Oca Balda 04-91.

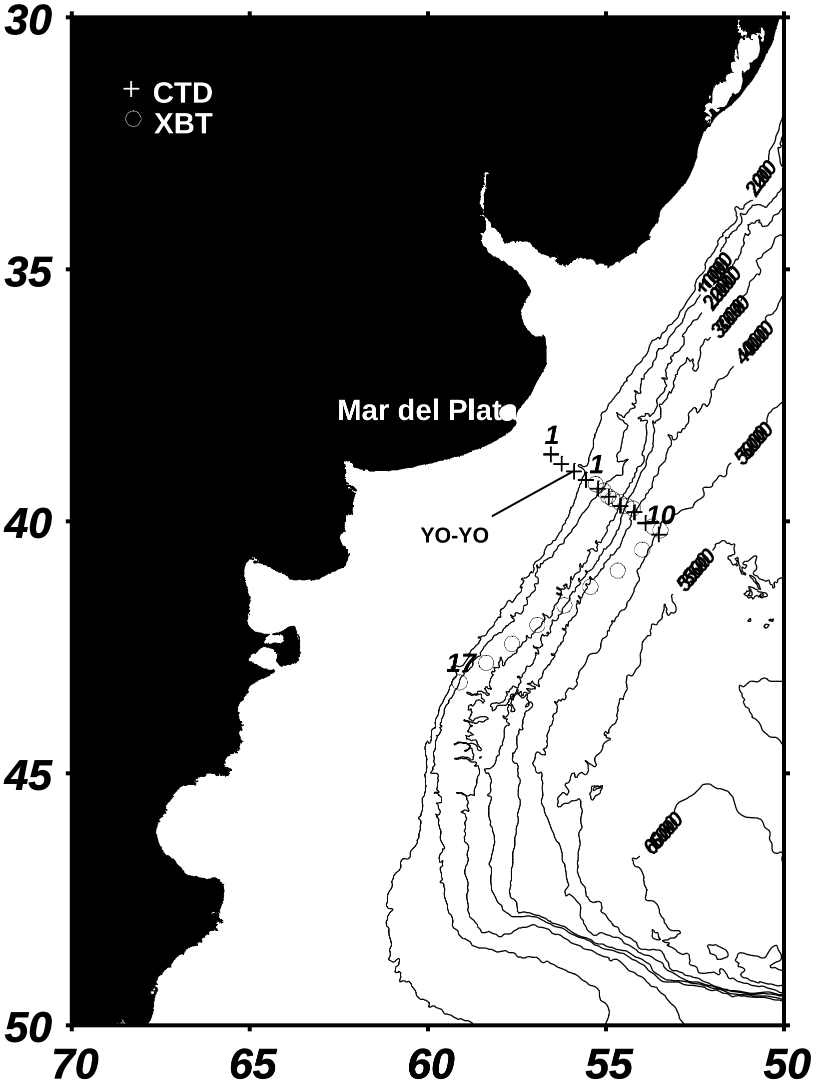


Figure 2. Posición de la estaciones oceanográficas y lanzamientos XBT realizadas en la Campaña Dr. Eduardo L. Holmberg 04-92.

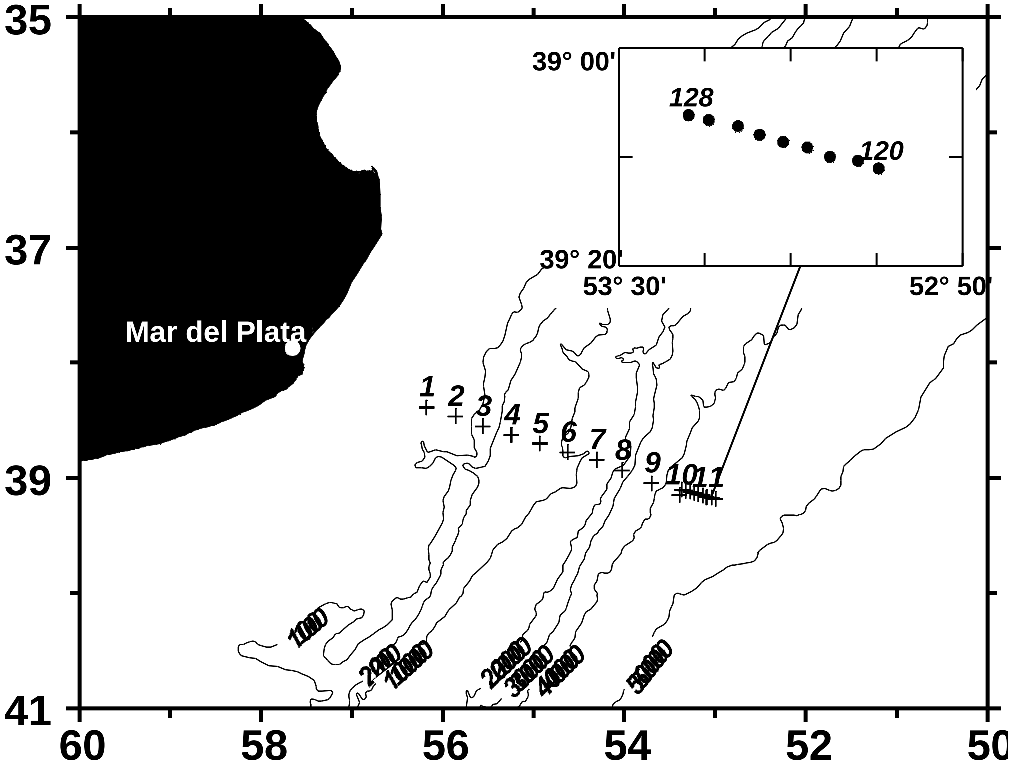
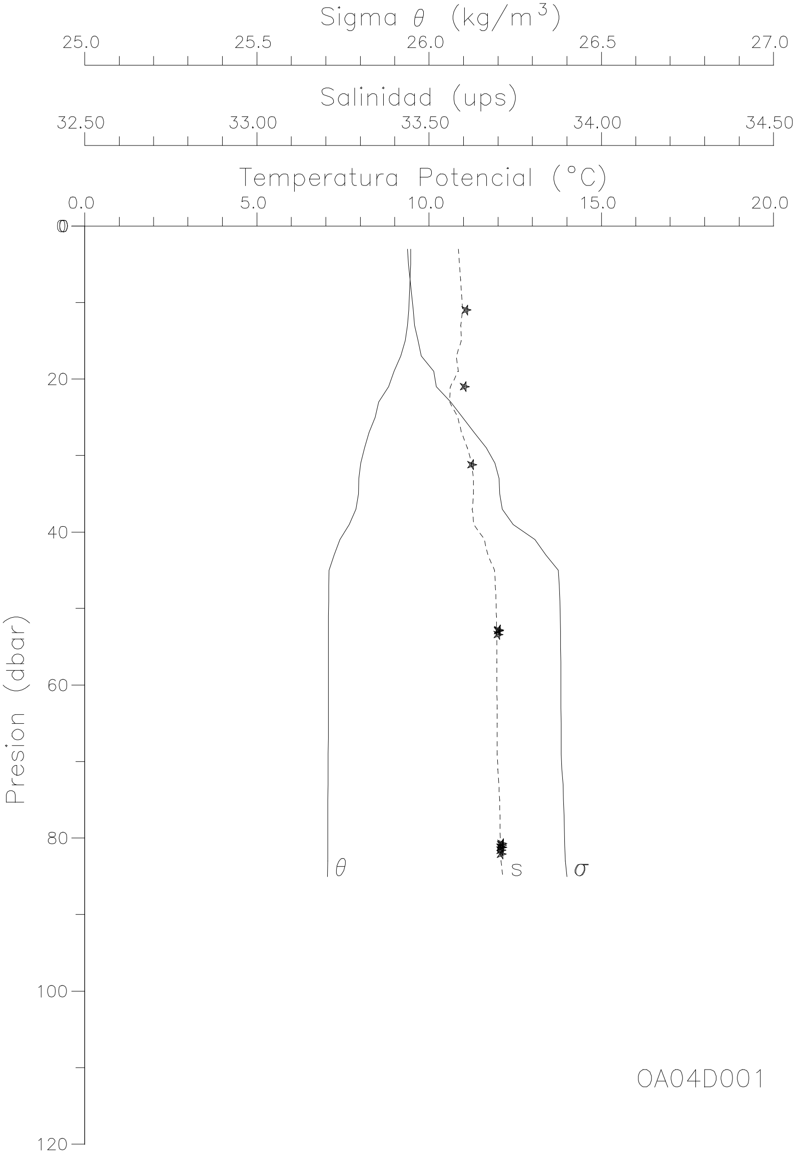


Figure 3. Posición de la estaciones oceanográficas realizadas en la Campaña El Austral 0192



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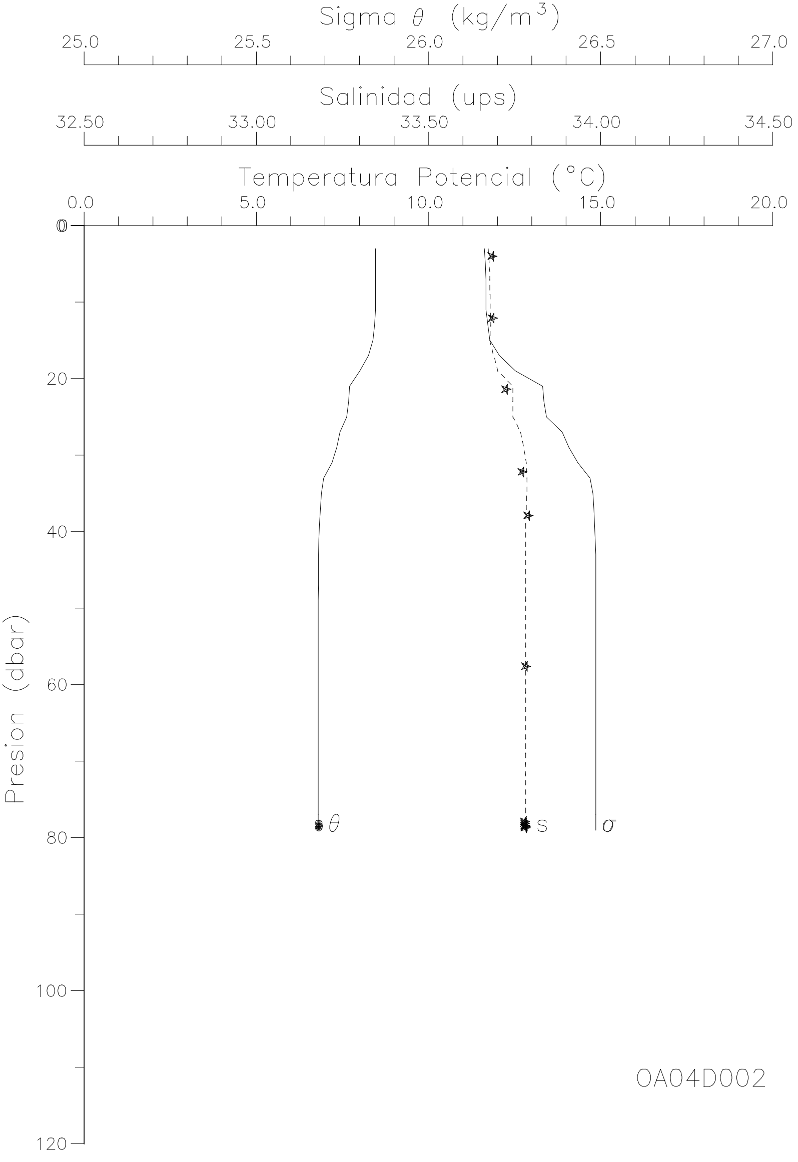

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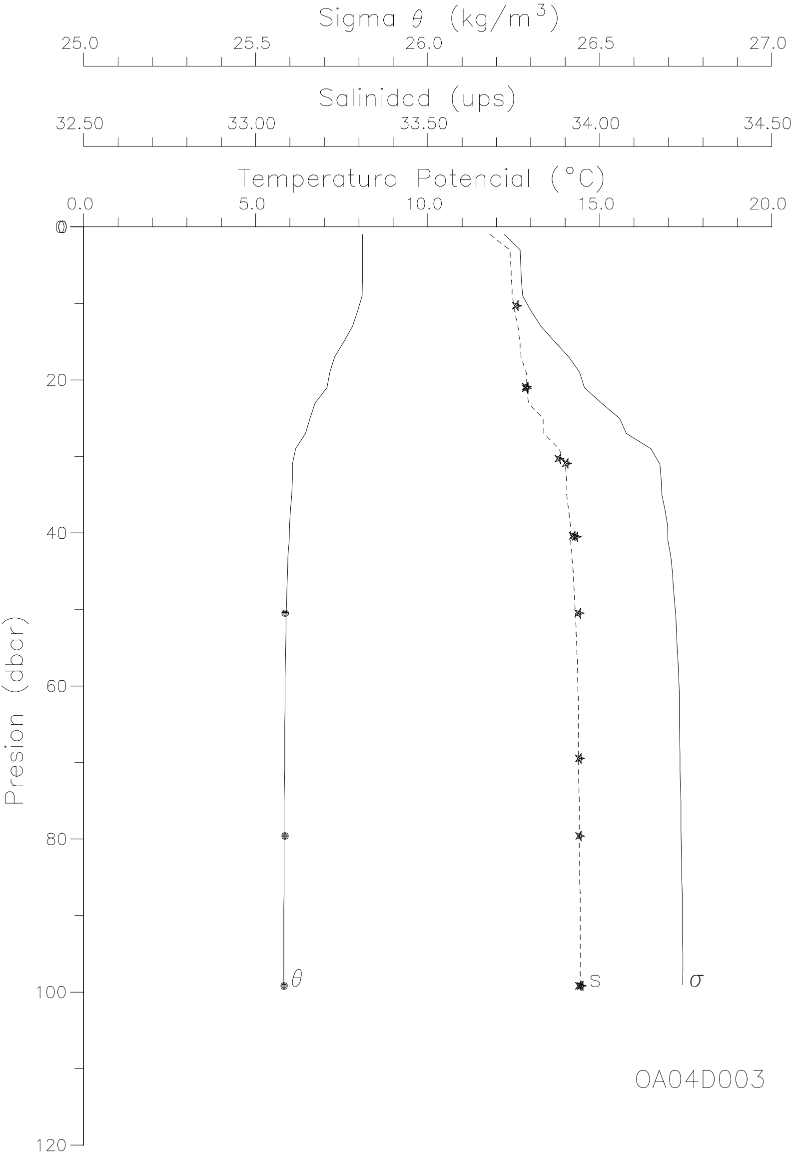

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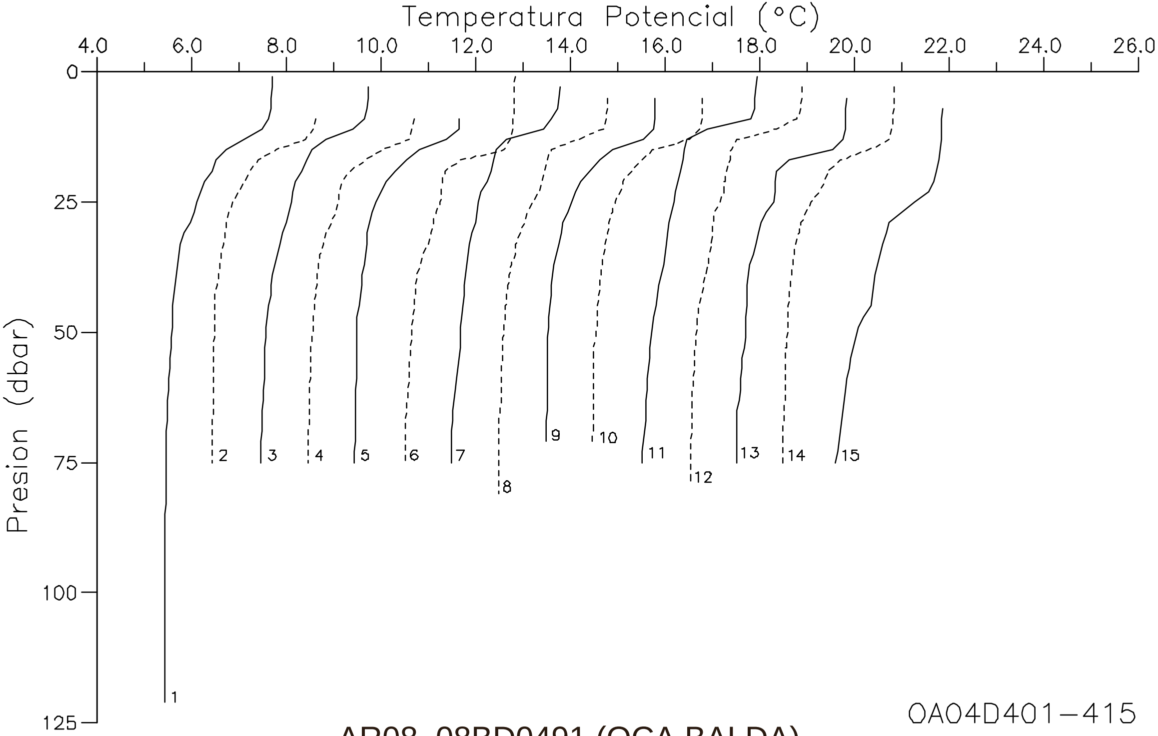

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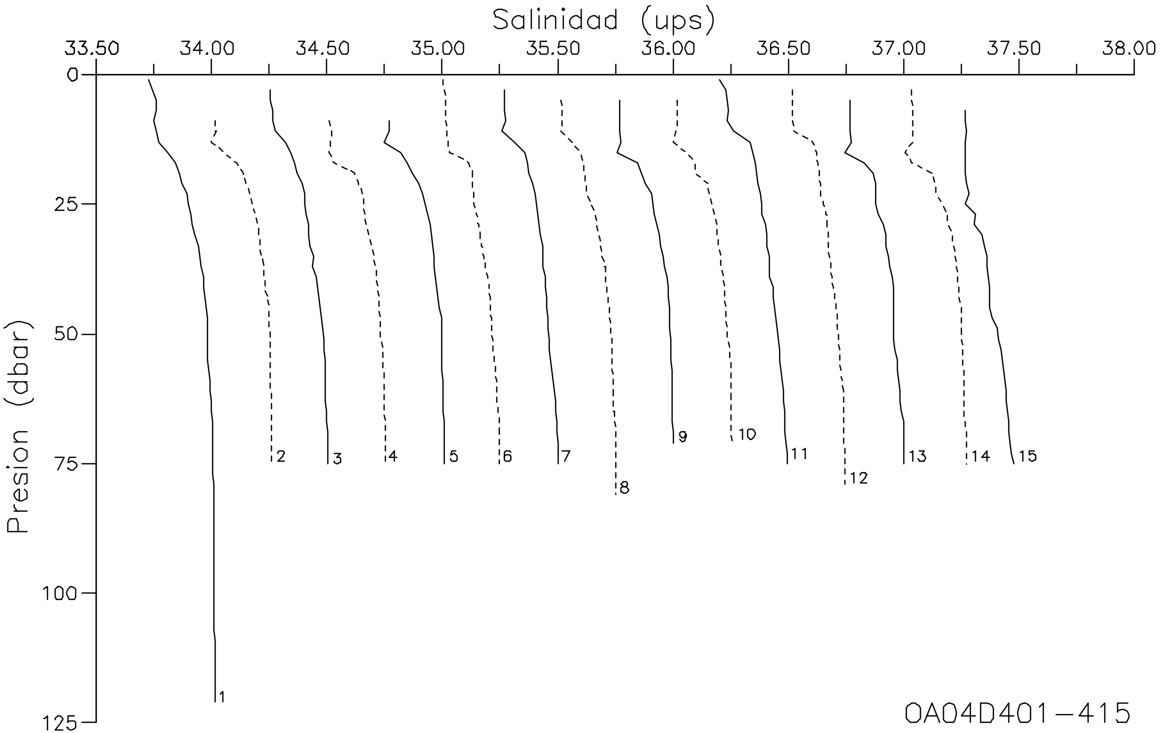

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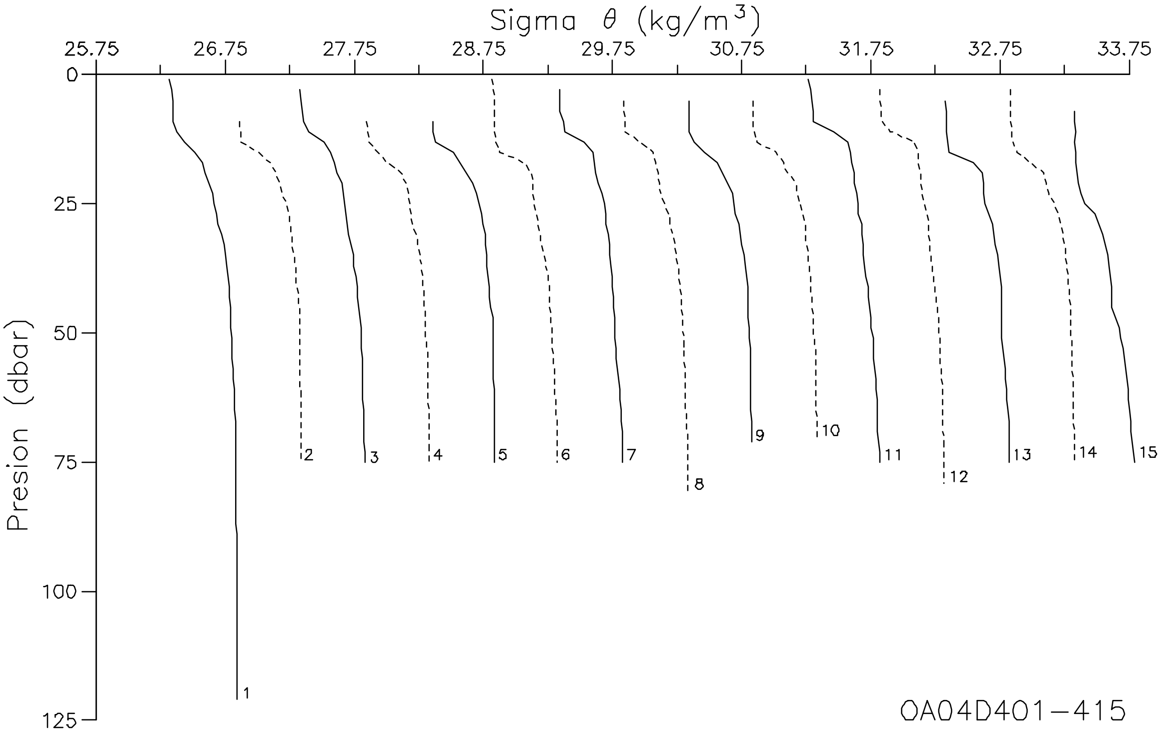

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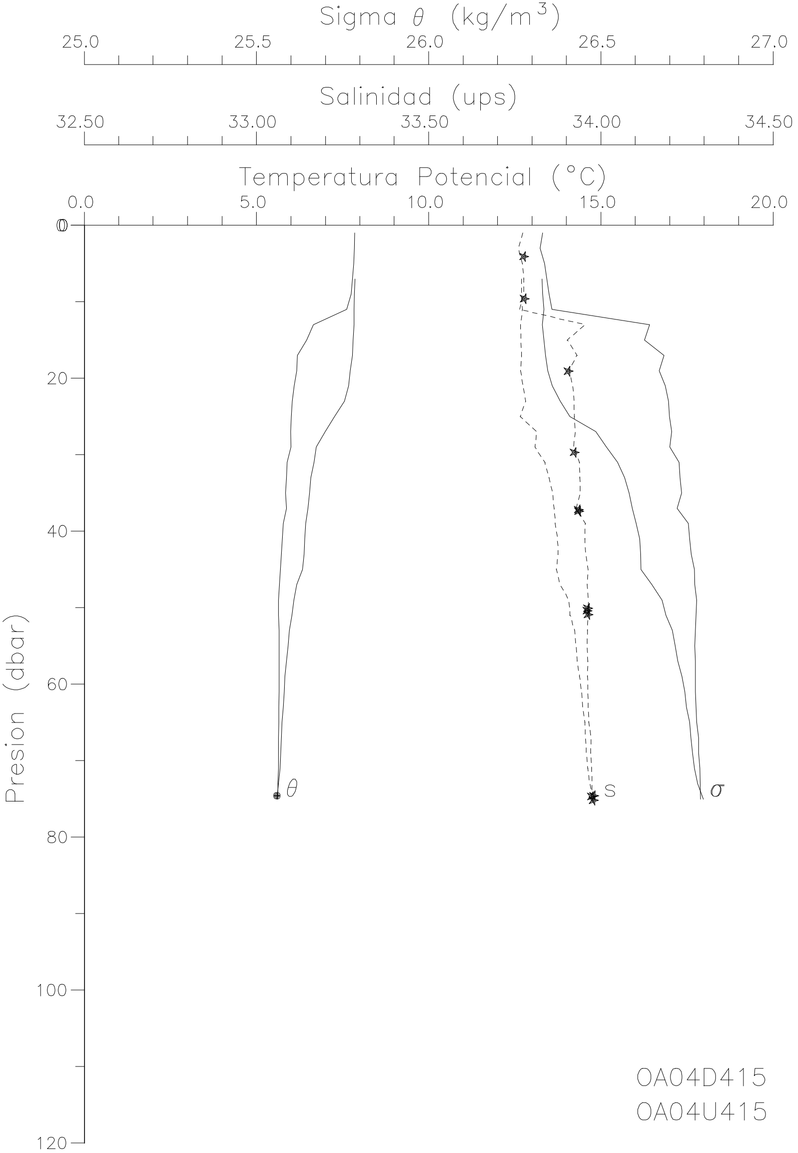

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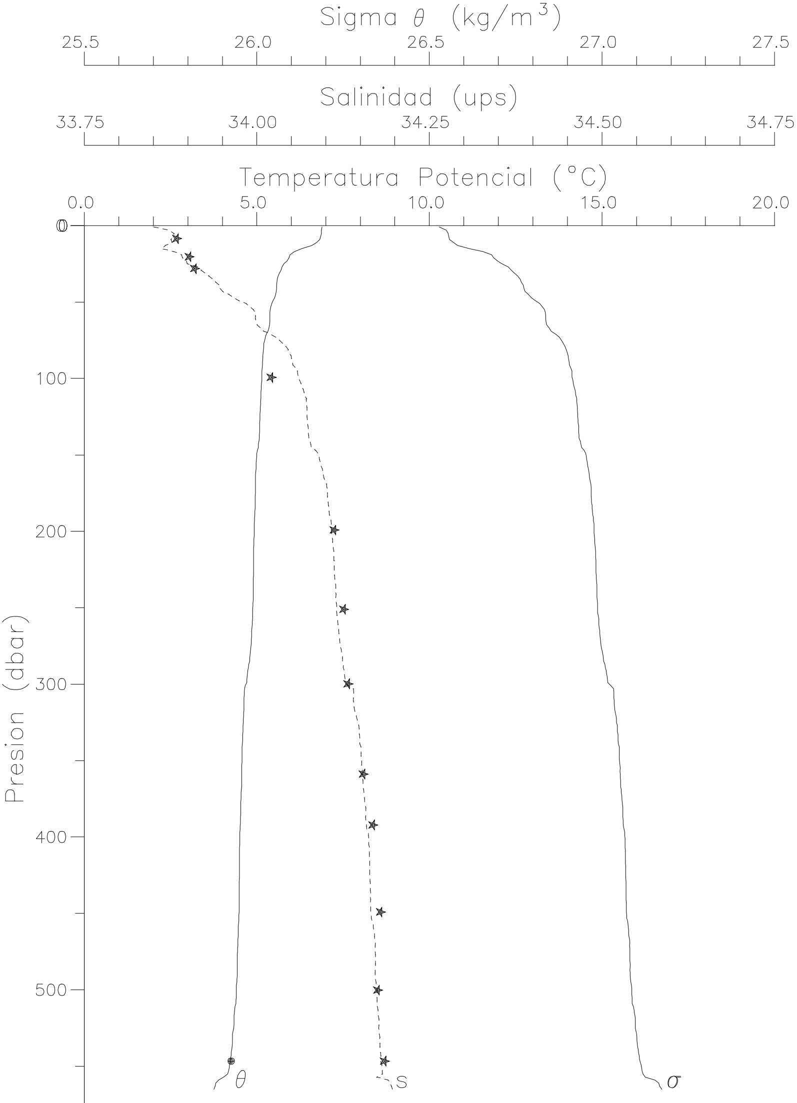

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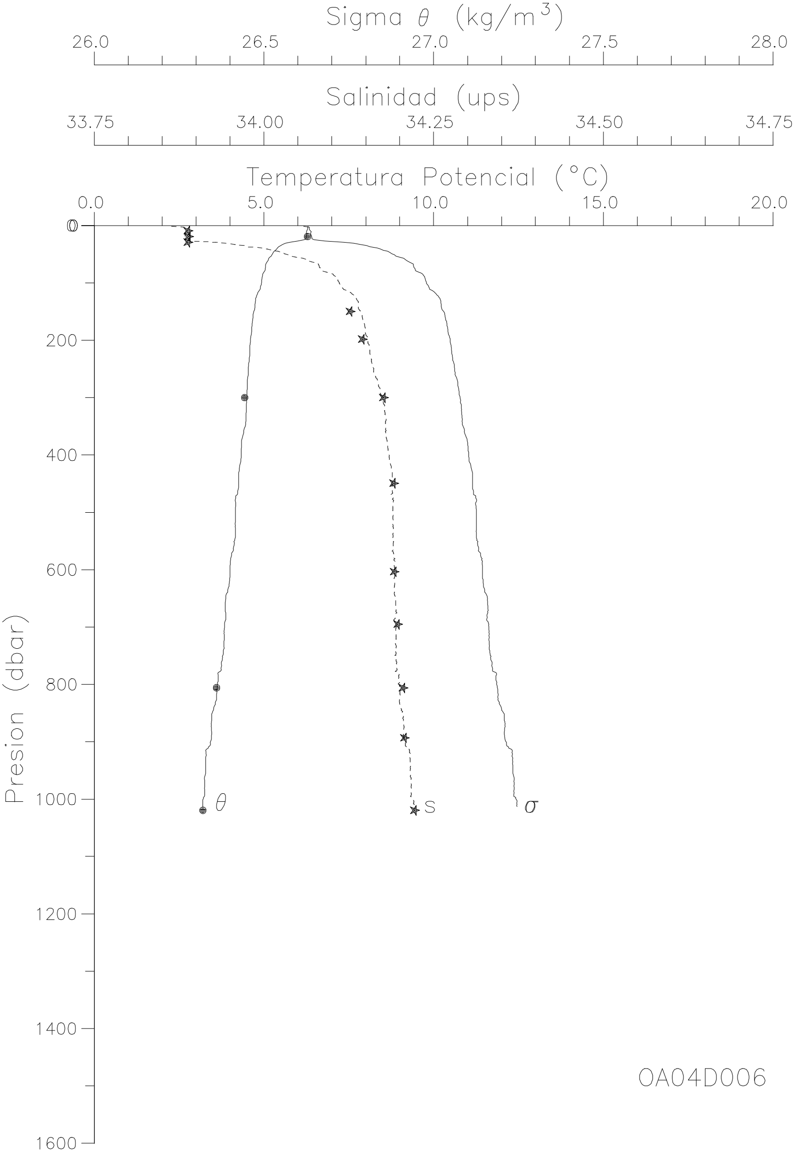

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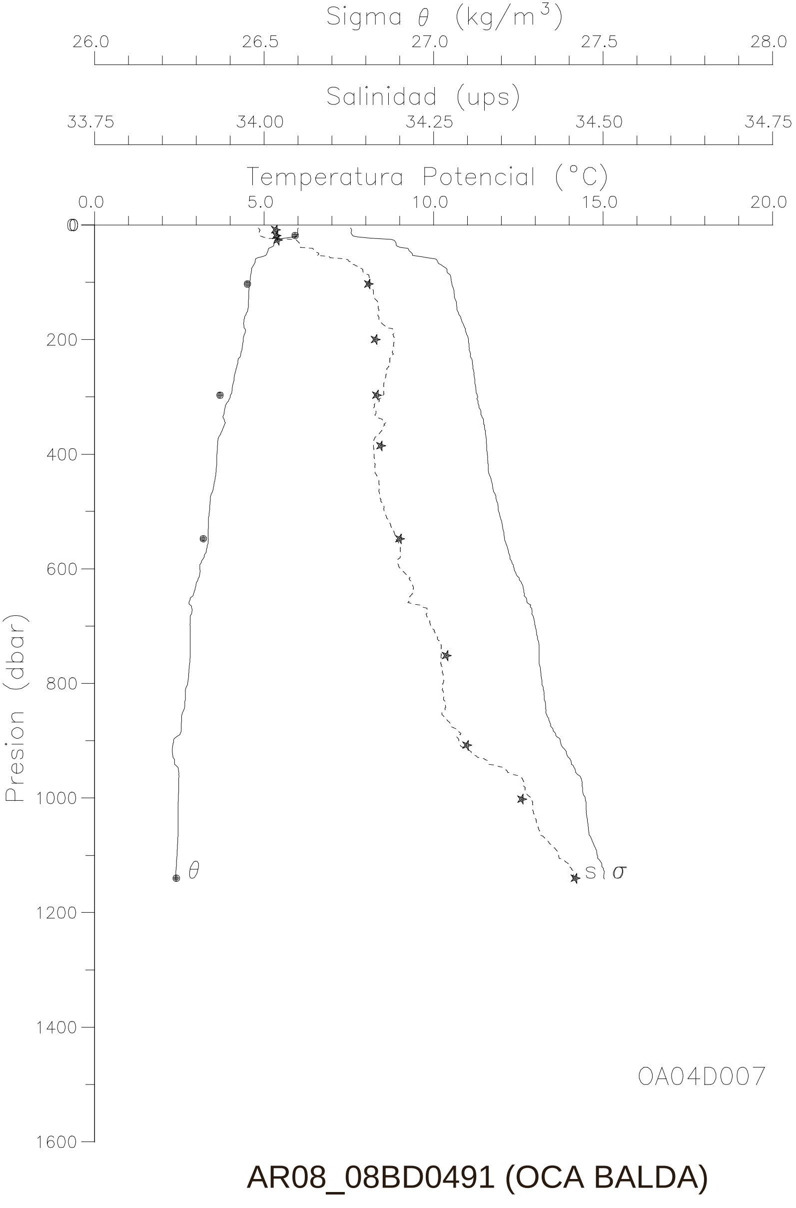

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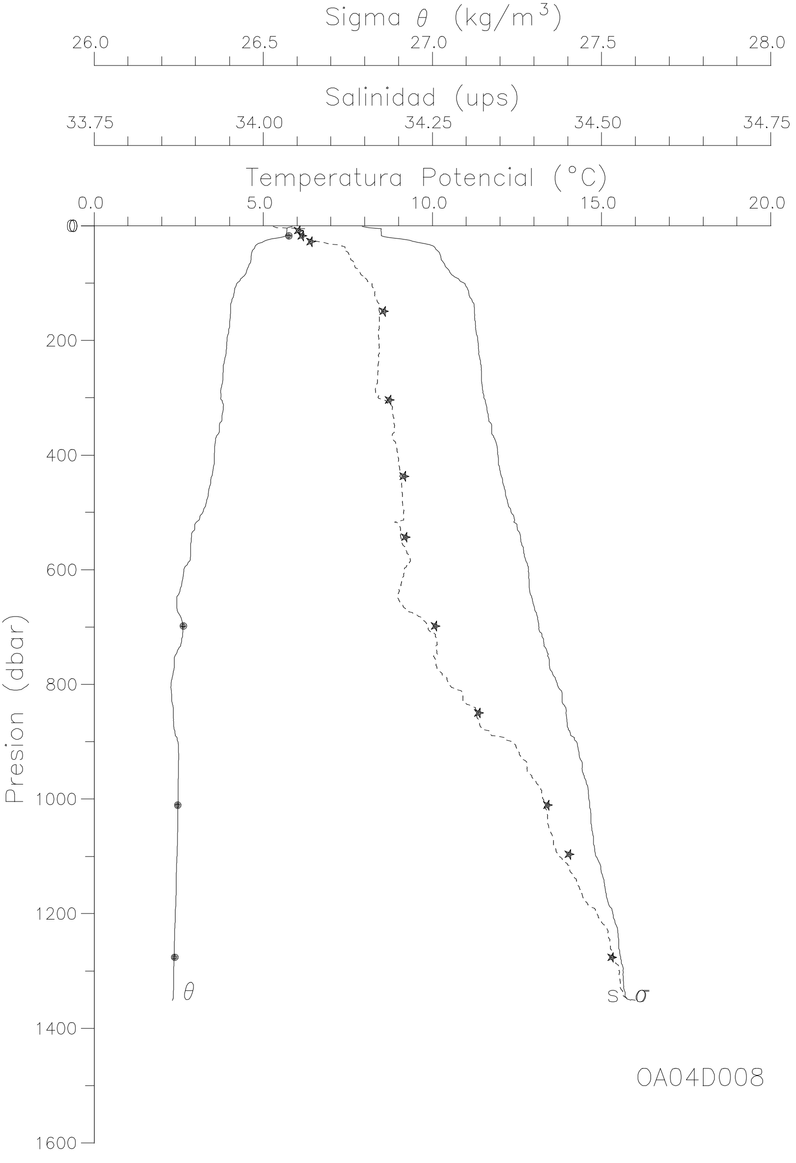

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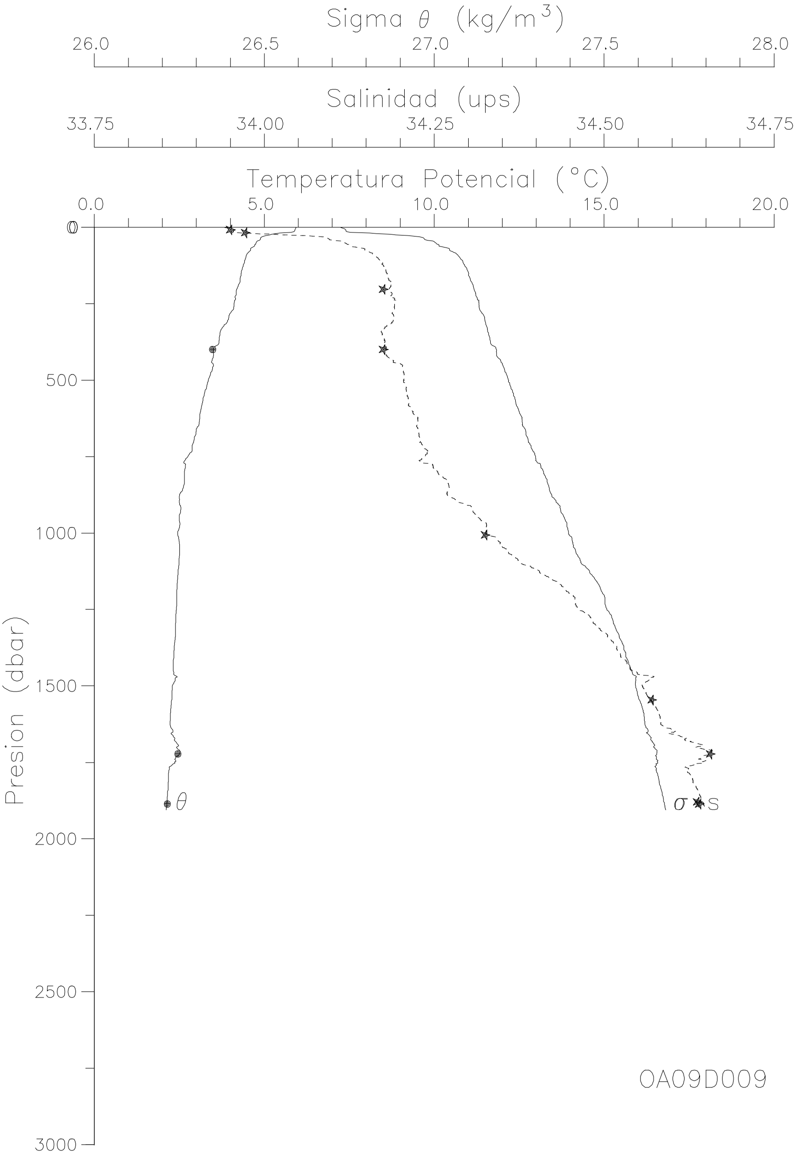

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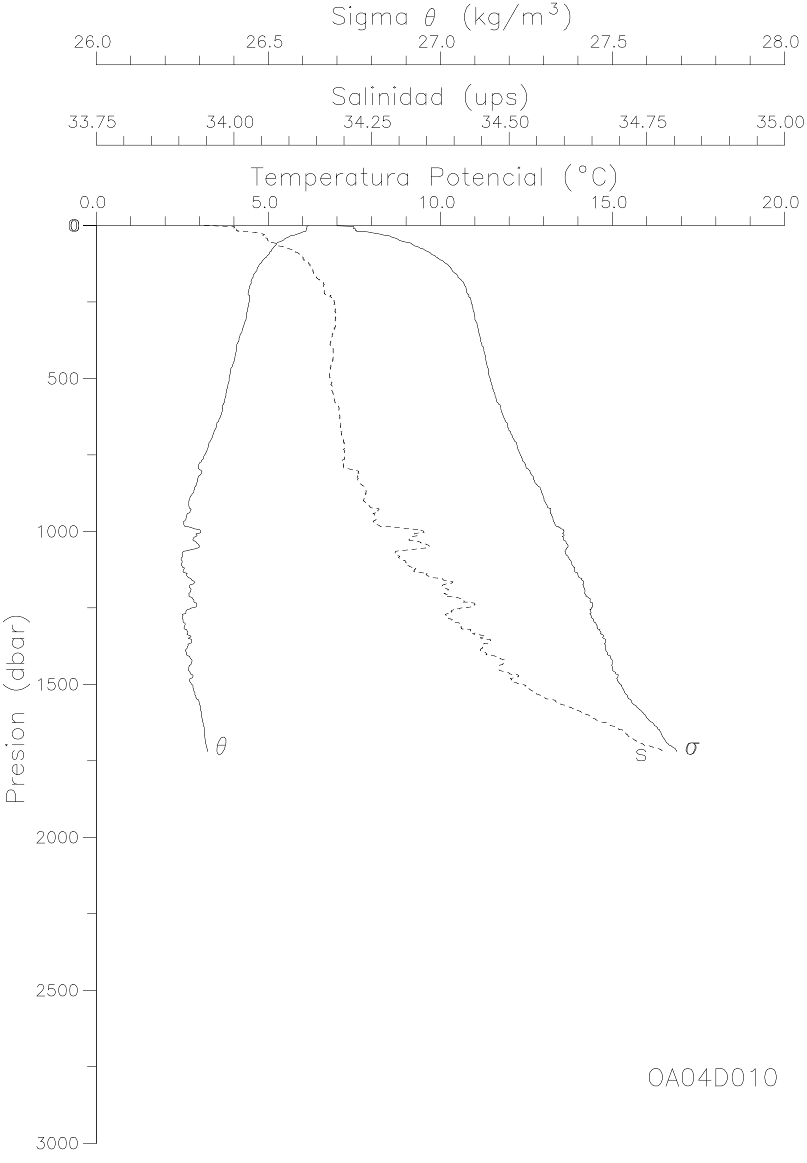

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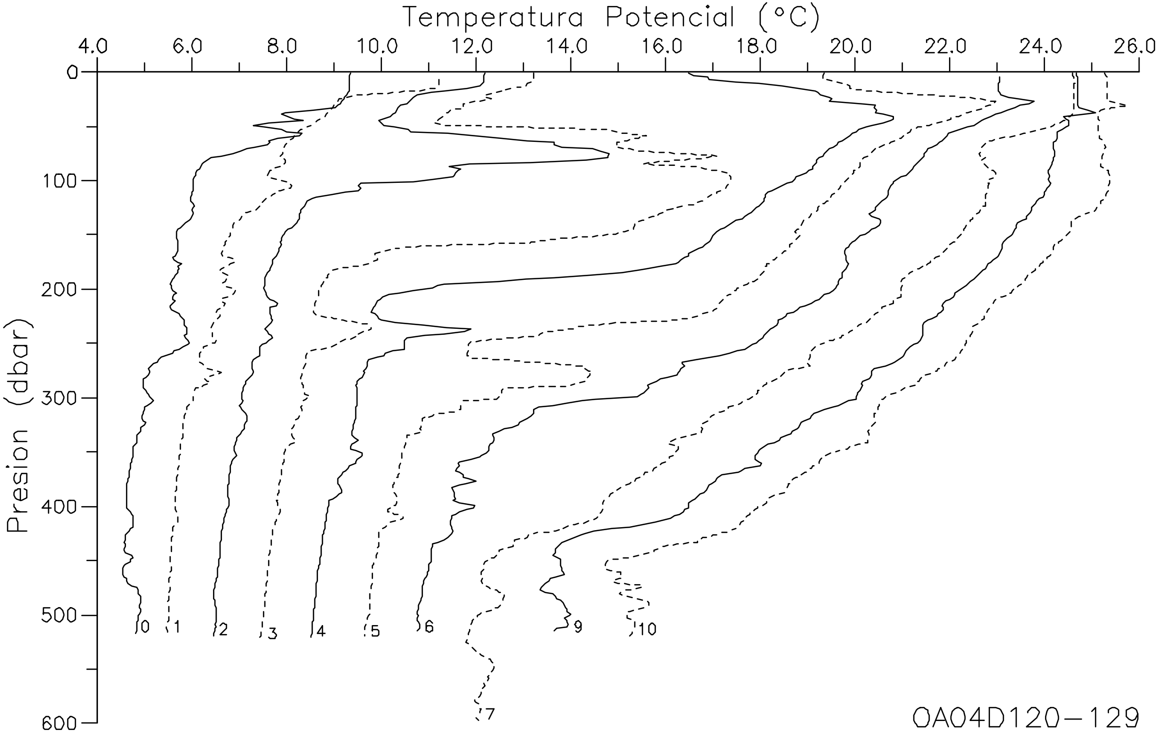

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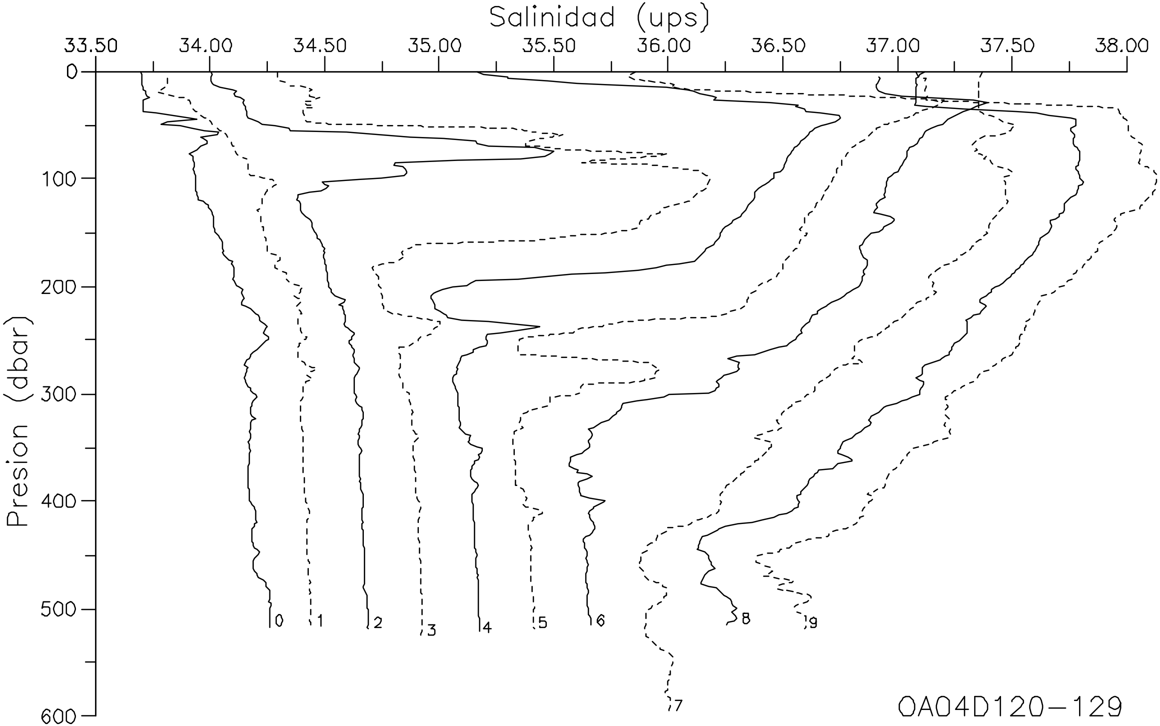

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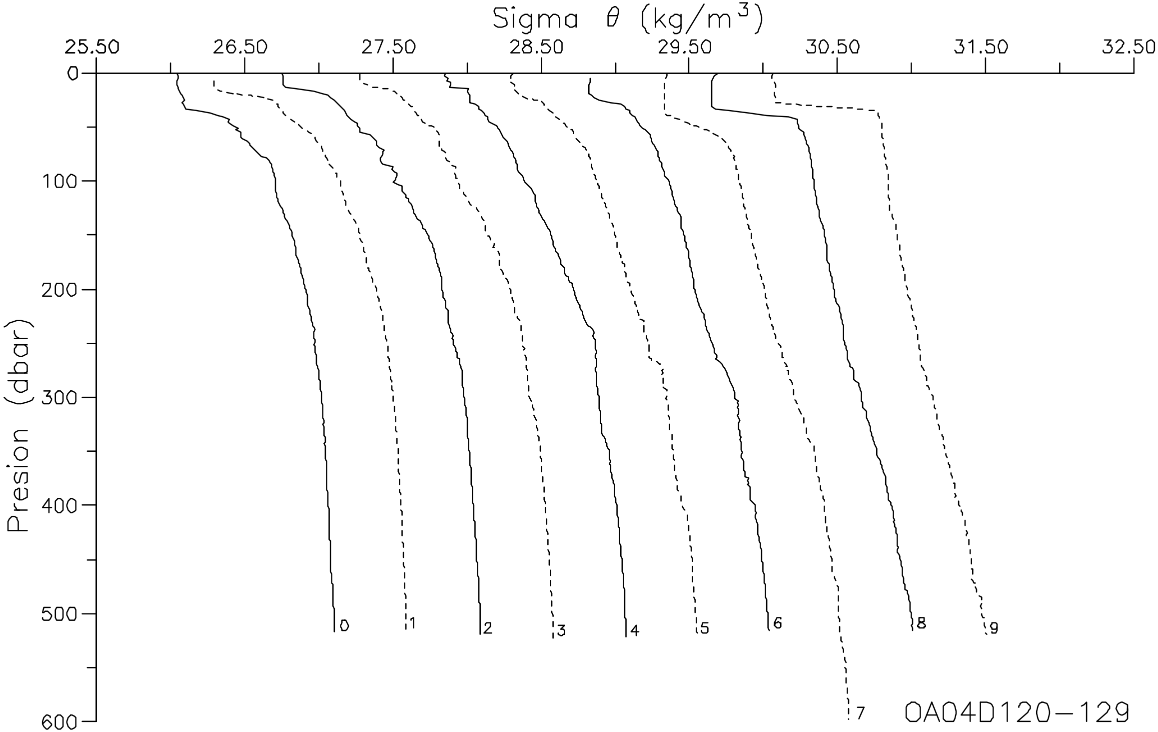

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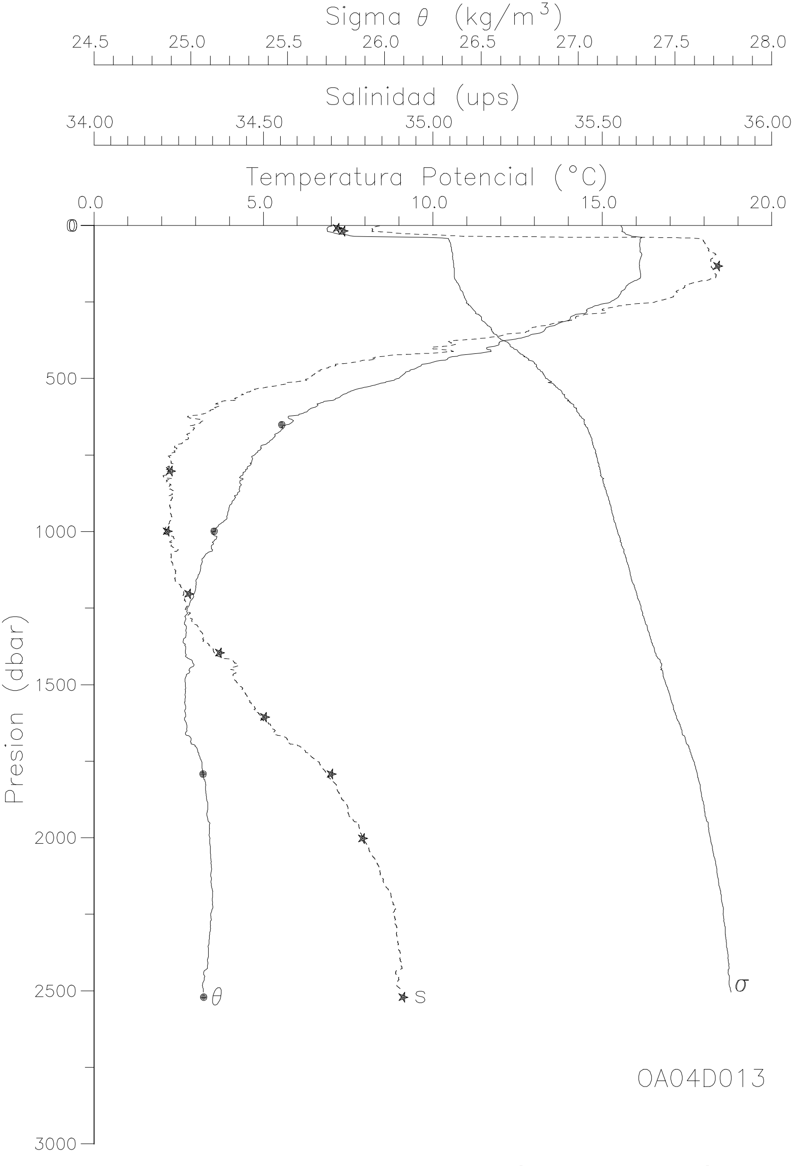

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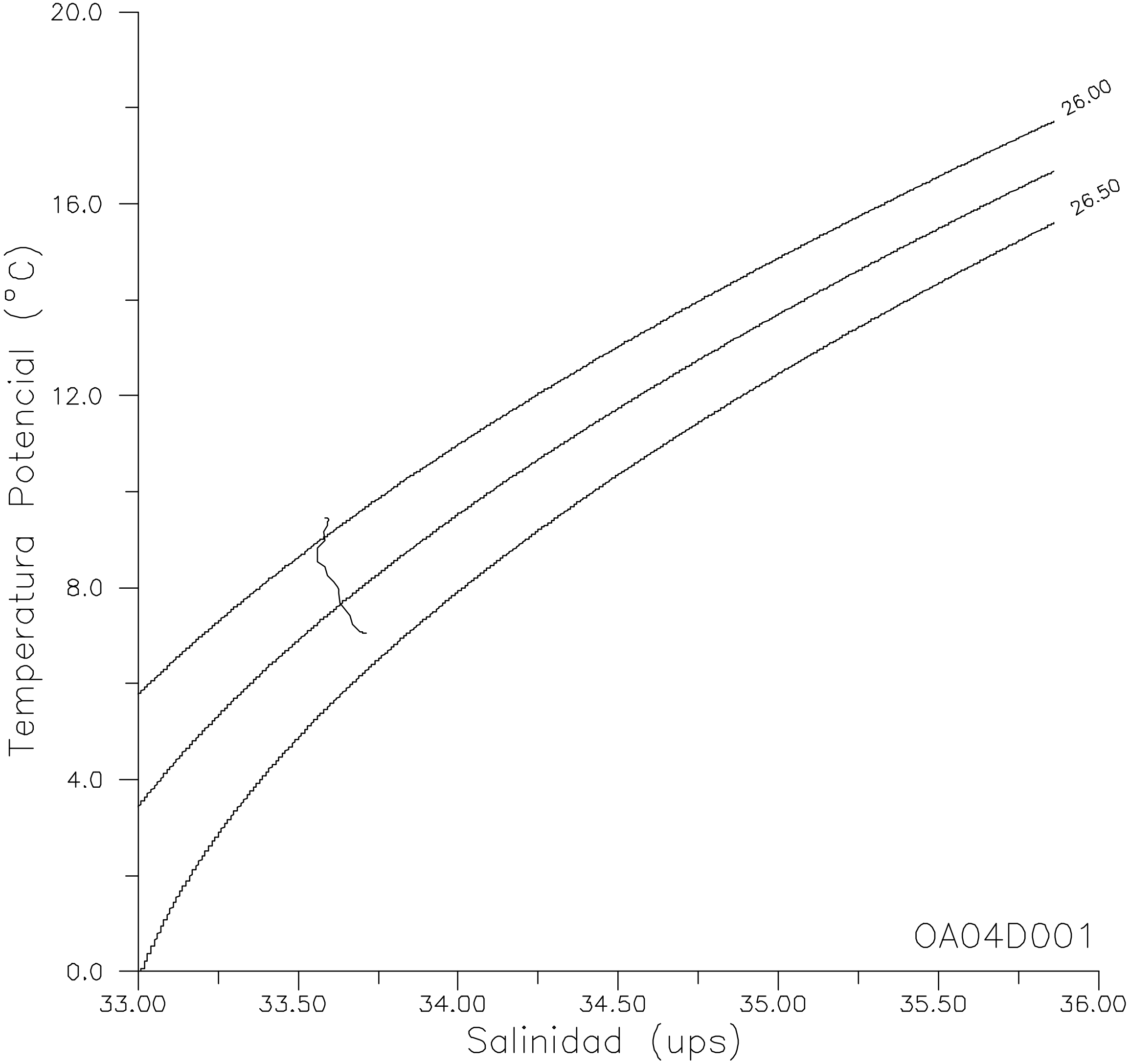

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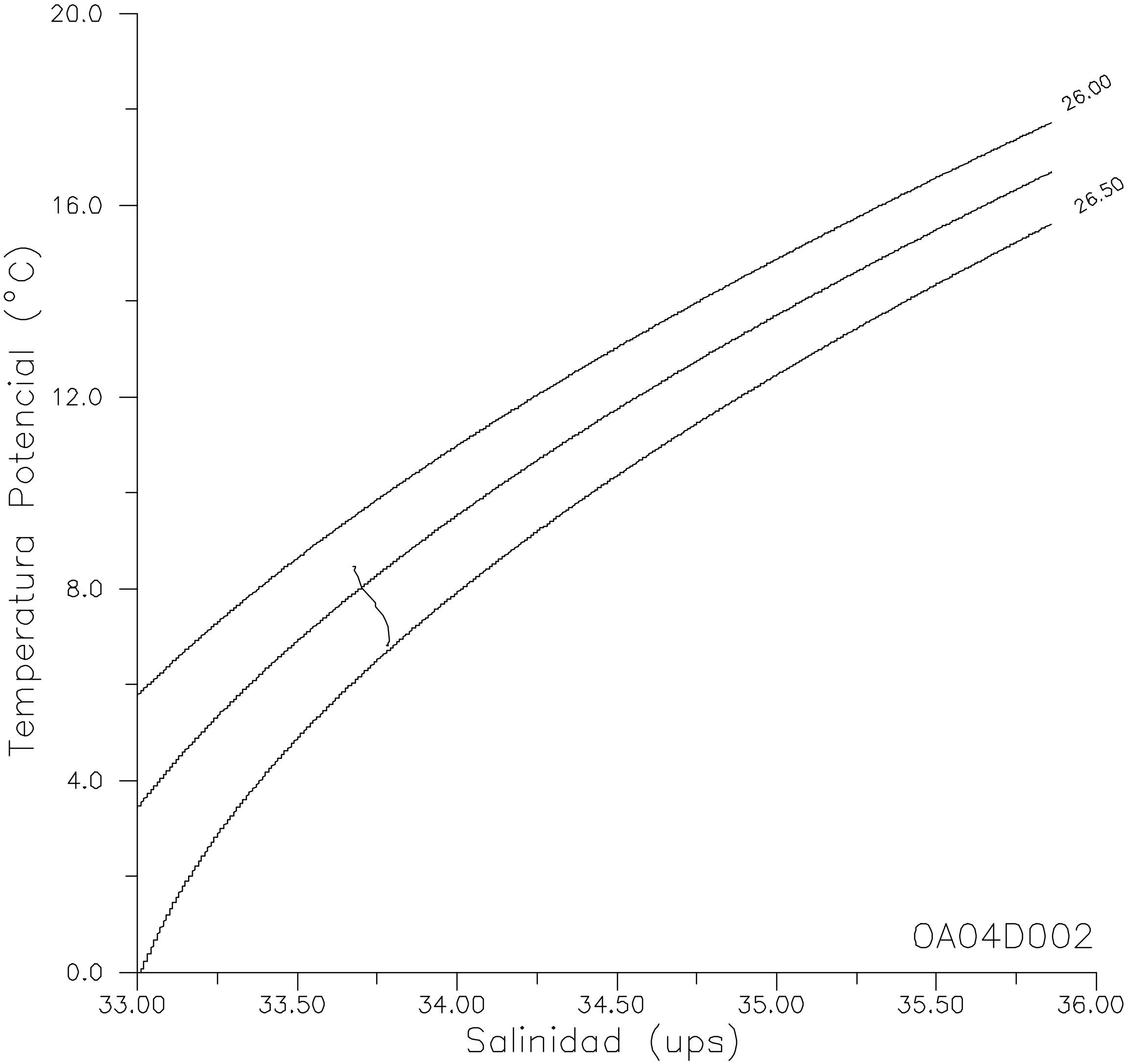

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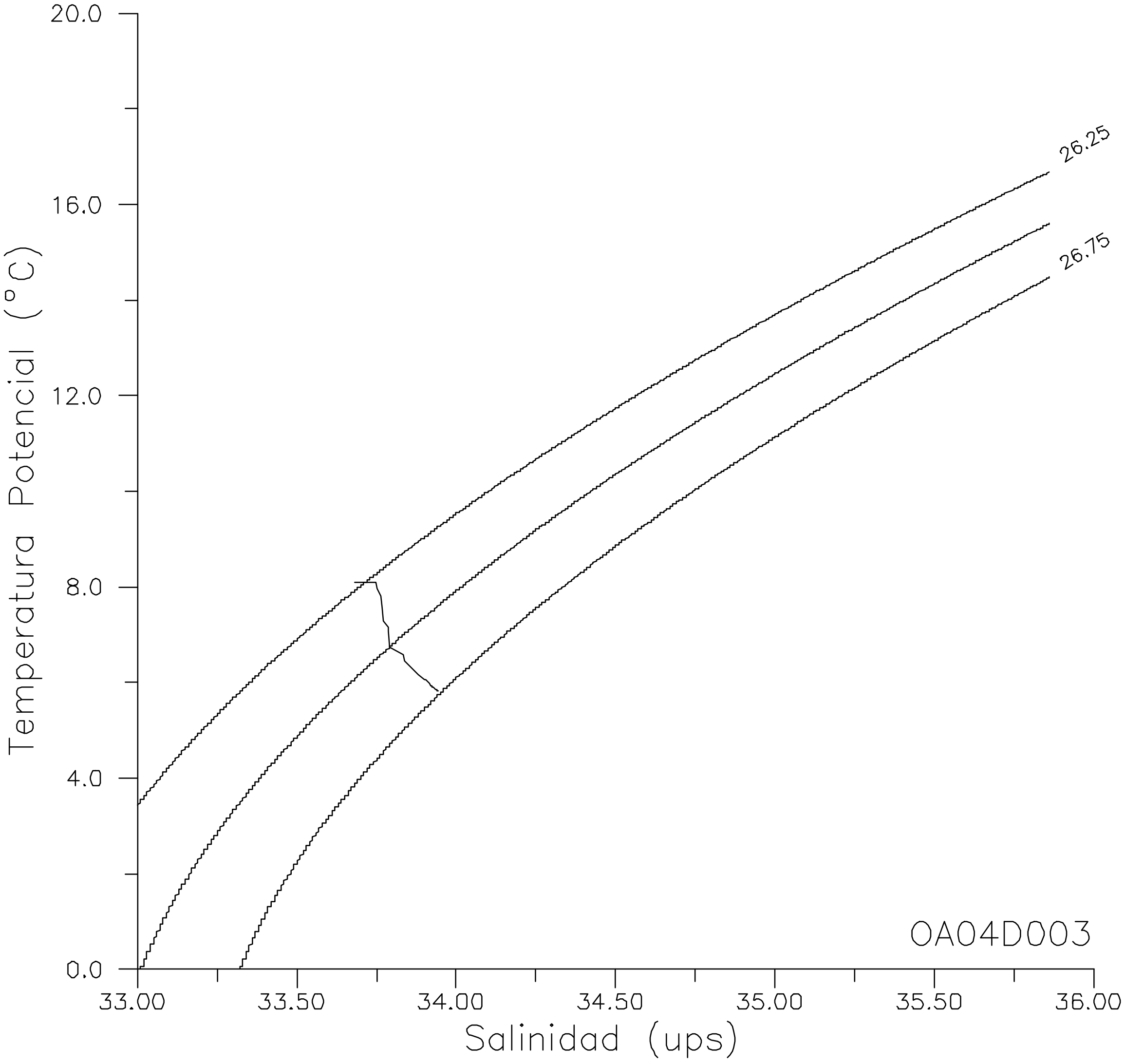

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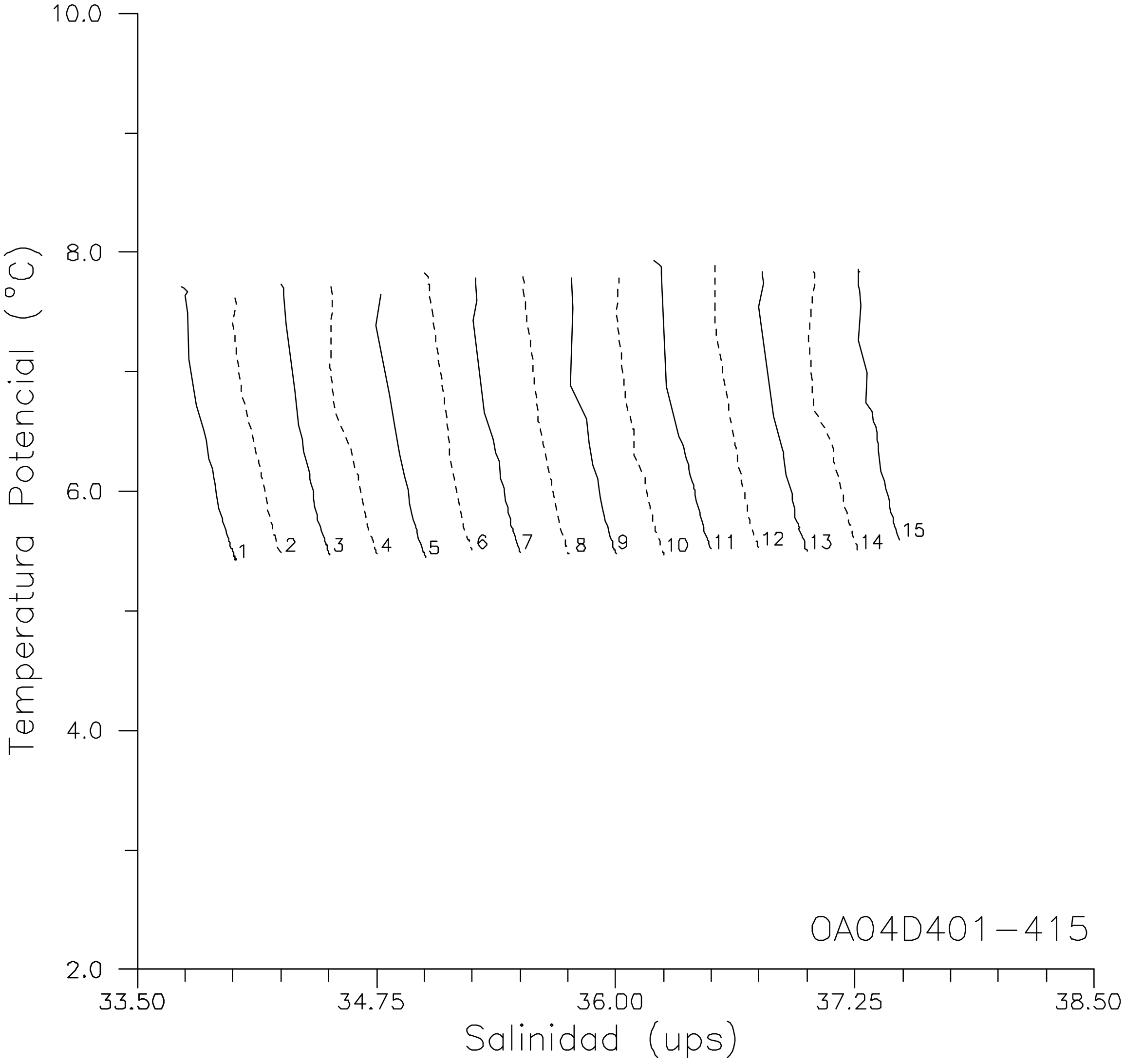

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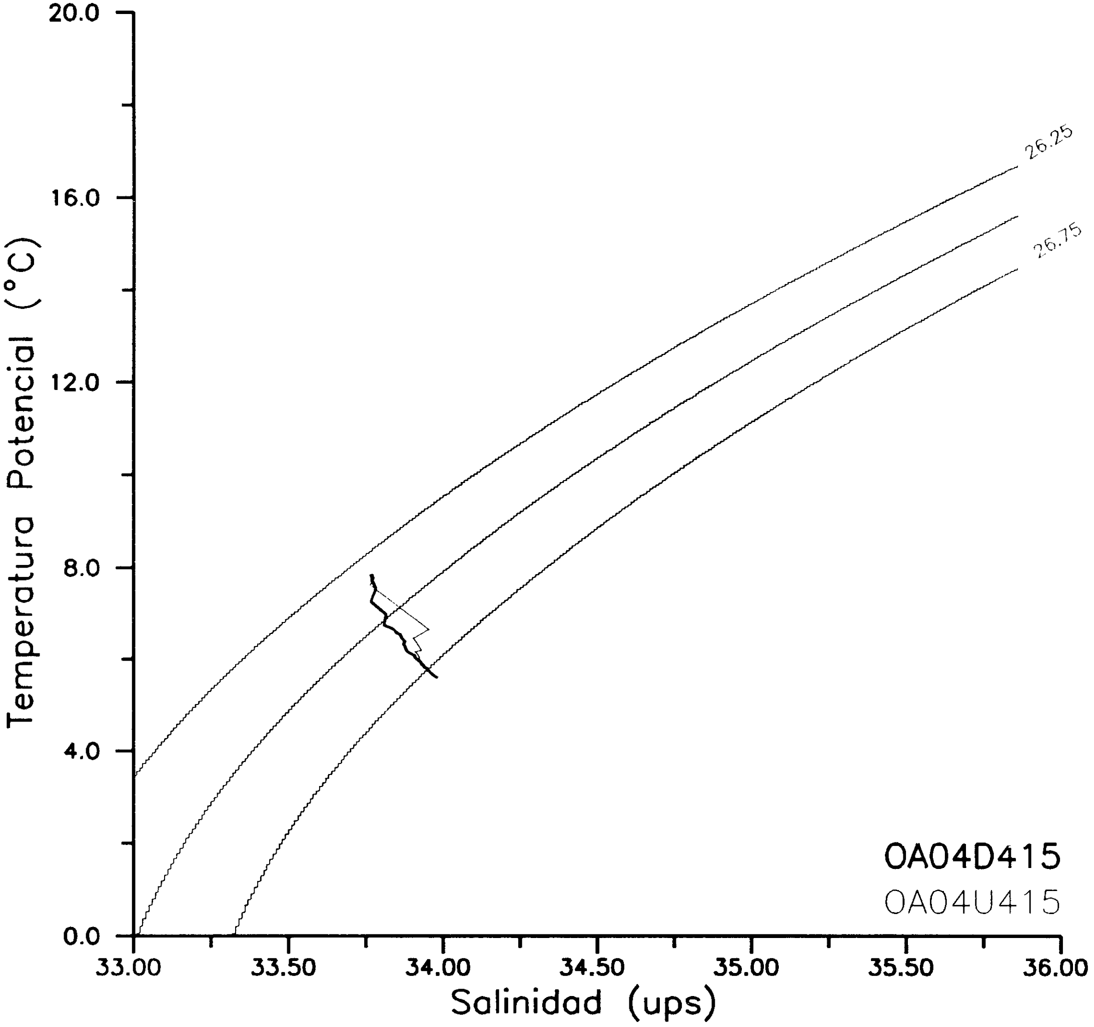

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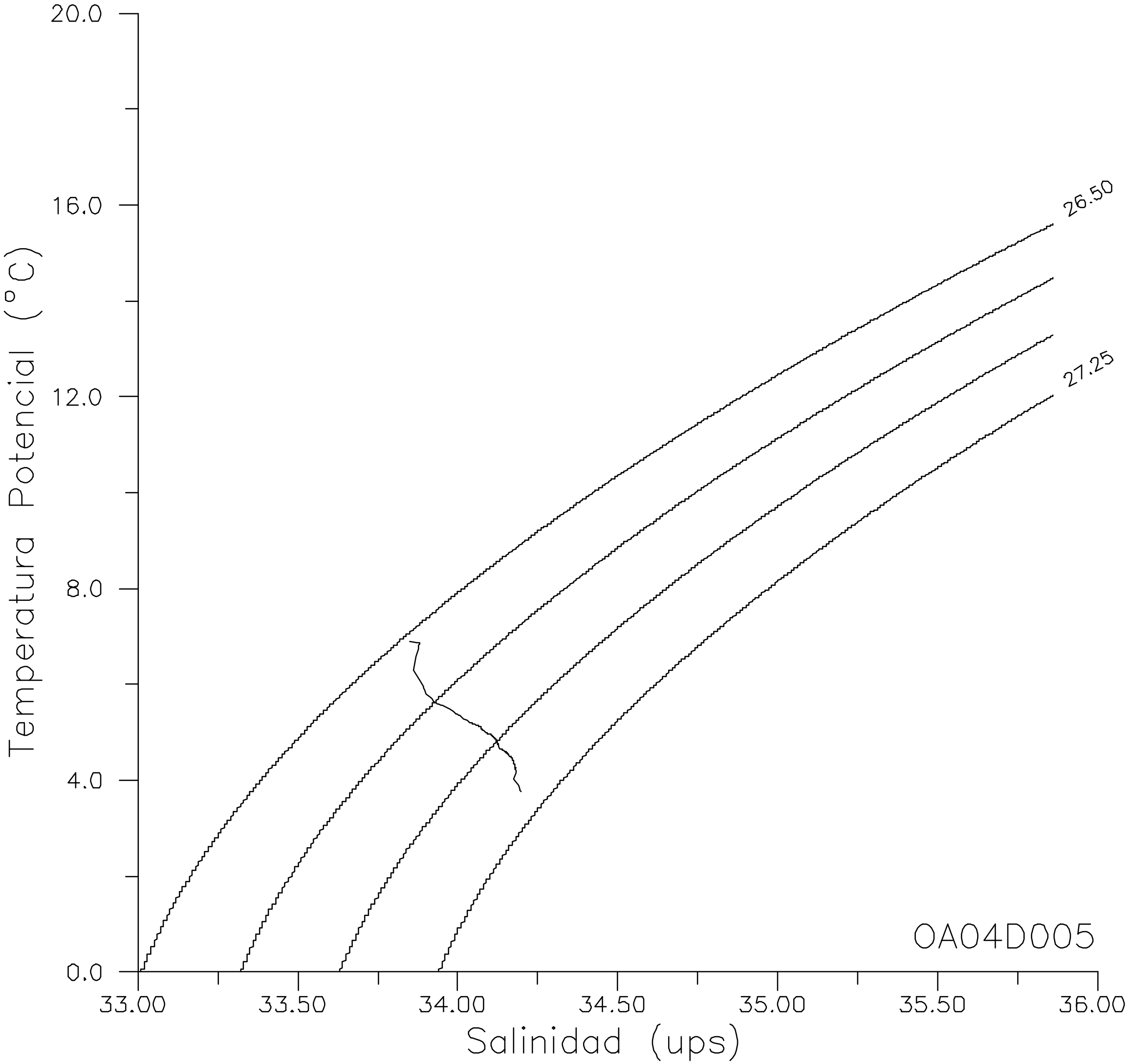

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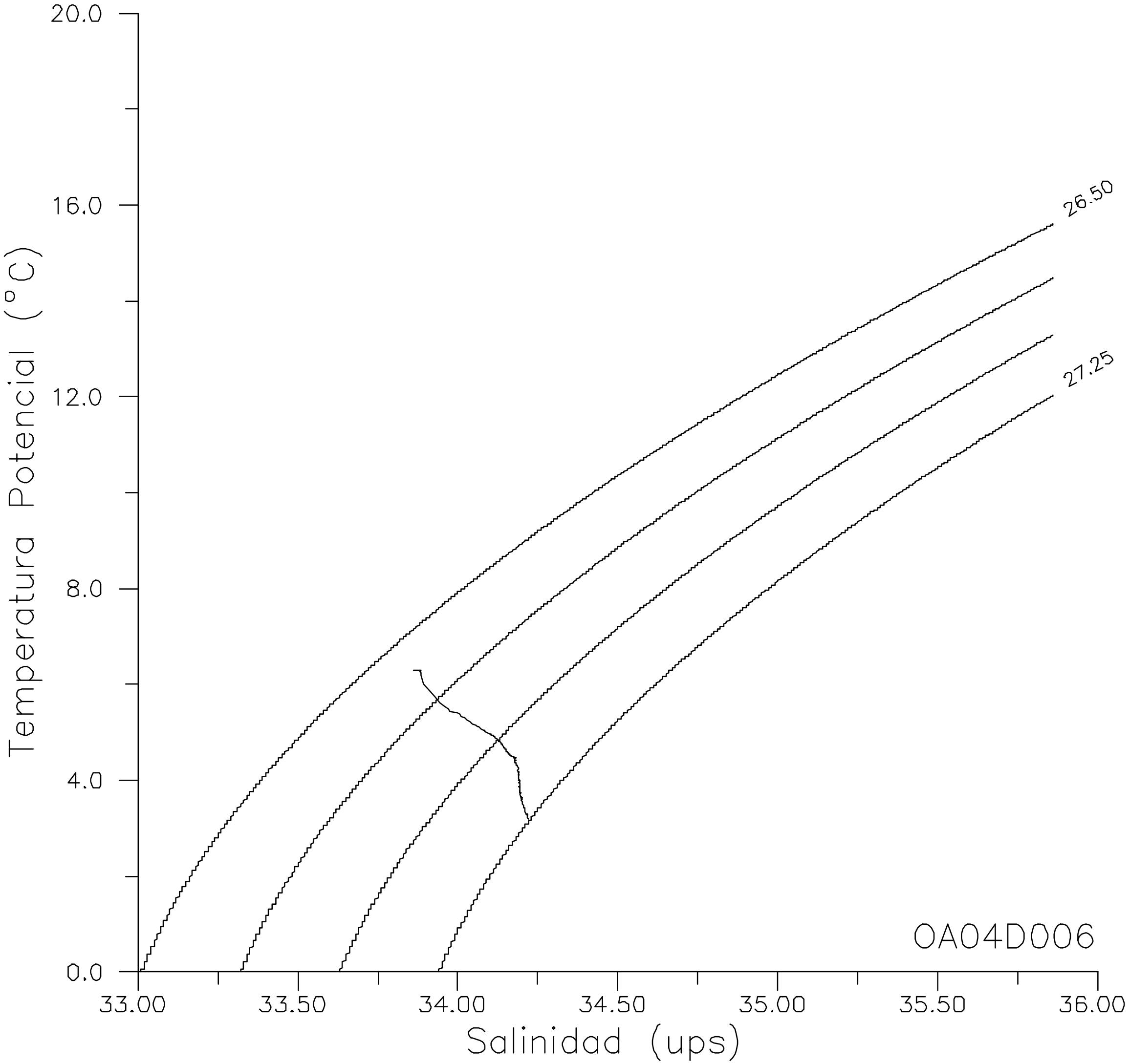

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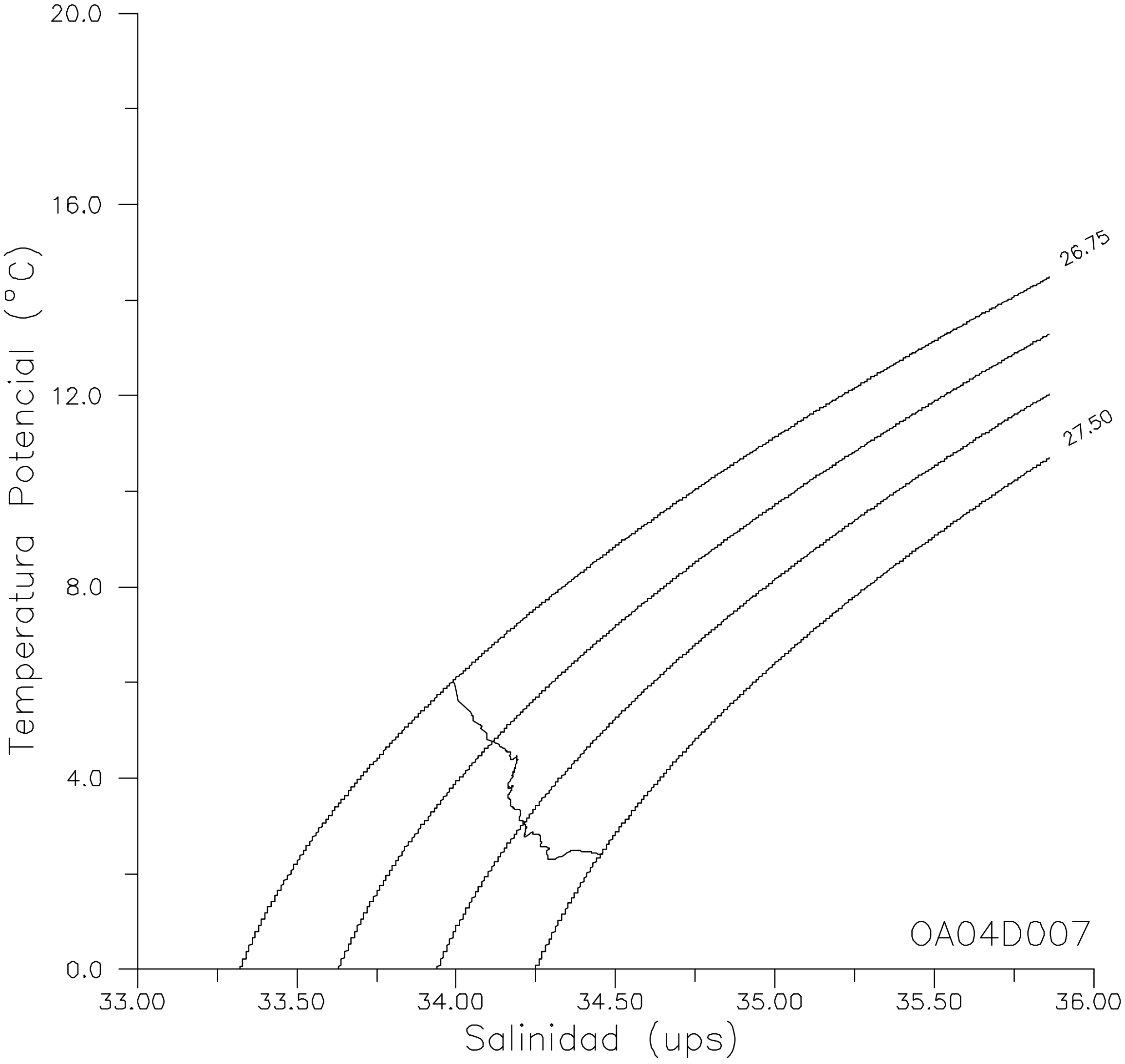

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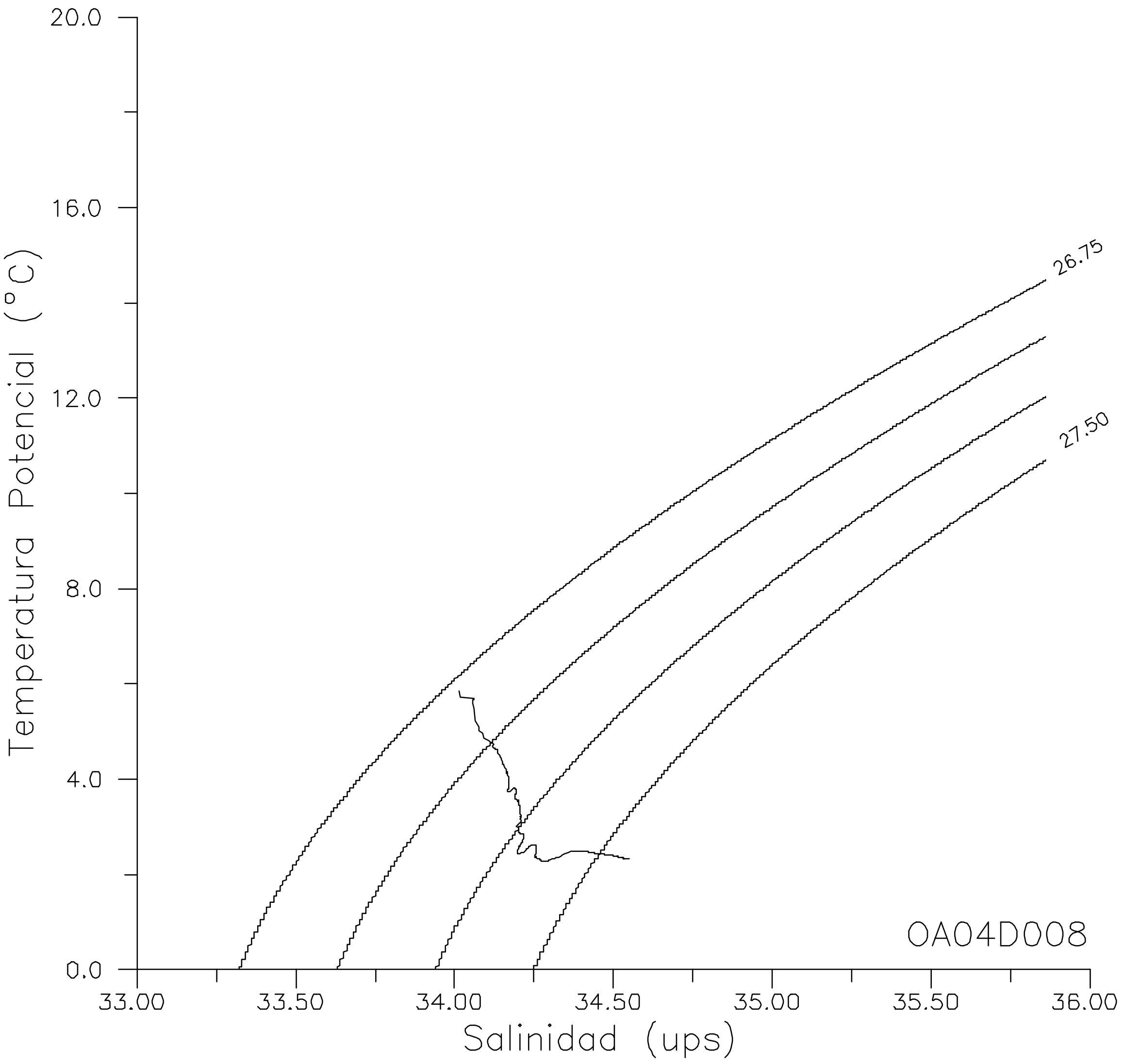

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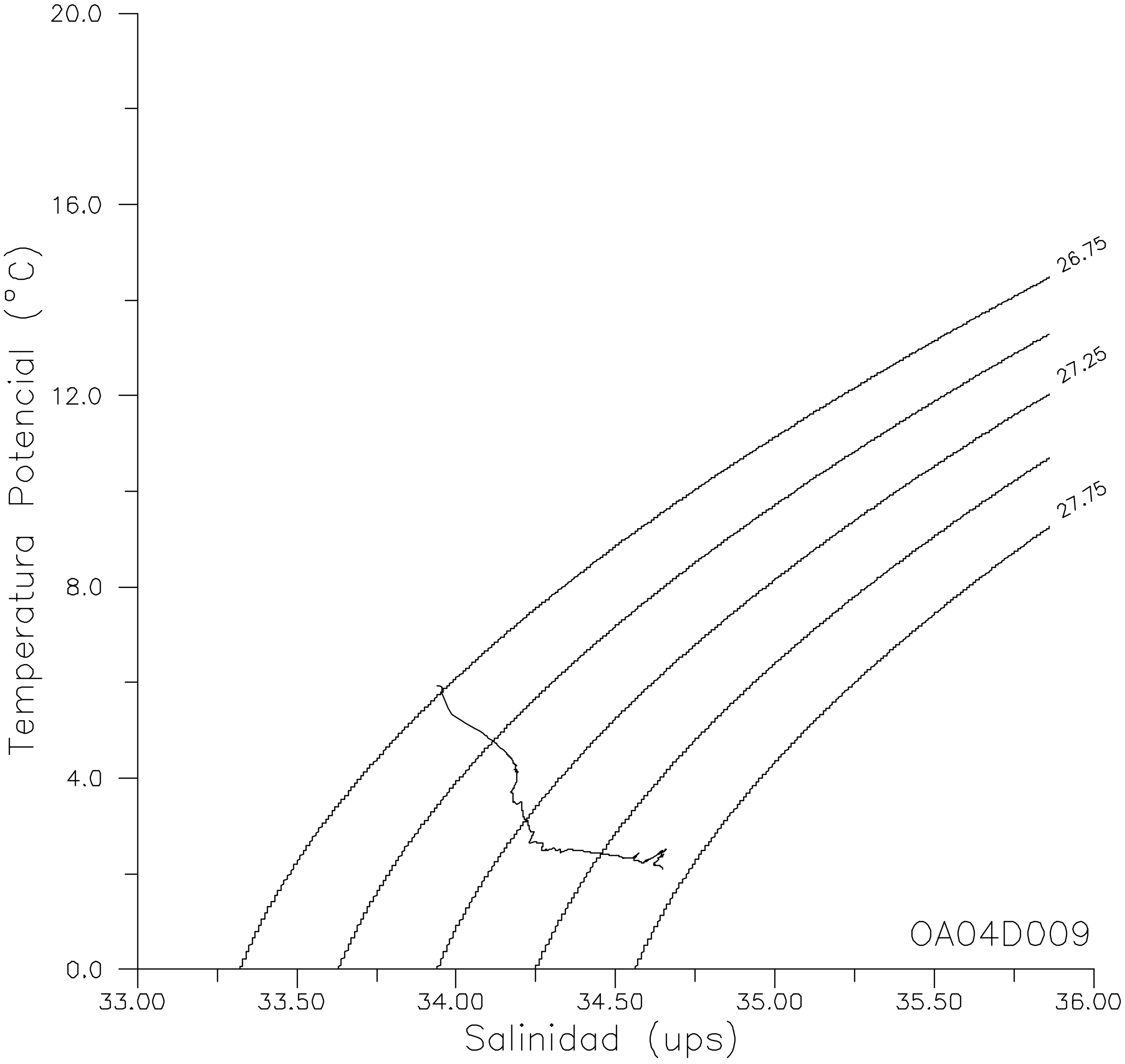

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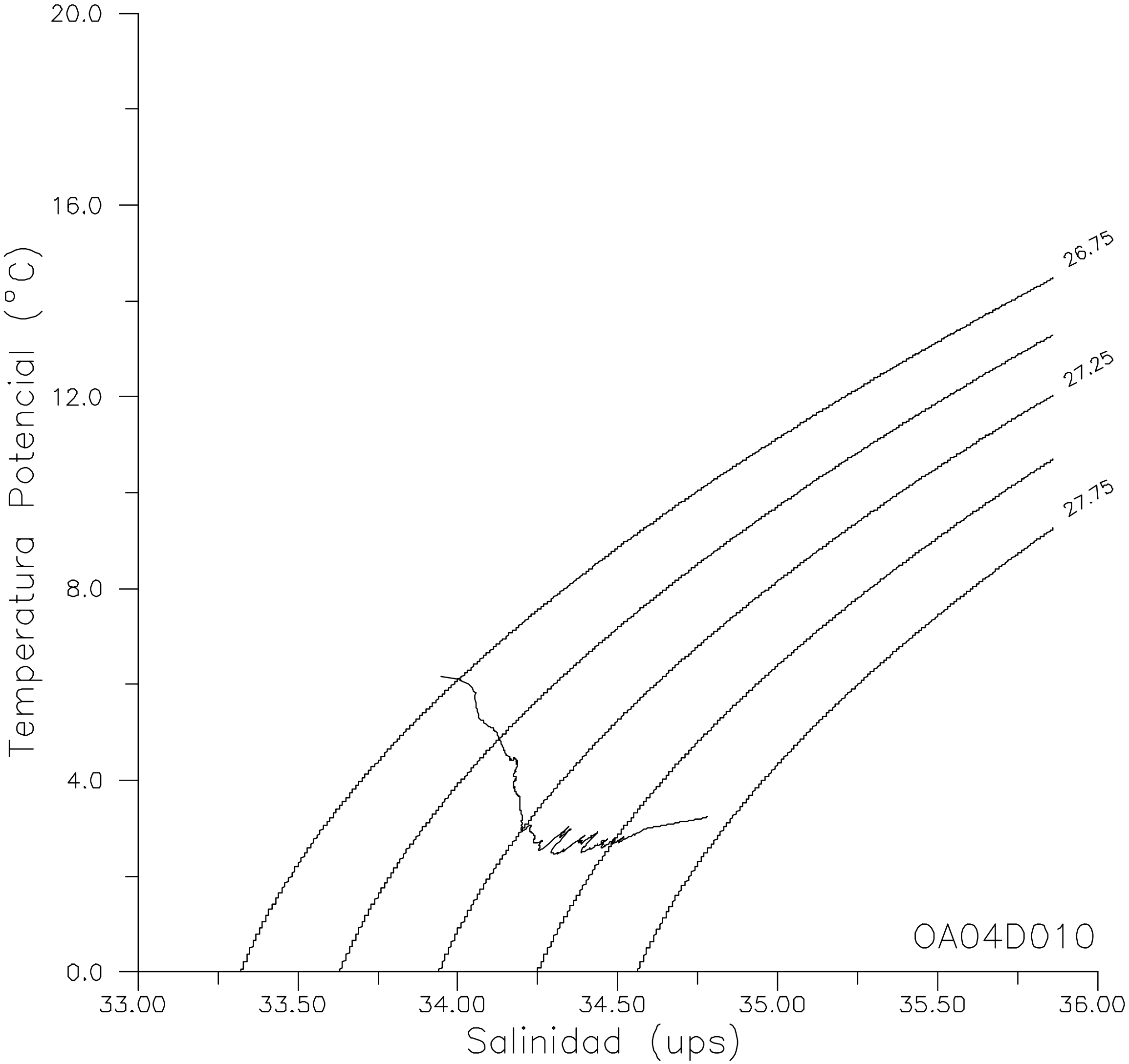

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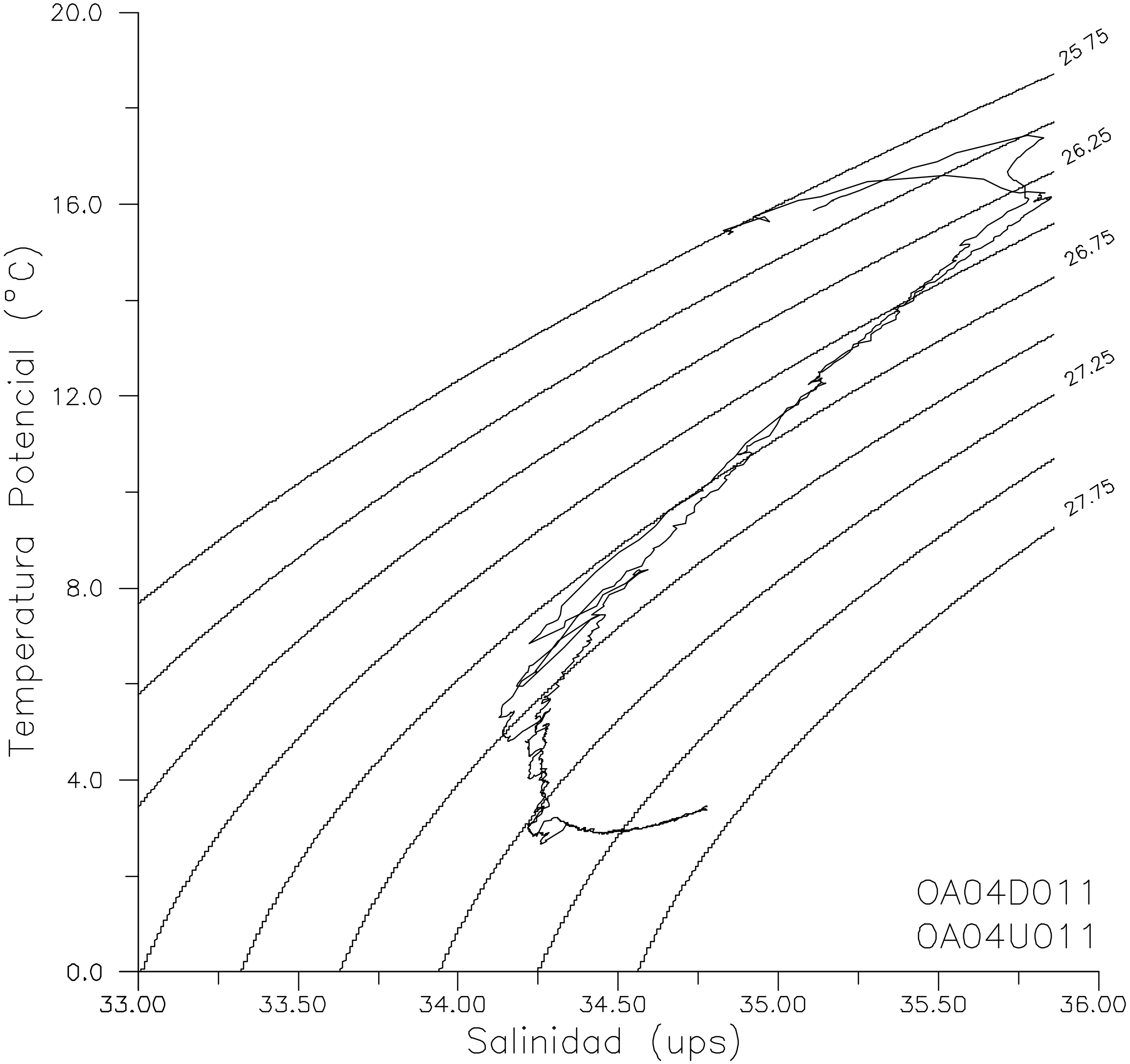

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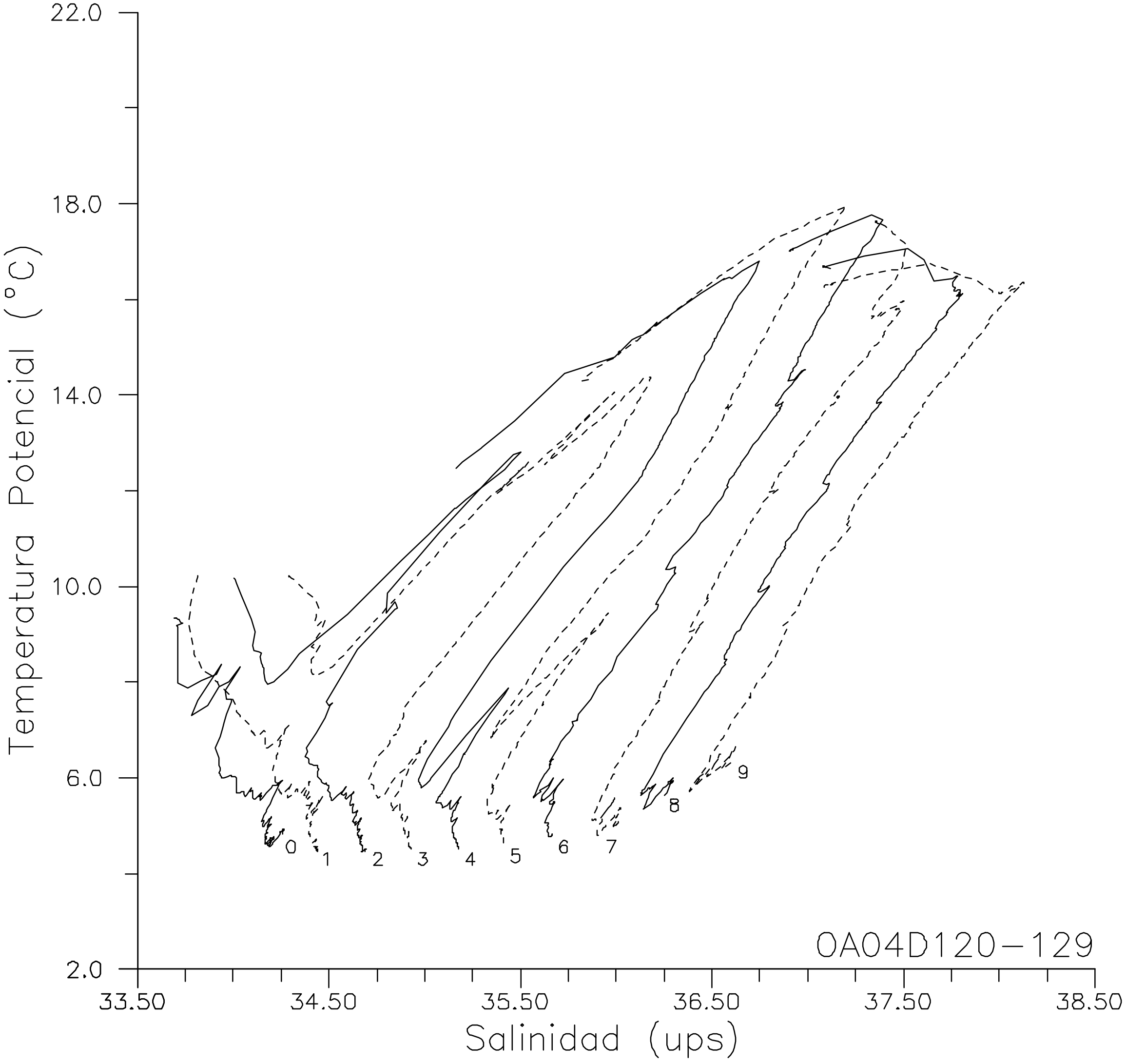

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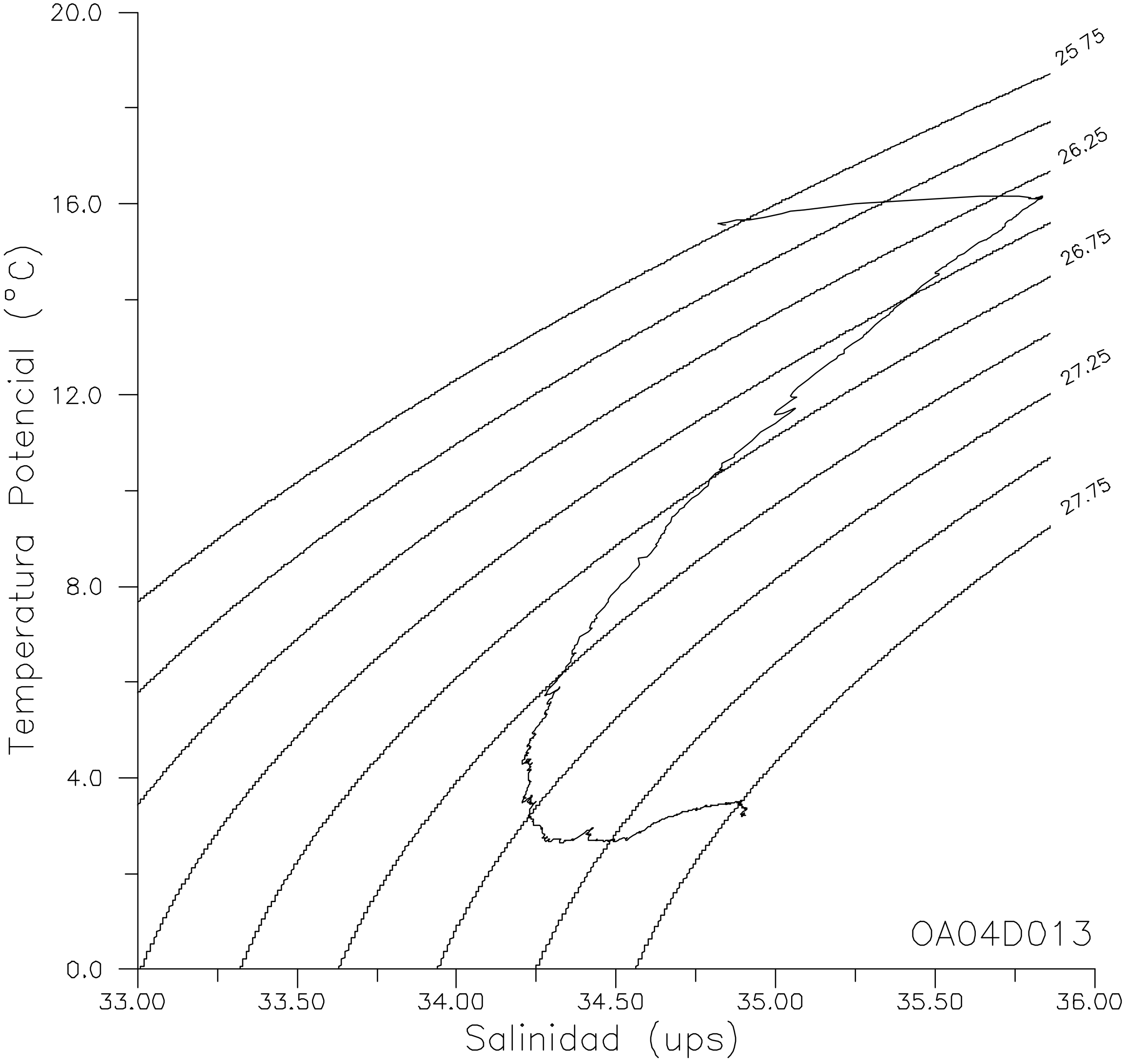

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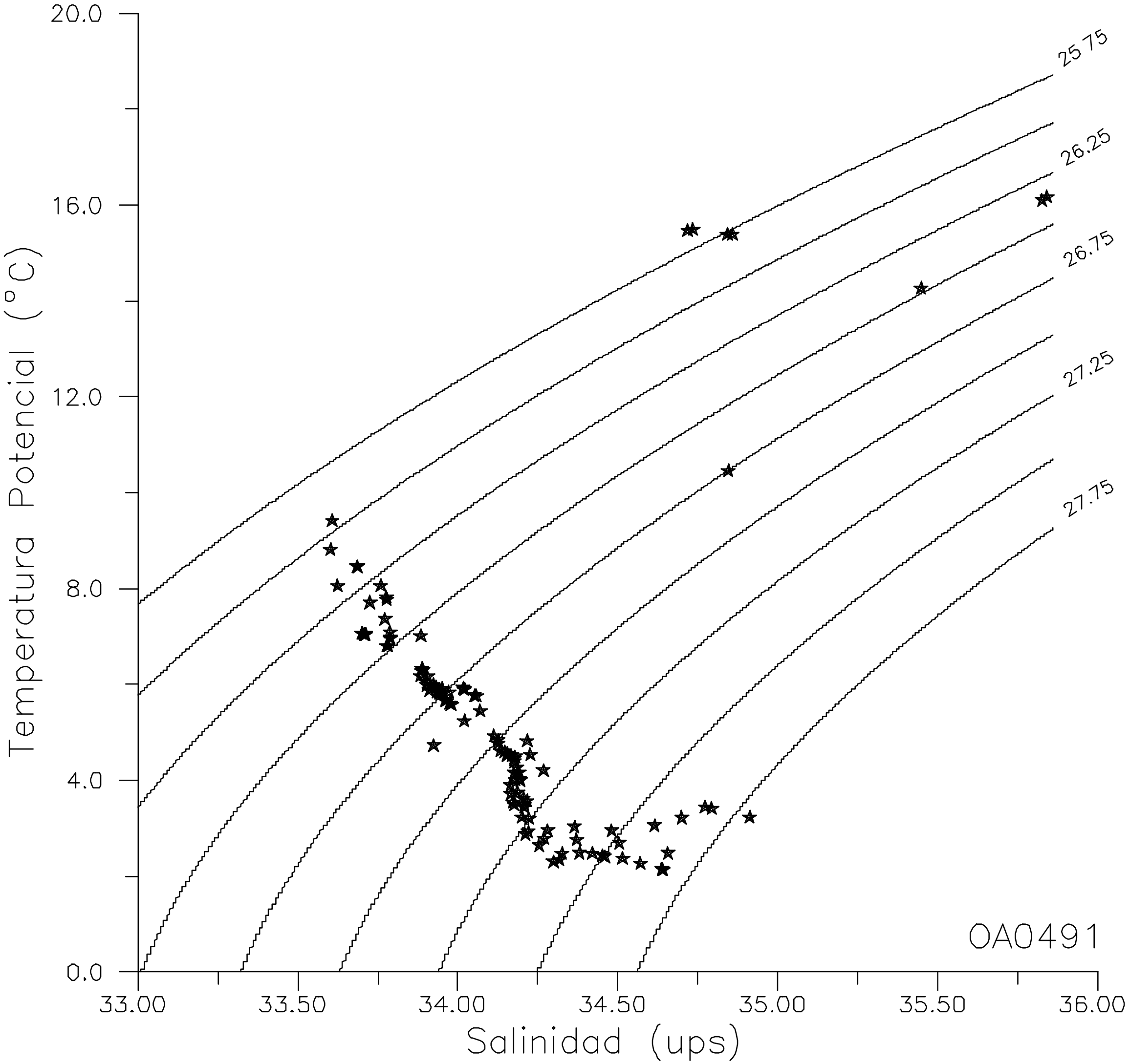

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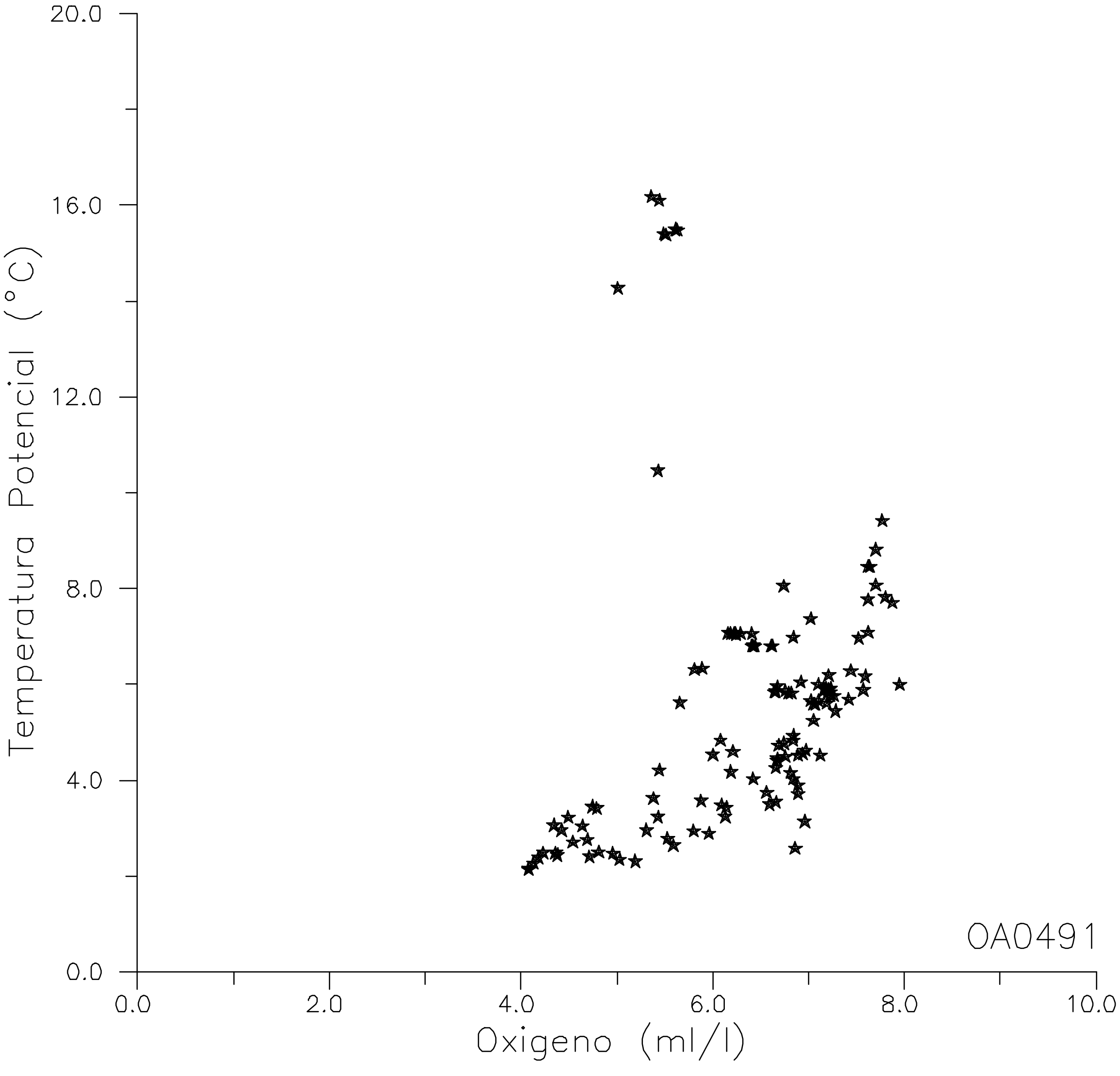

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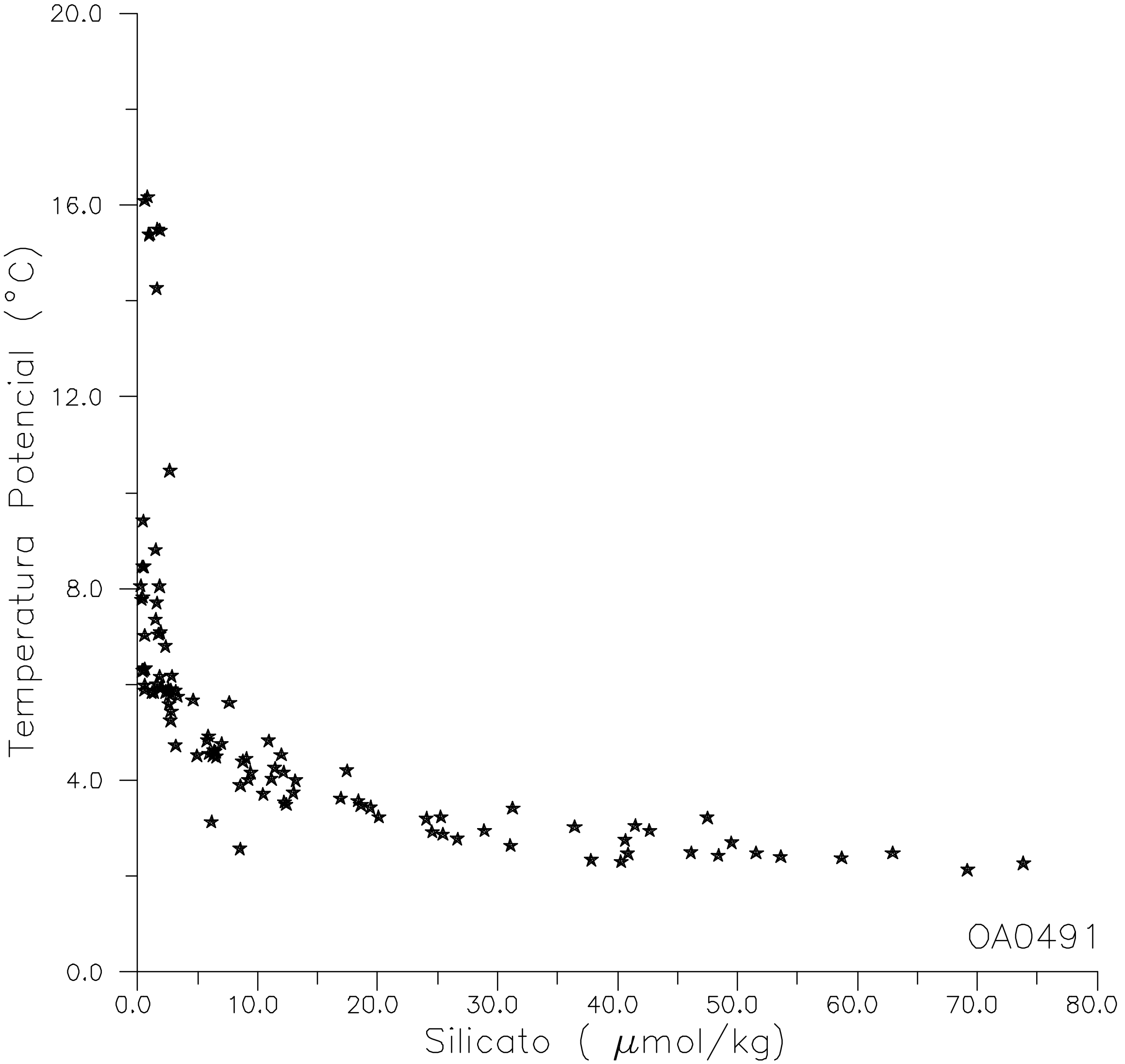

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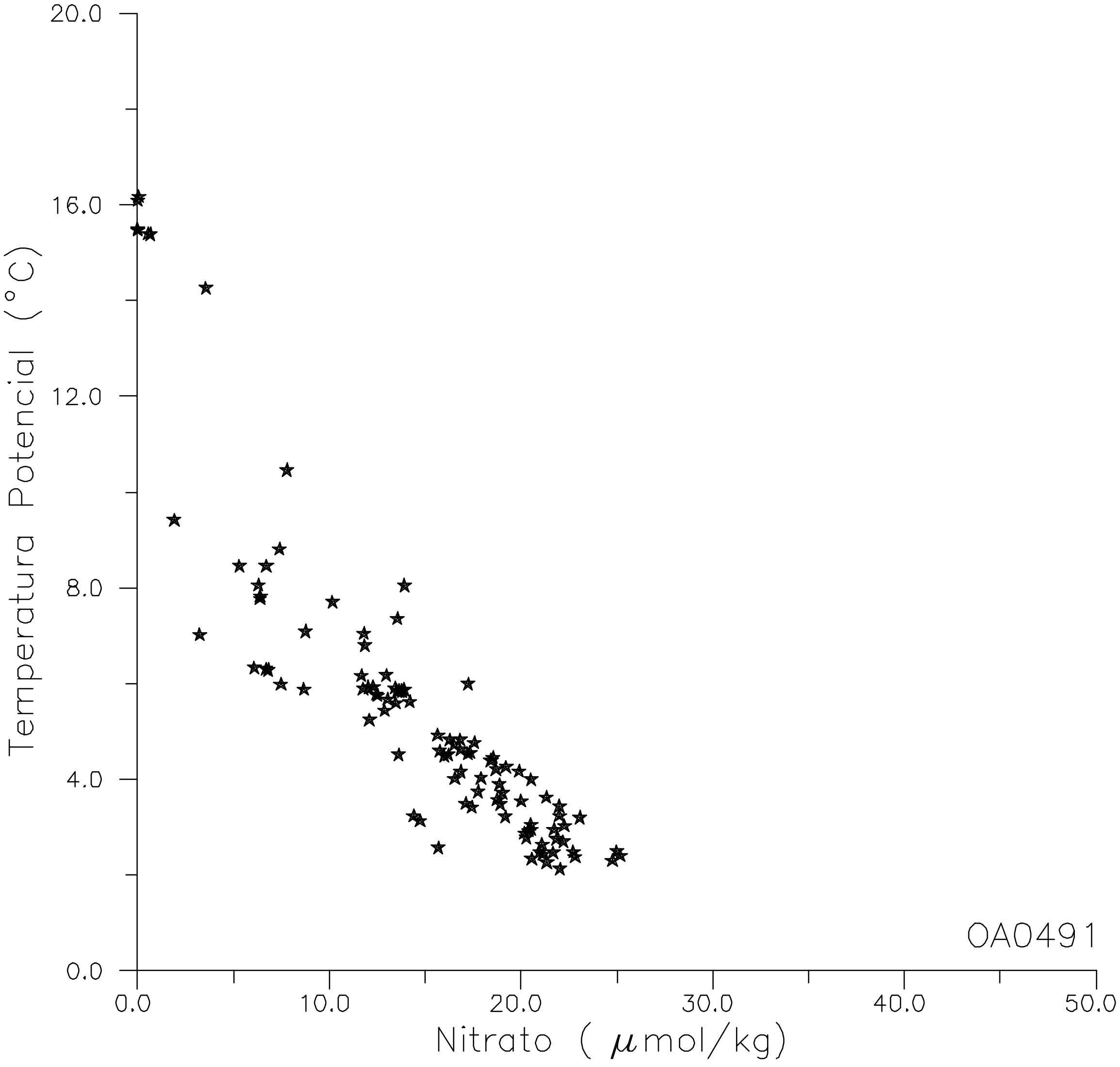

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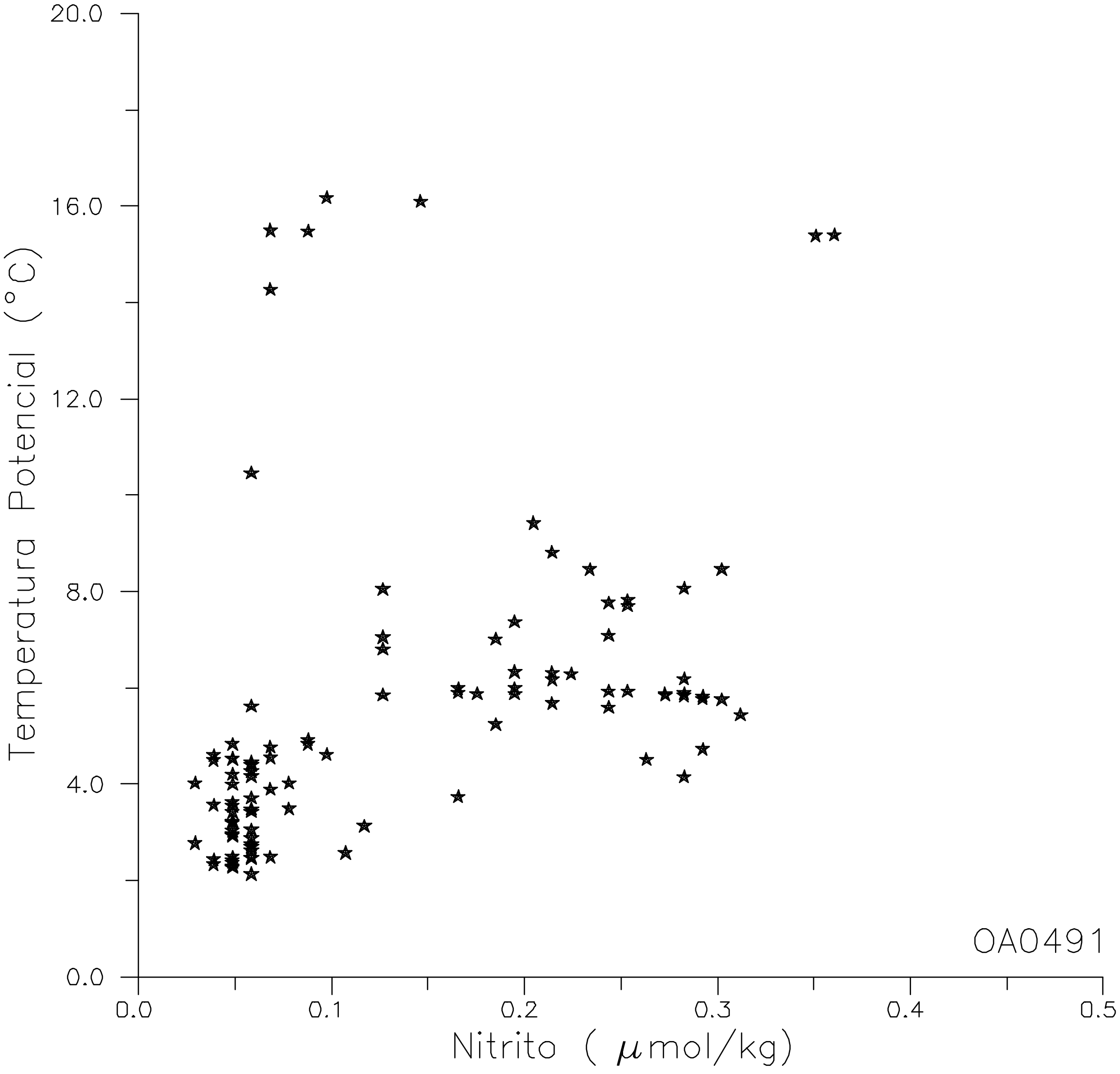

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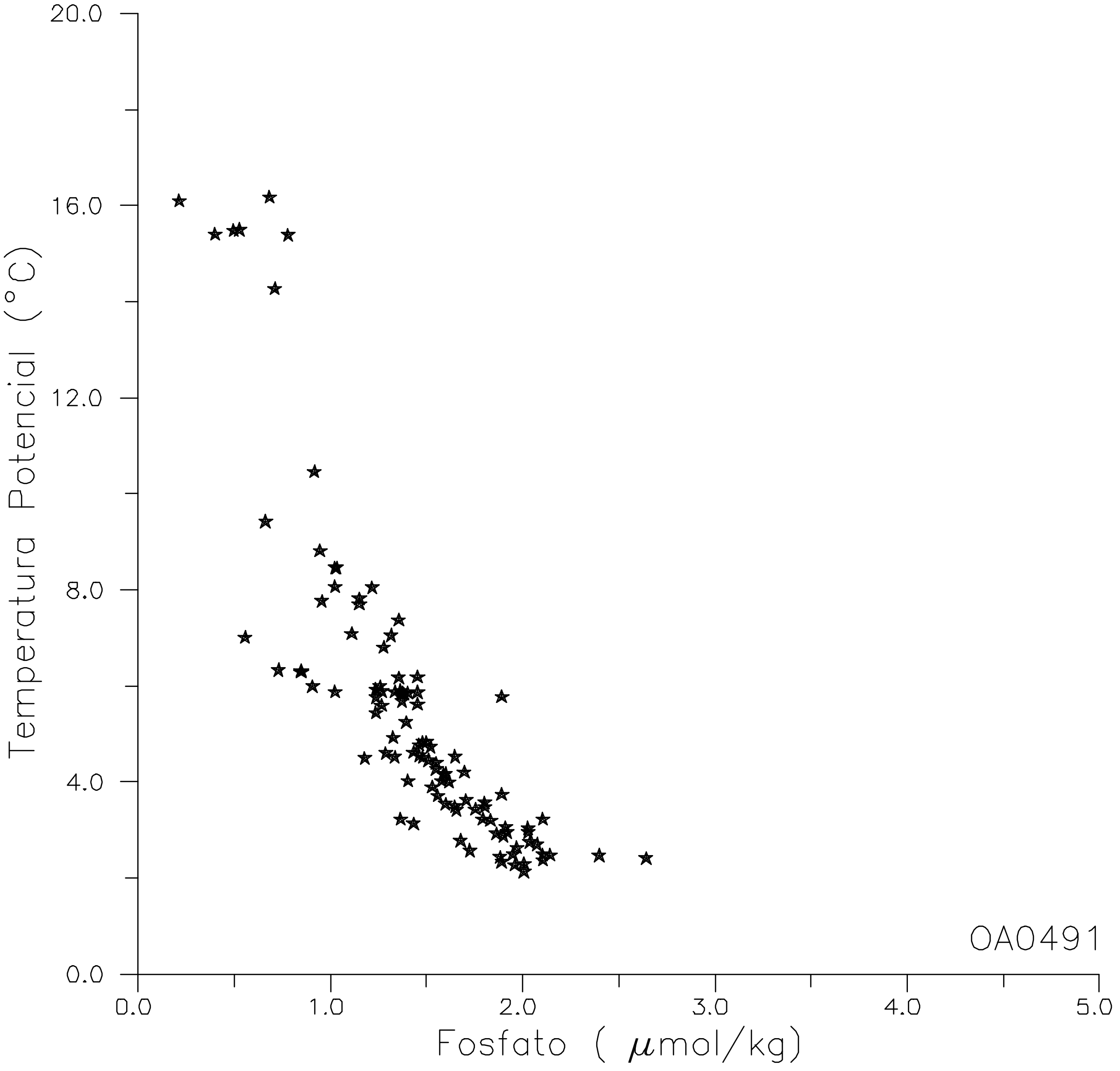

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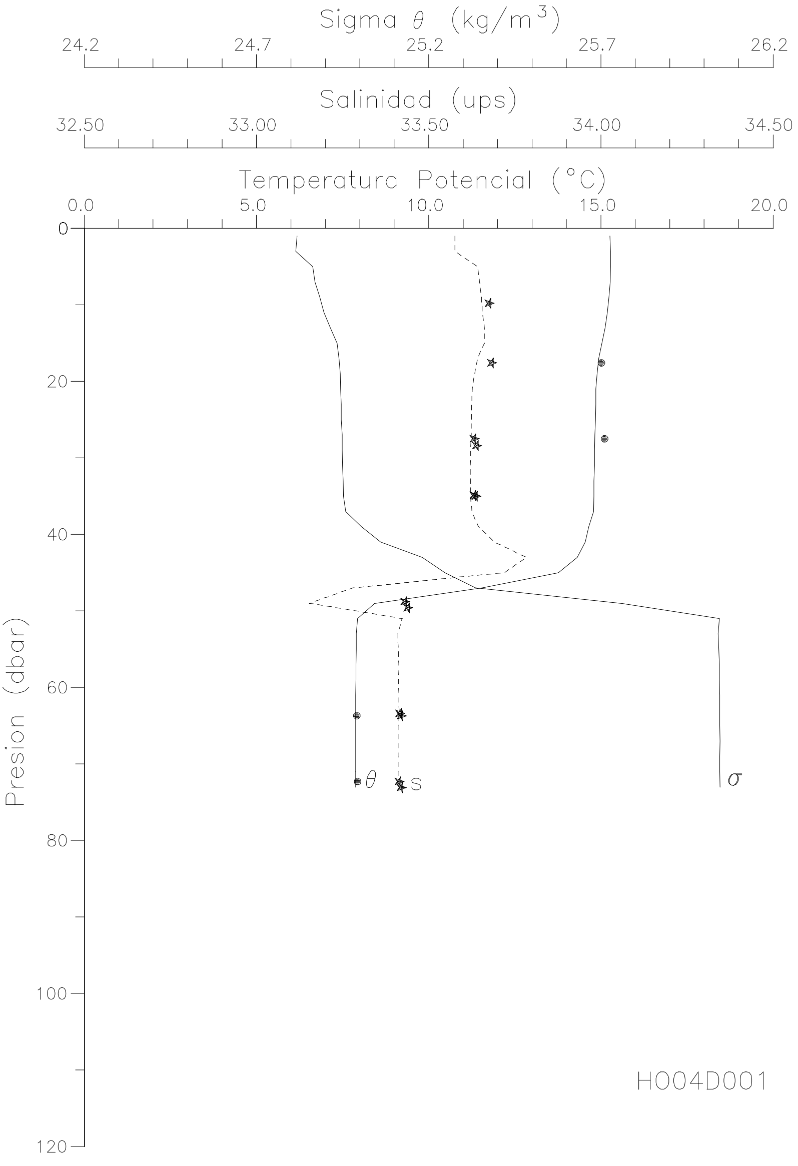

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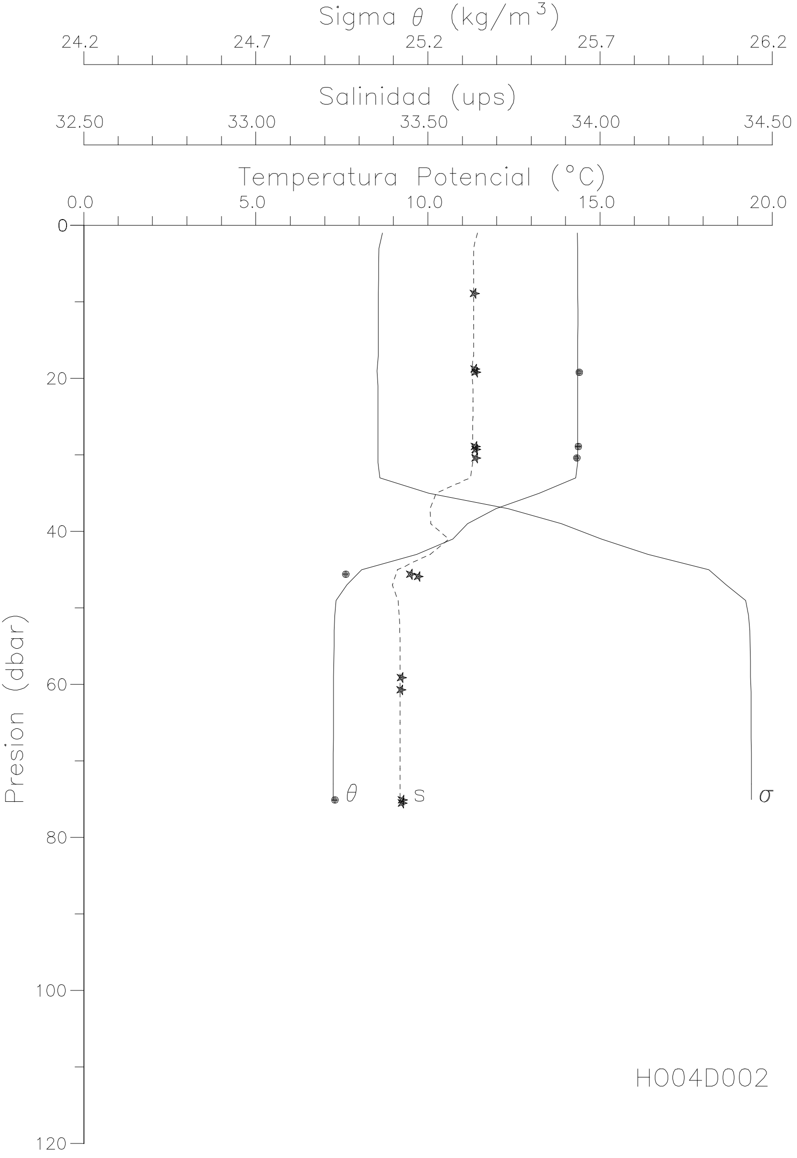

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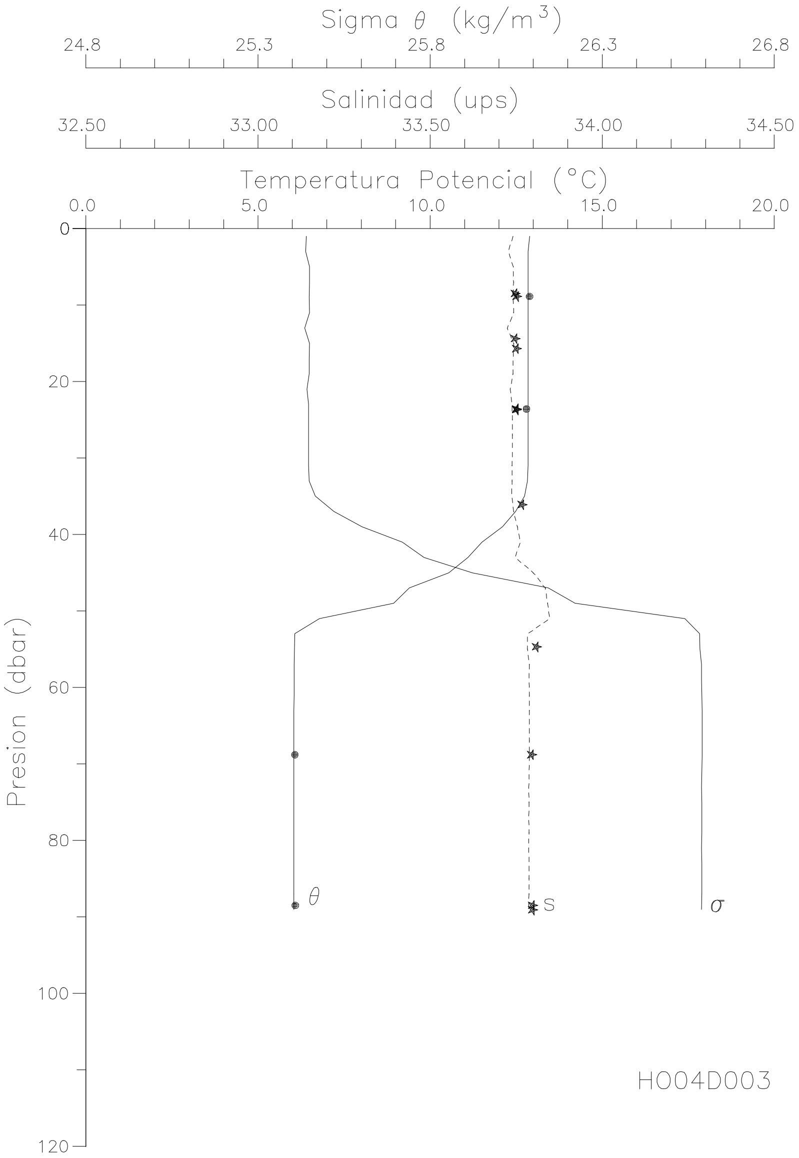

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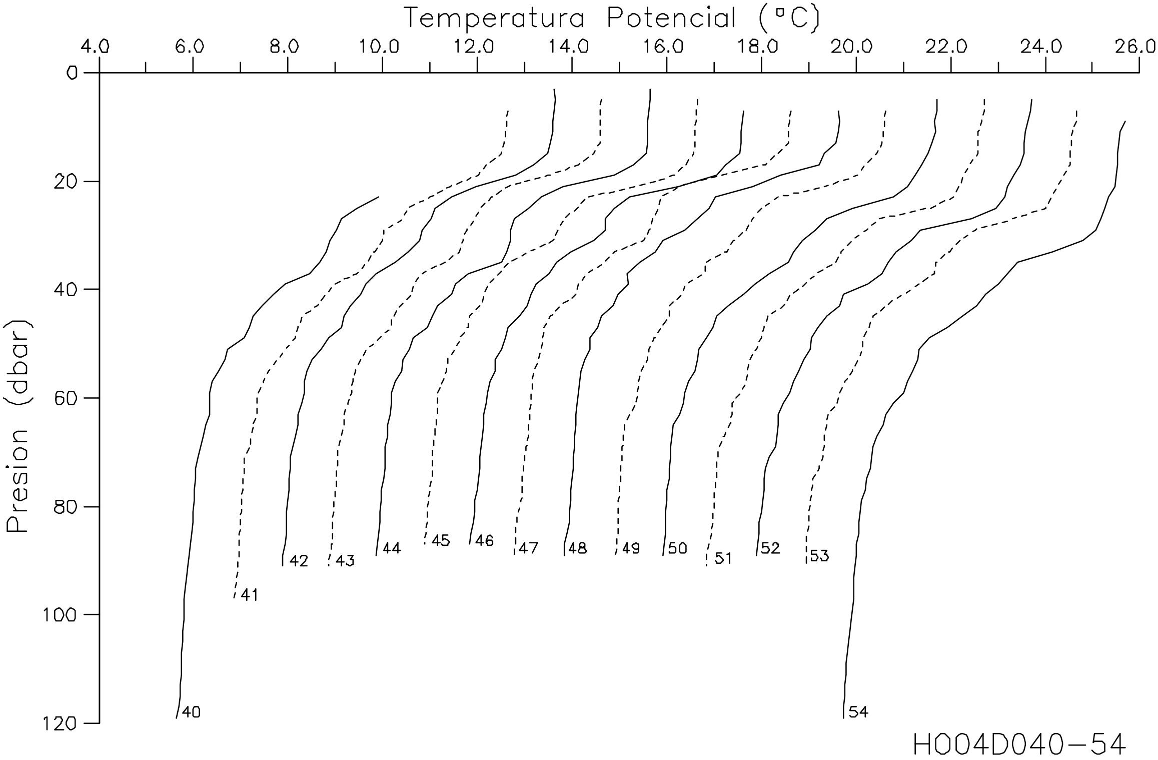

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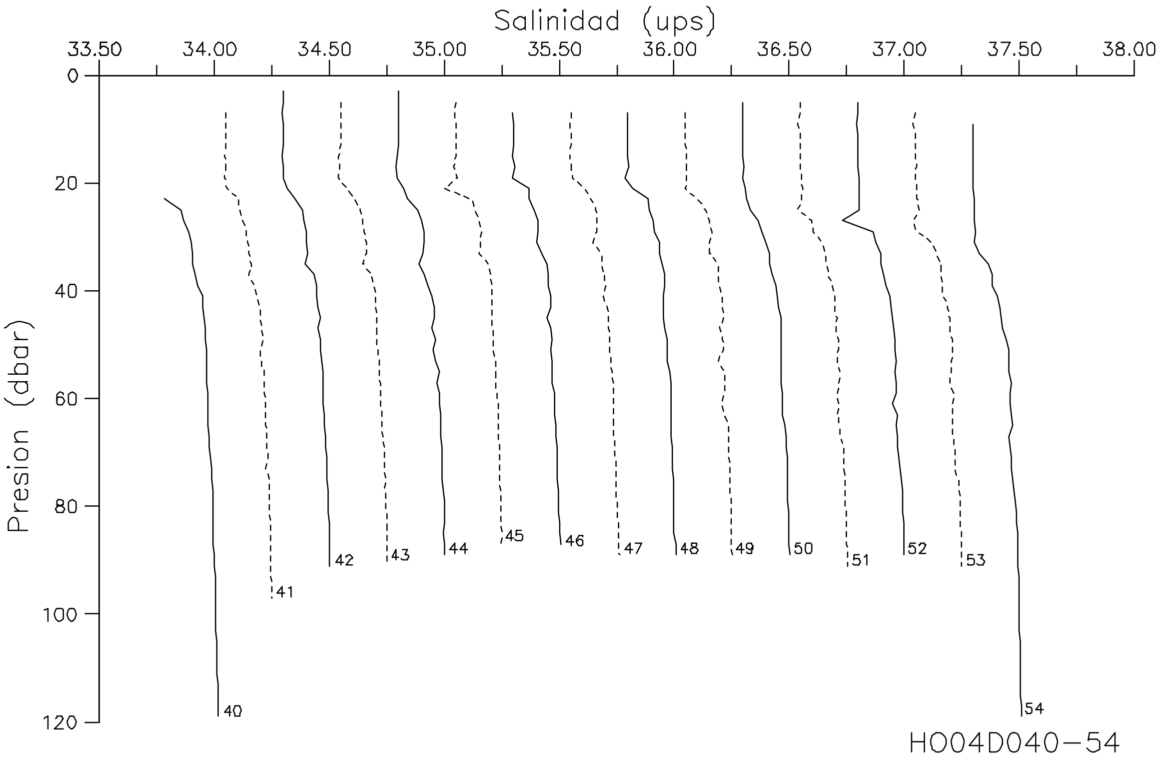

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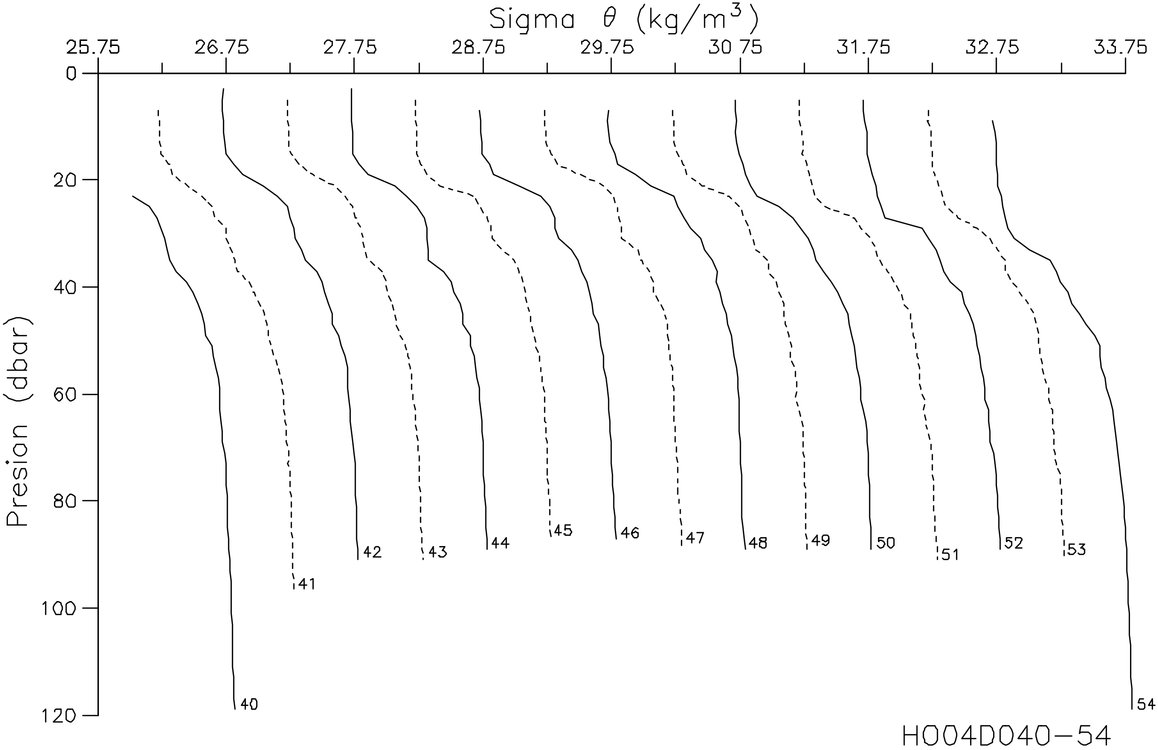

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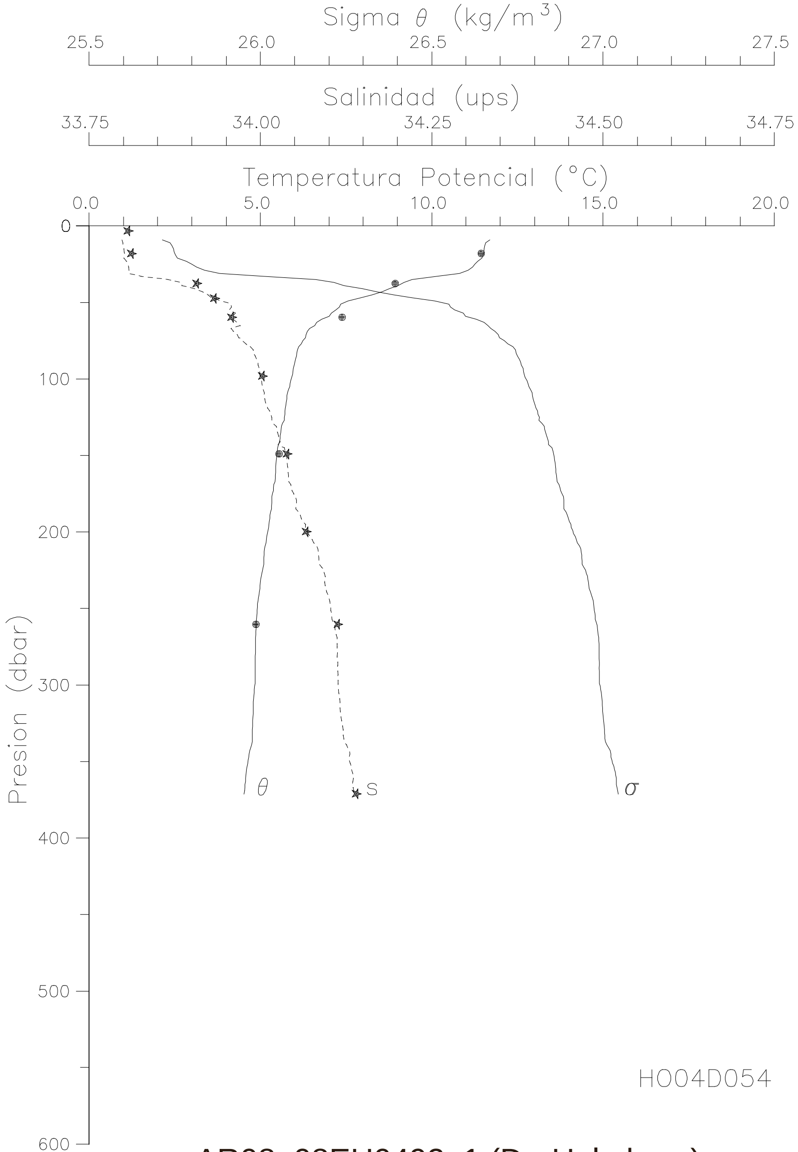

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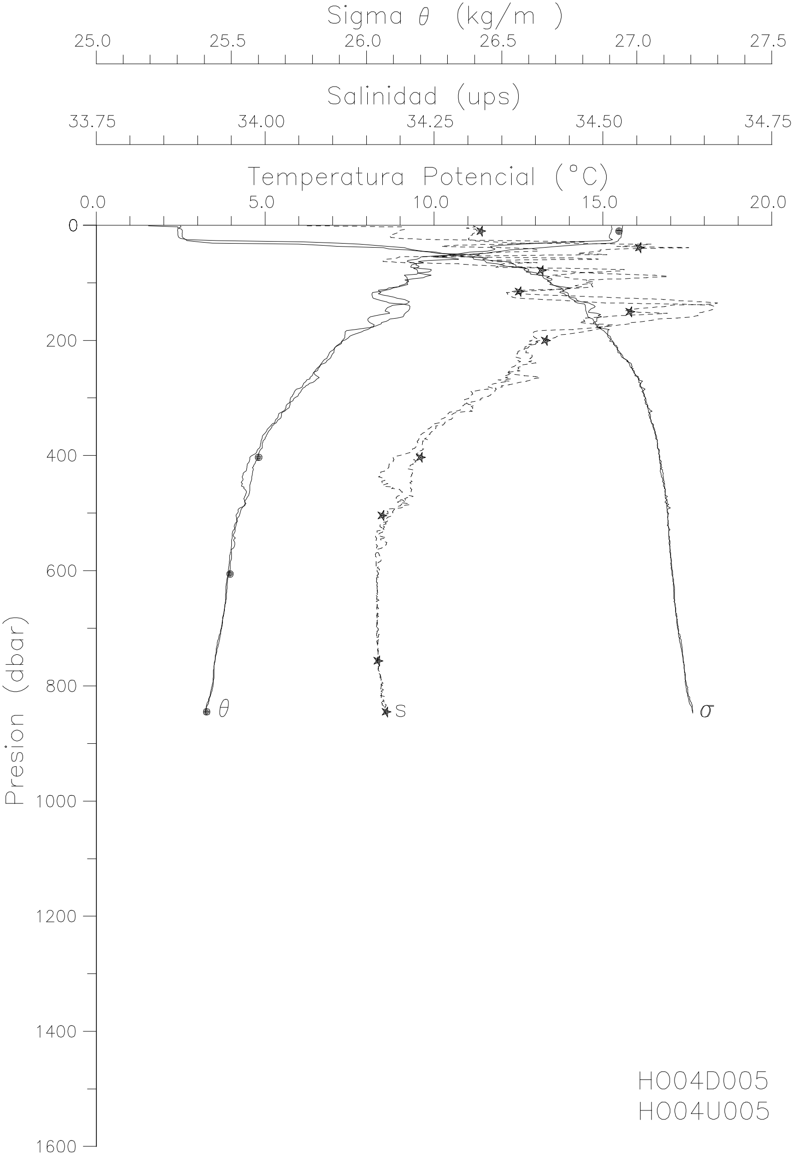

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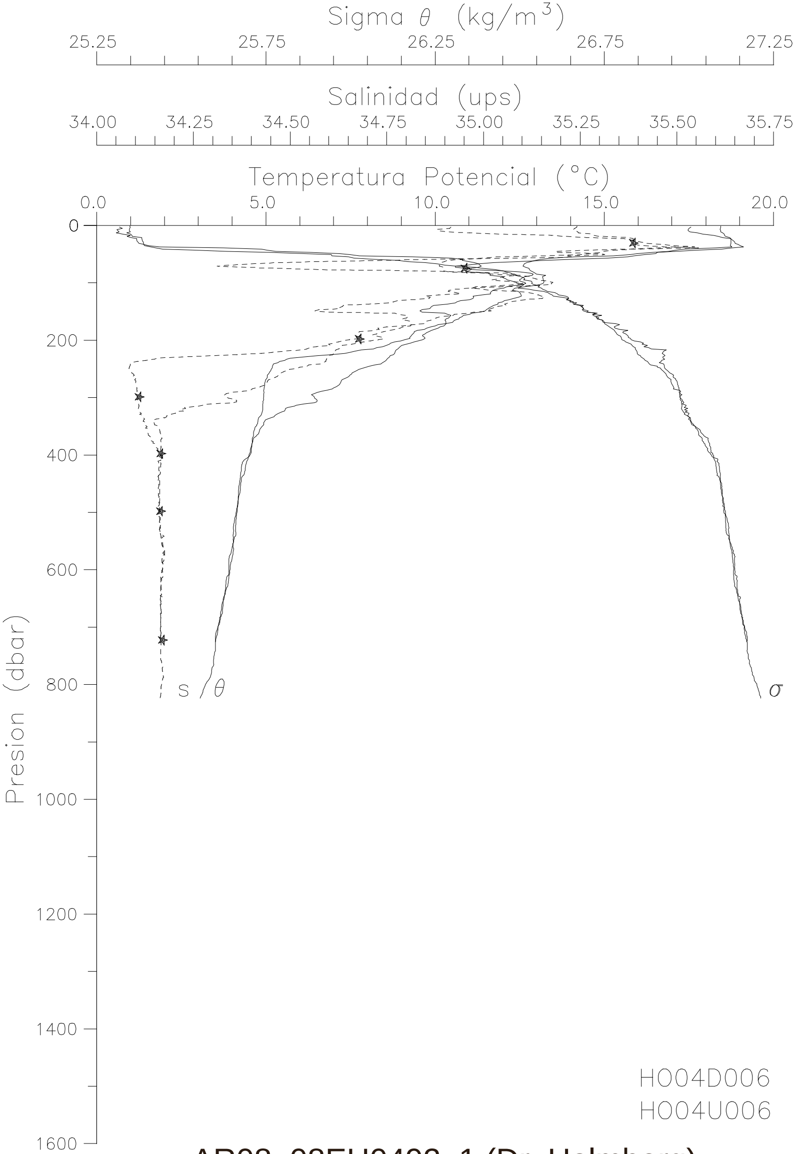

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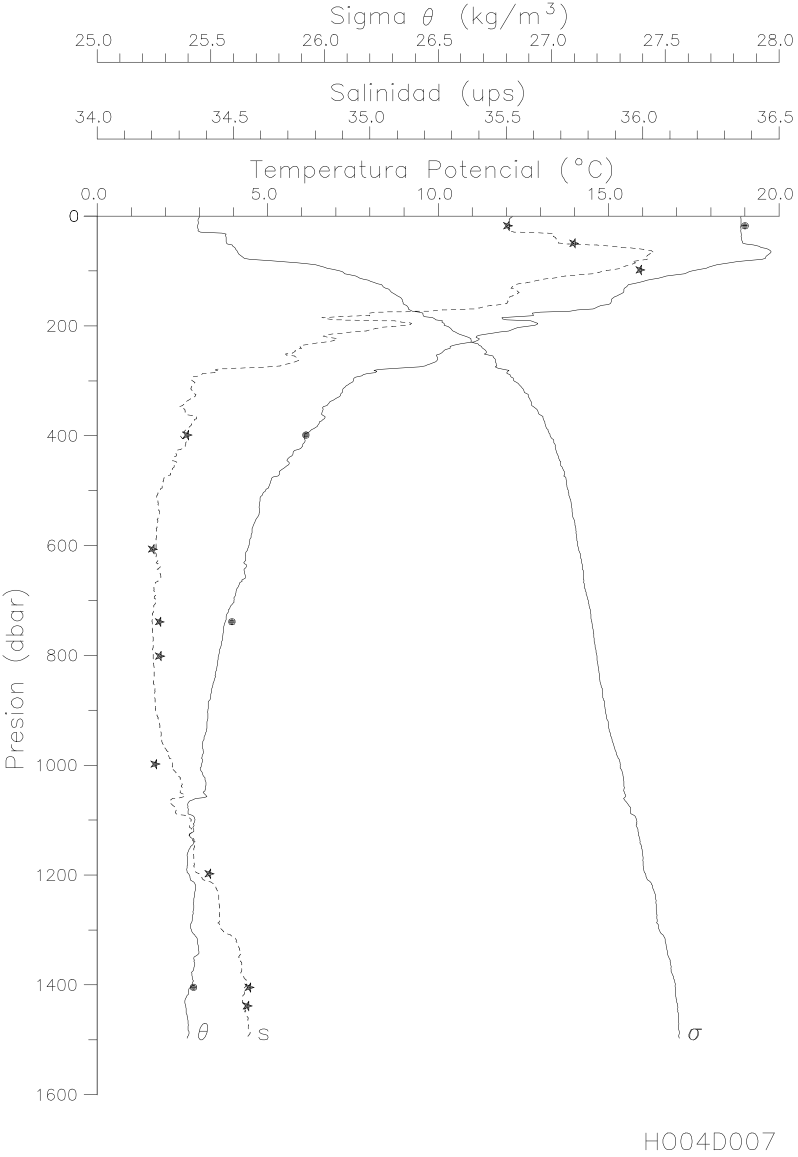

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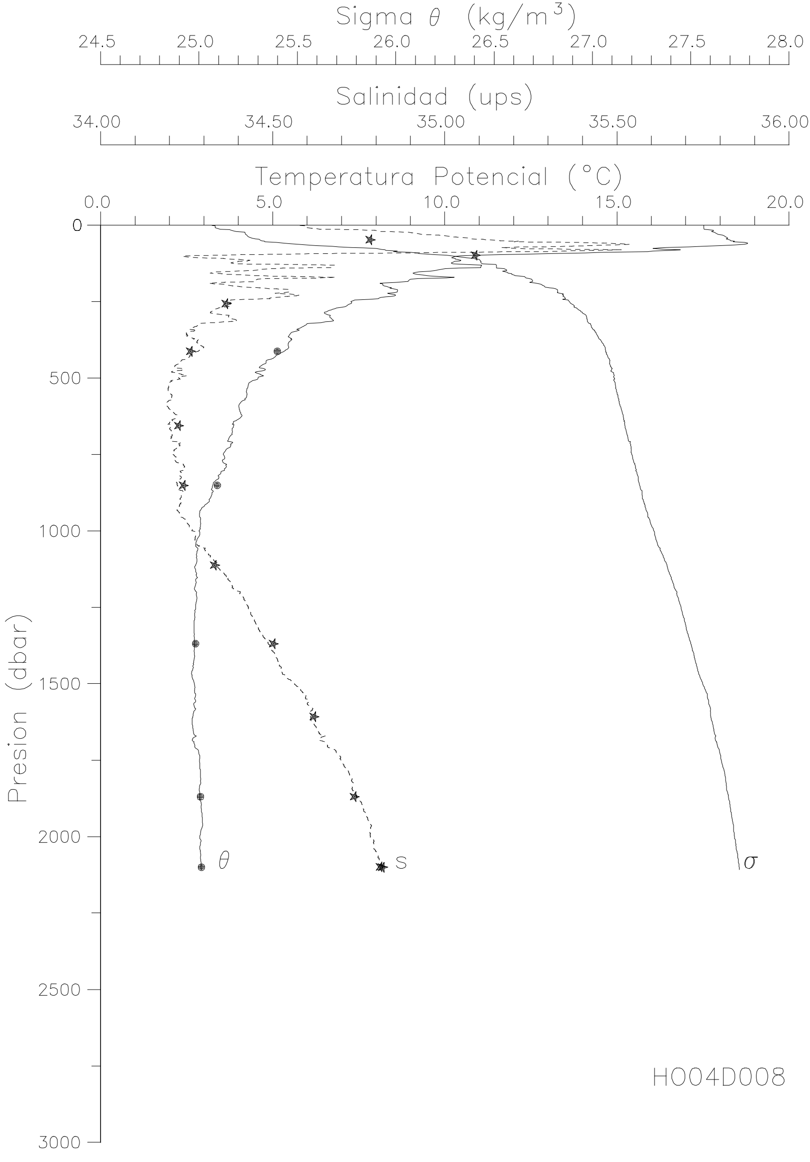

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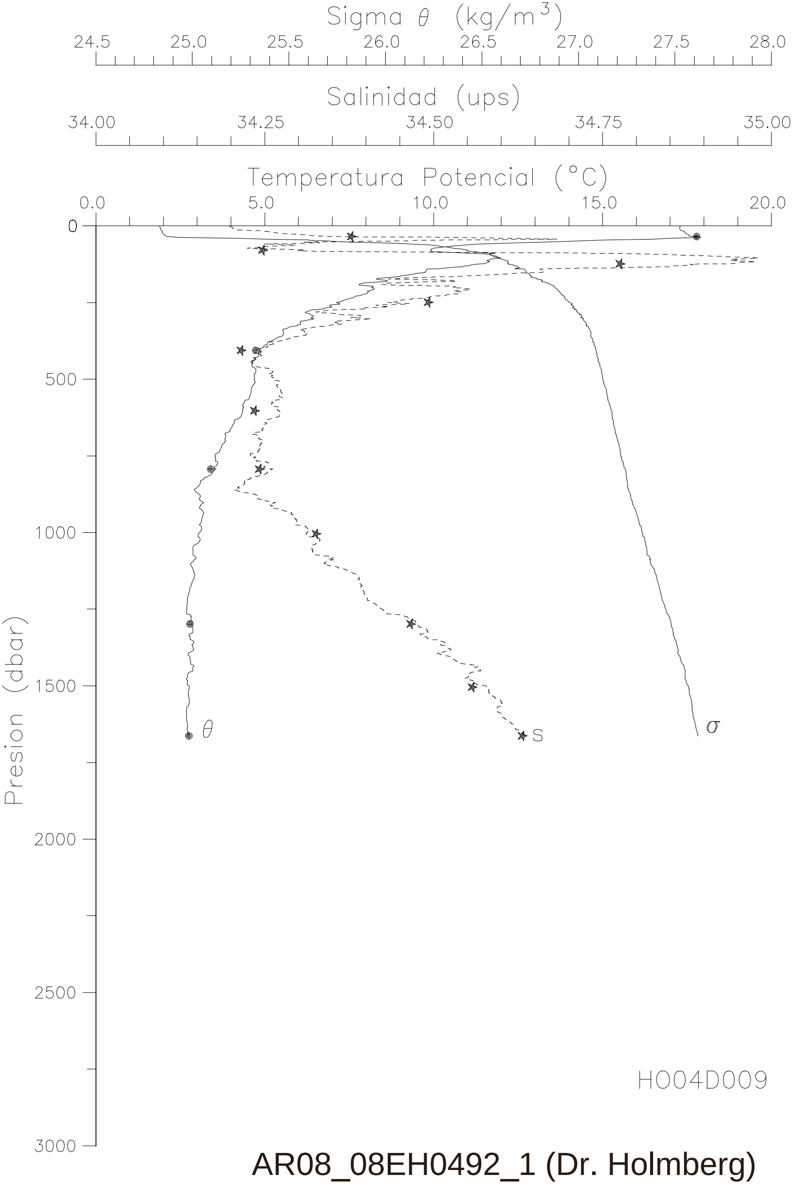

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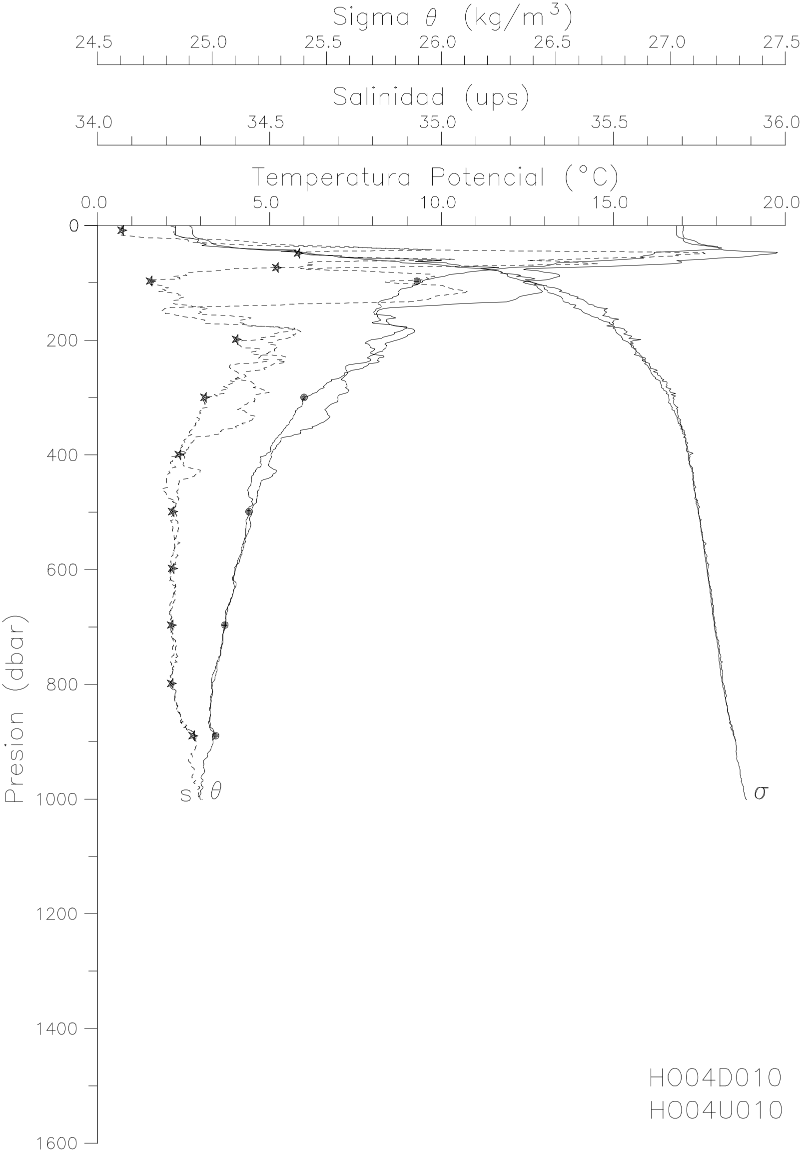

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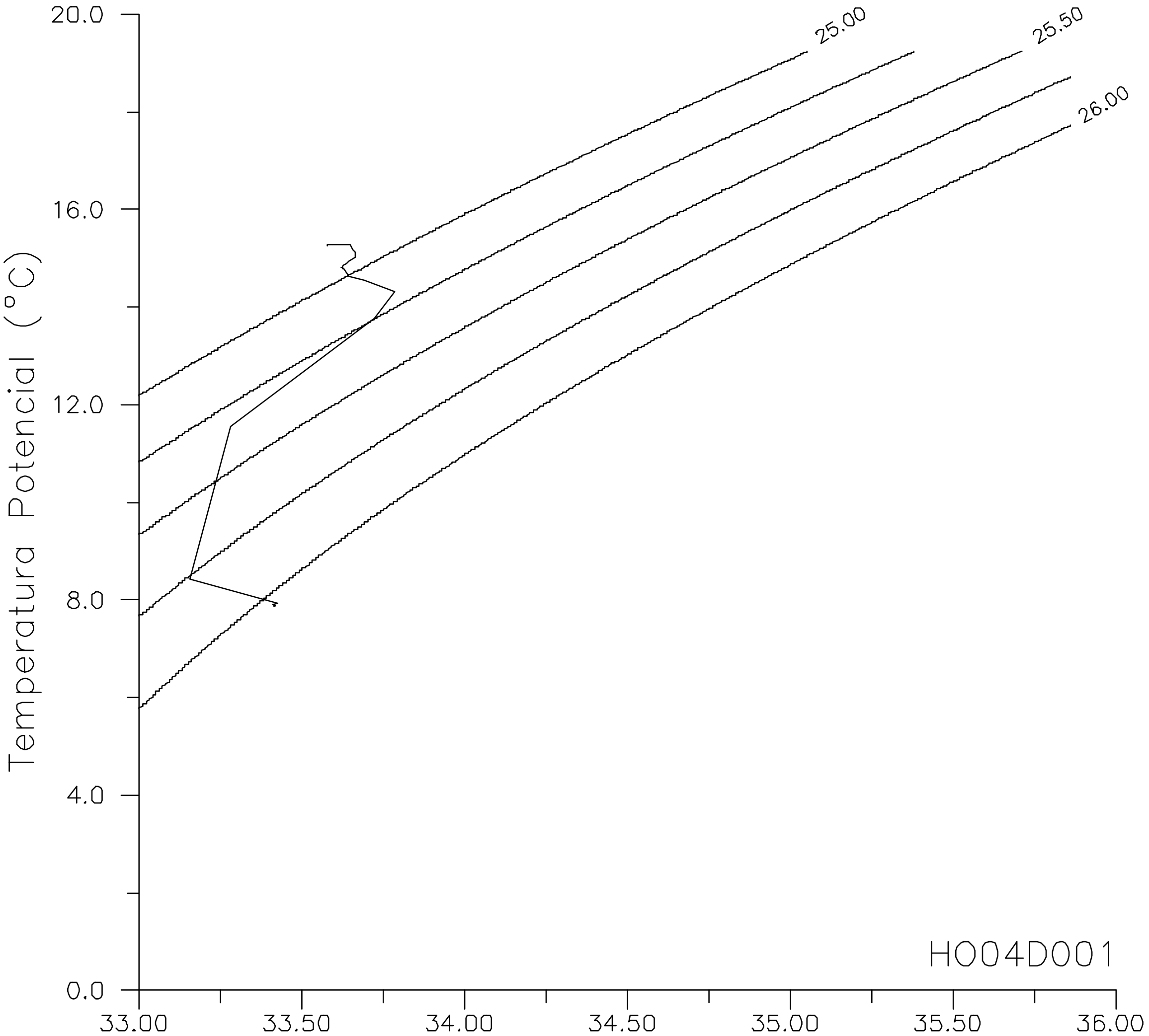

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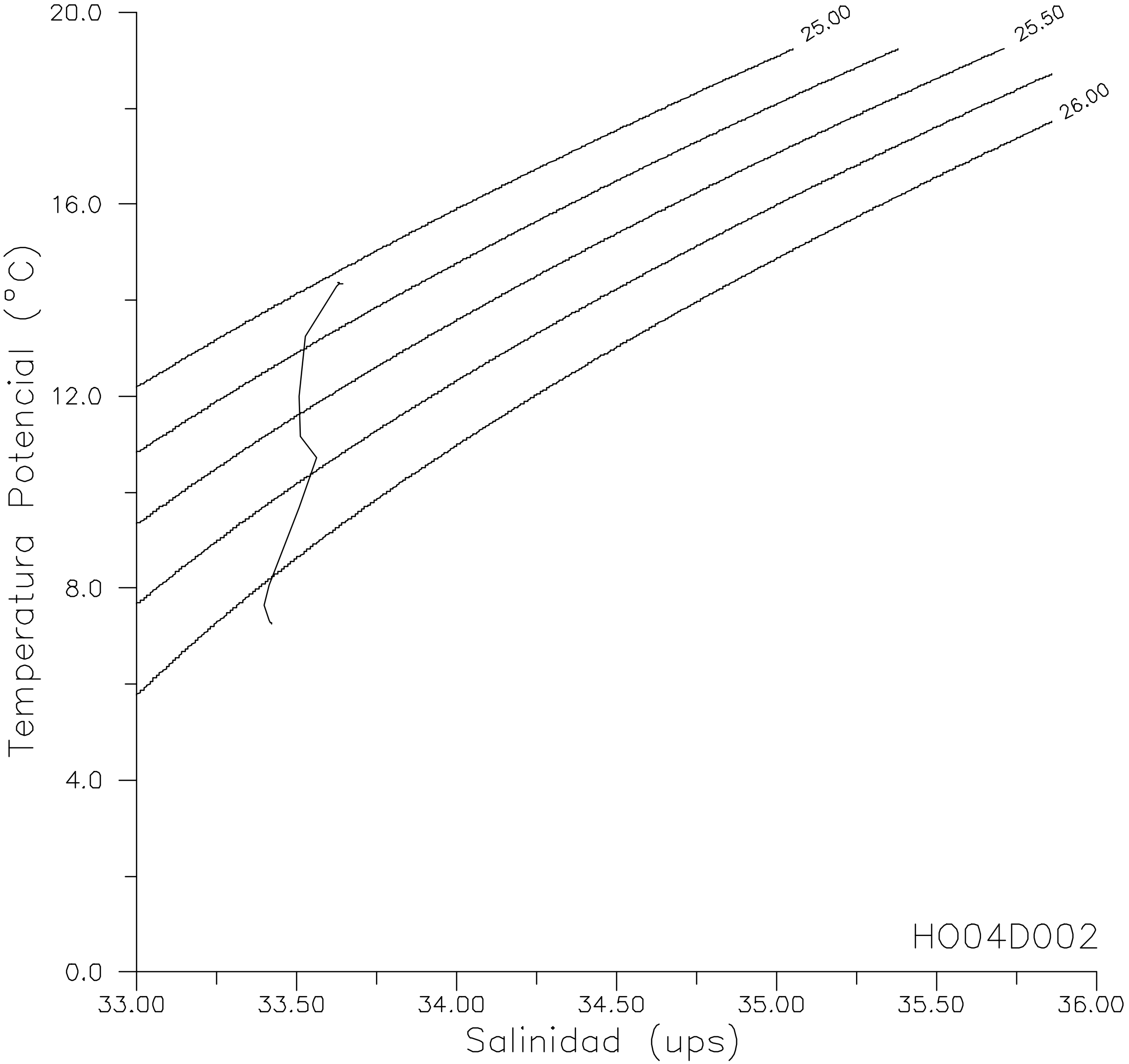

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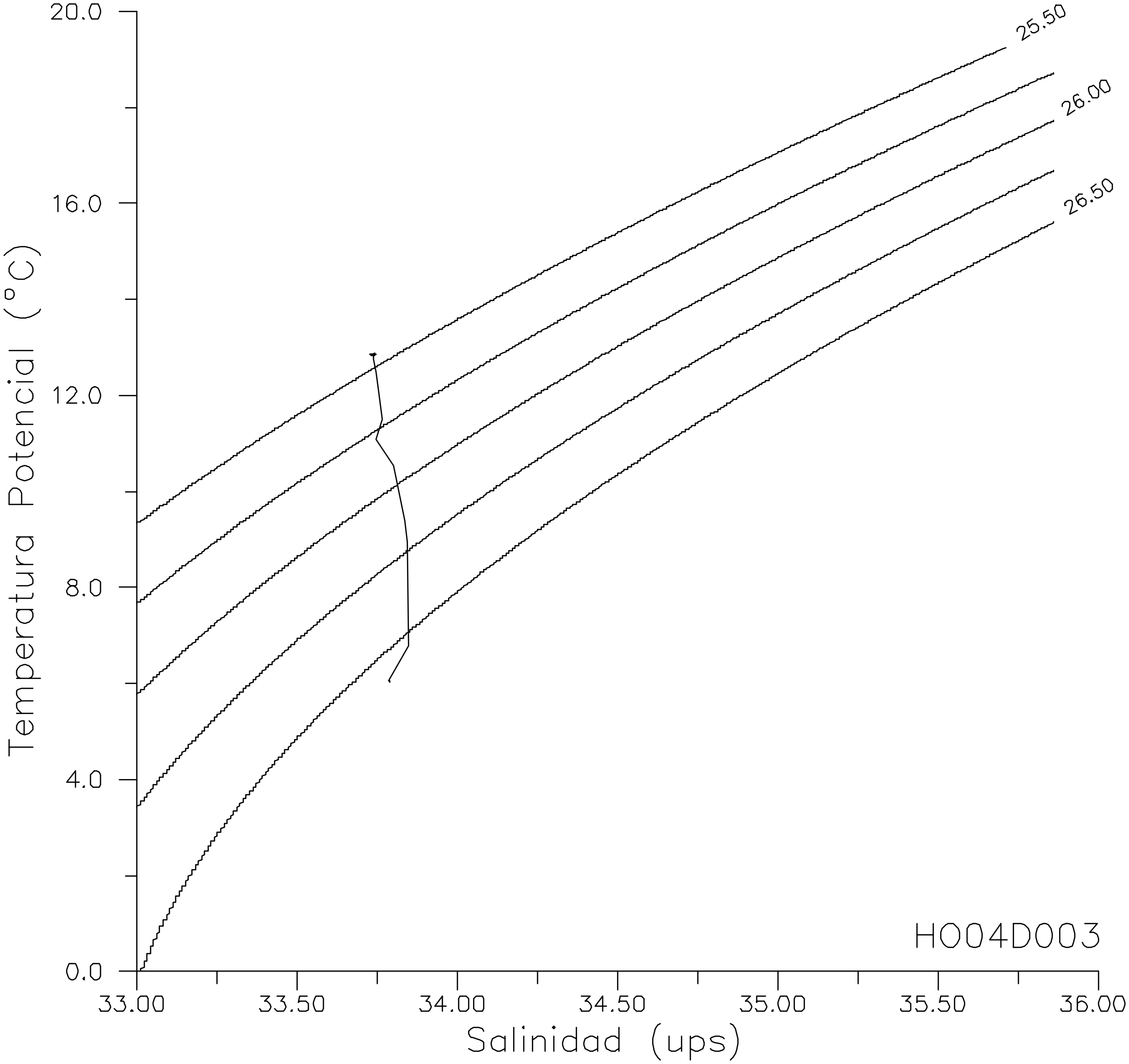

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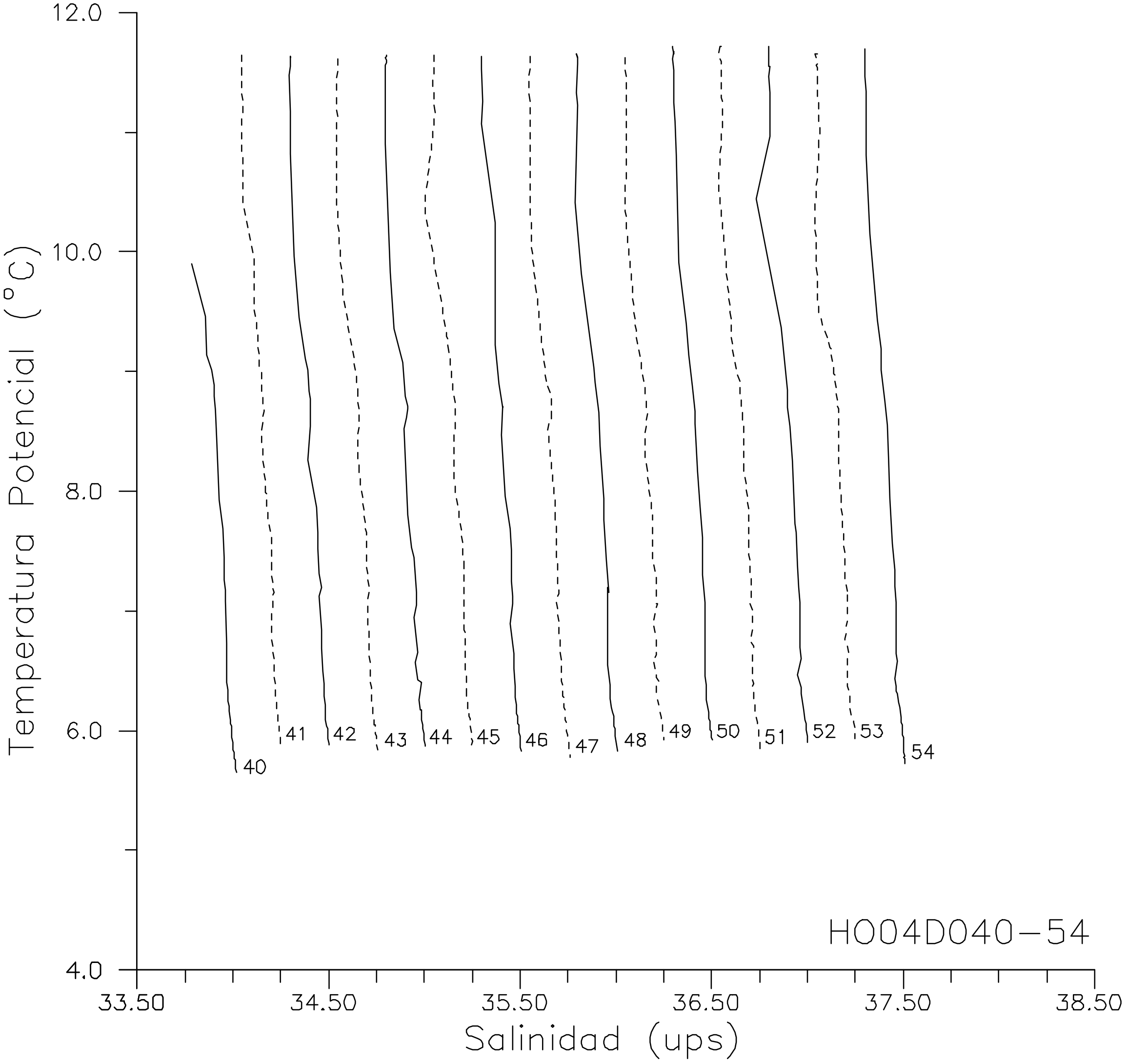

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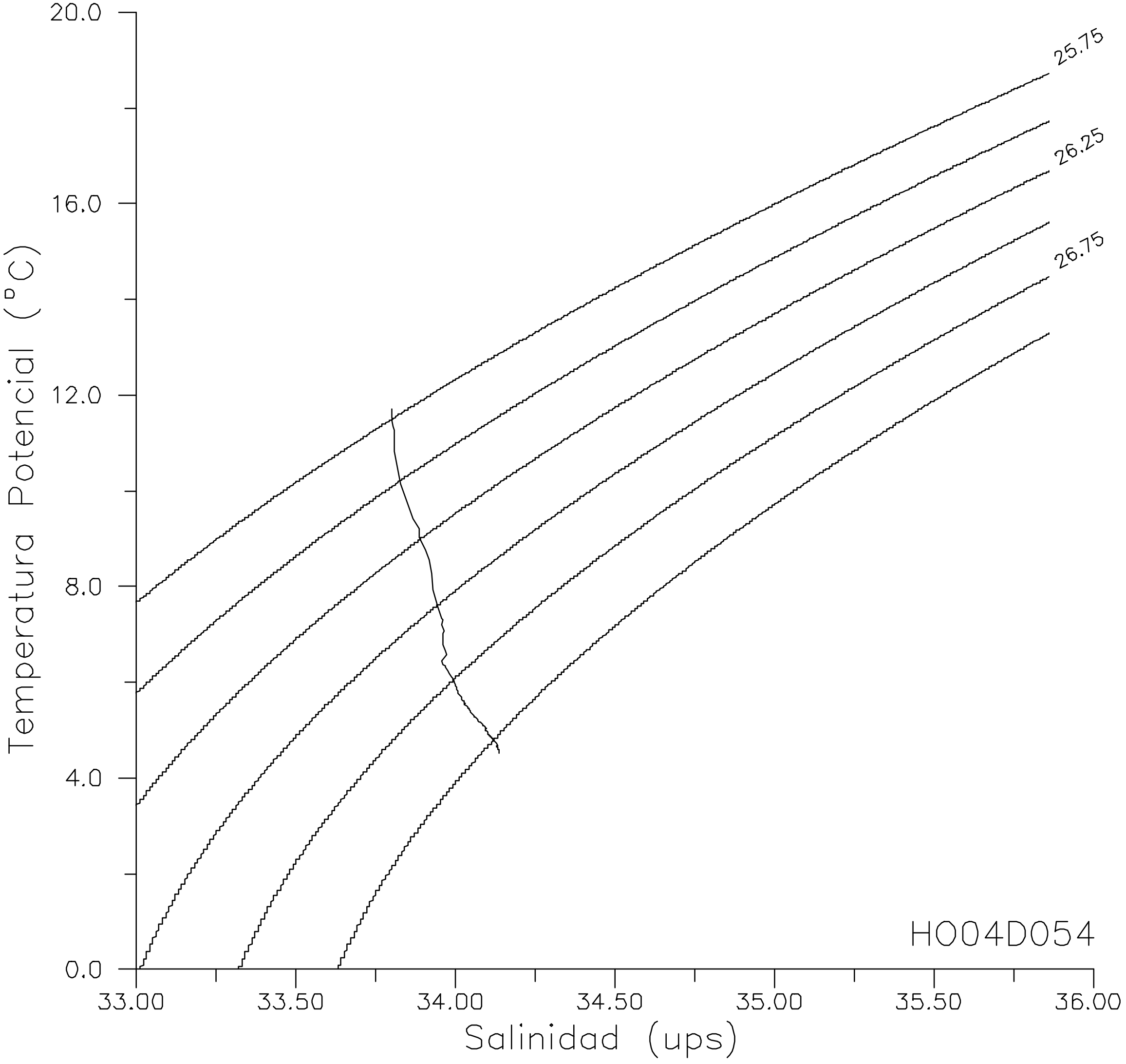

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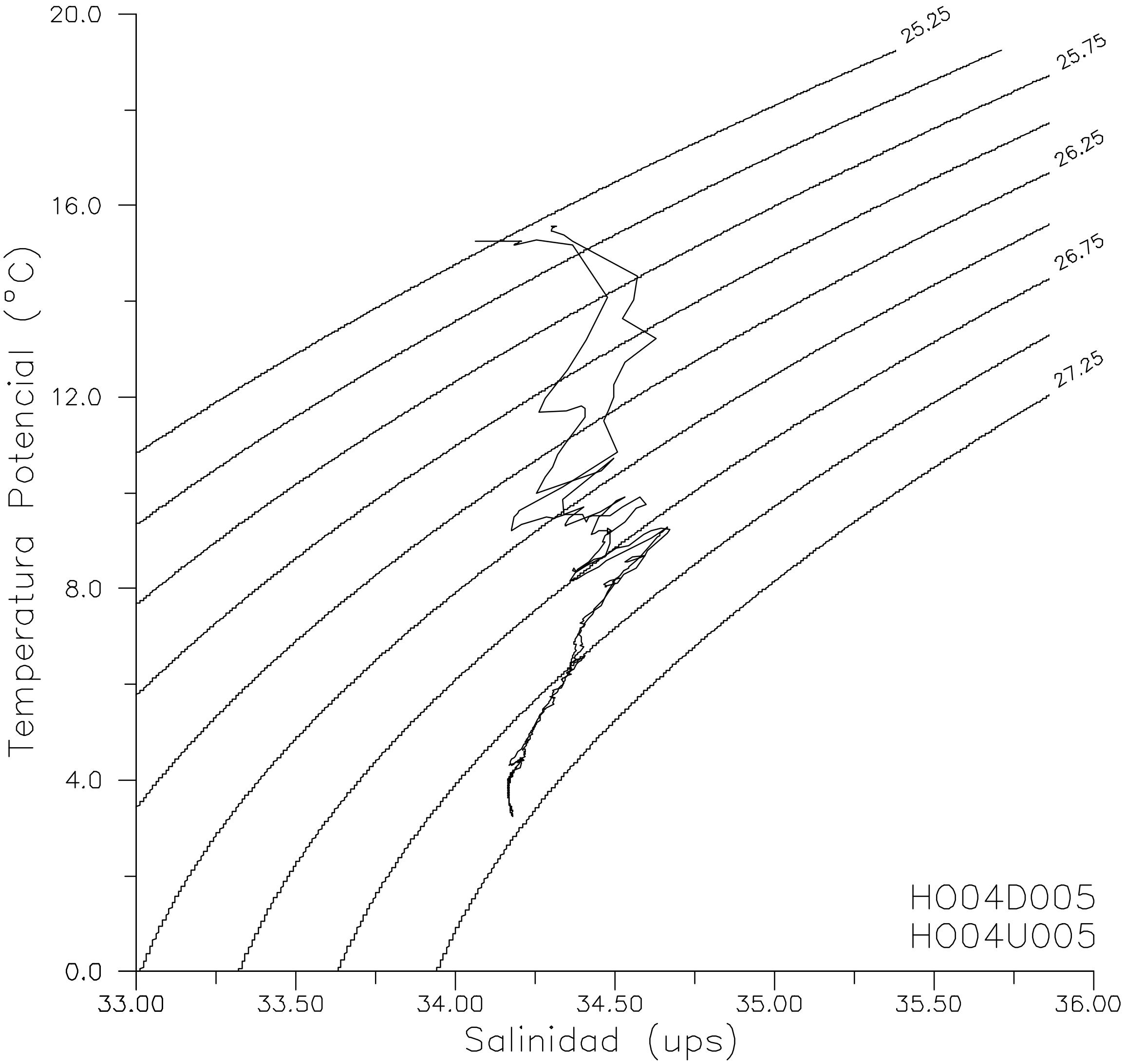

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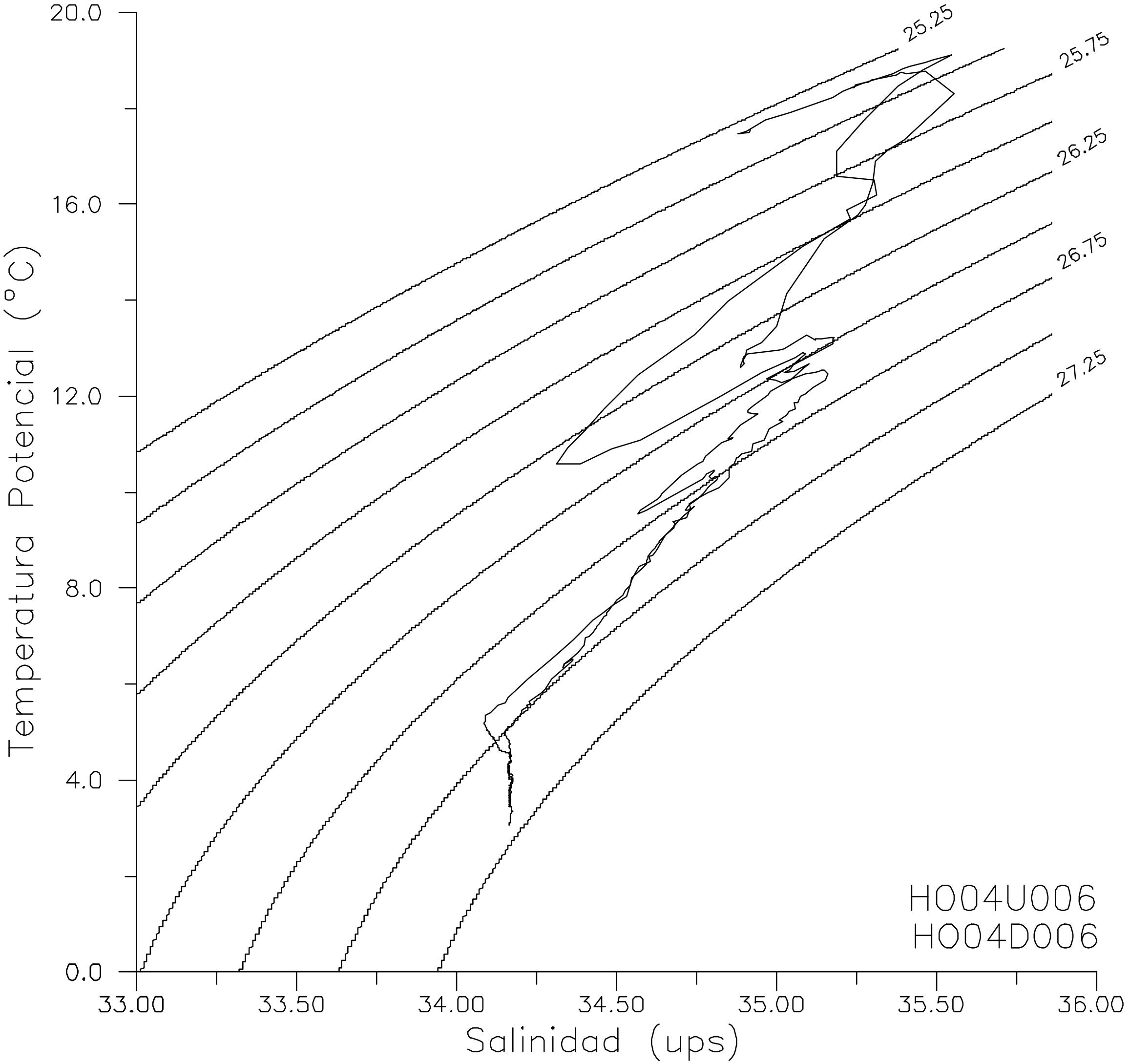

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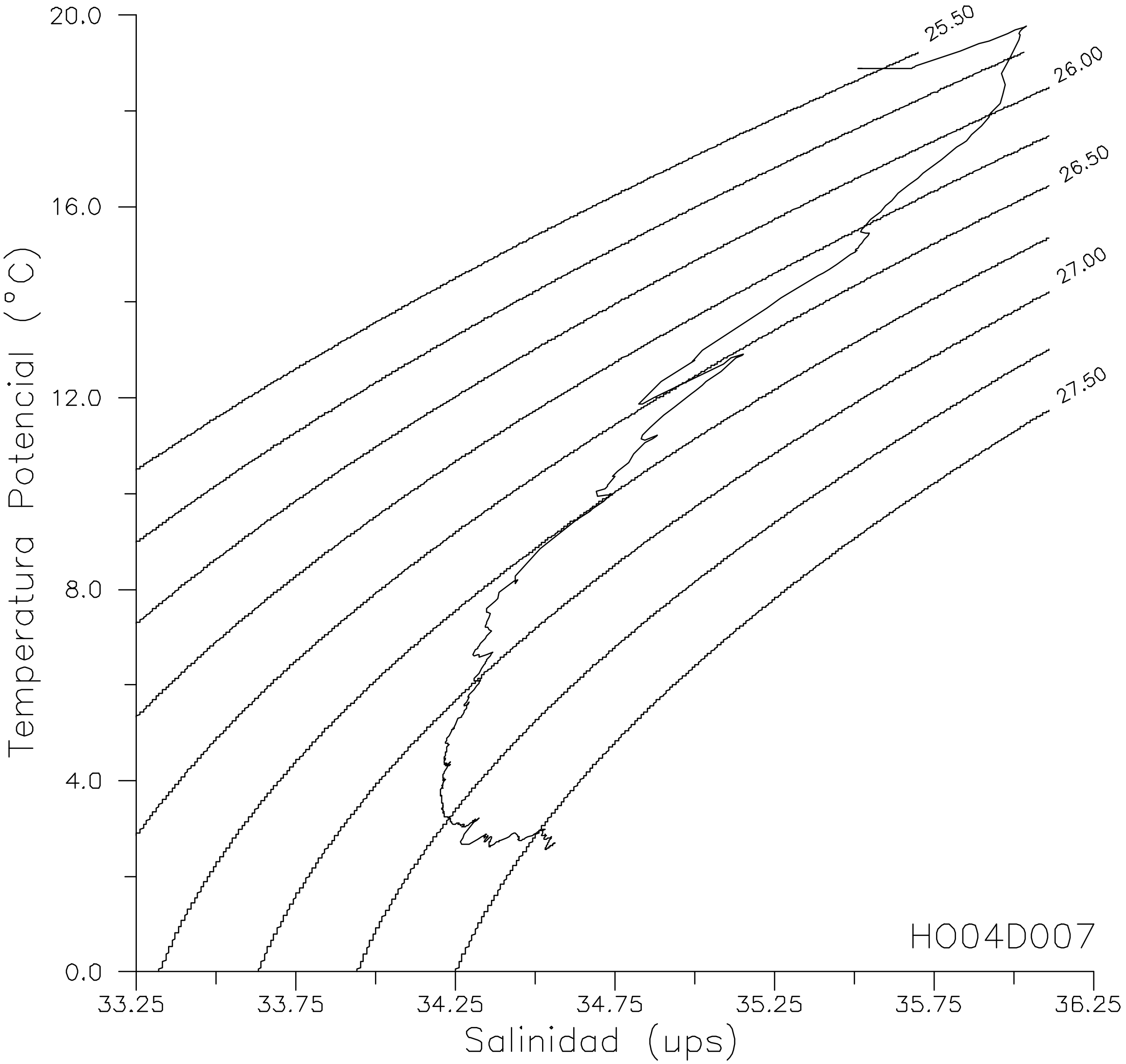

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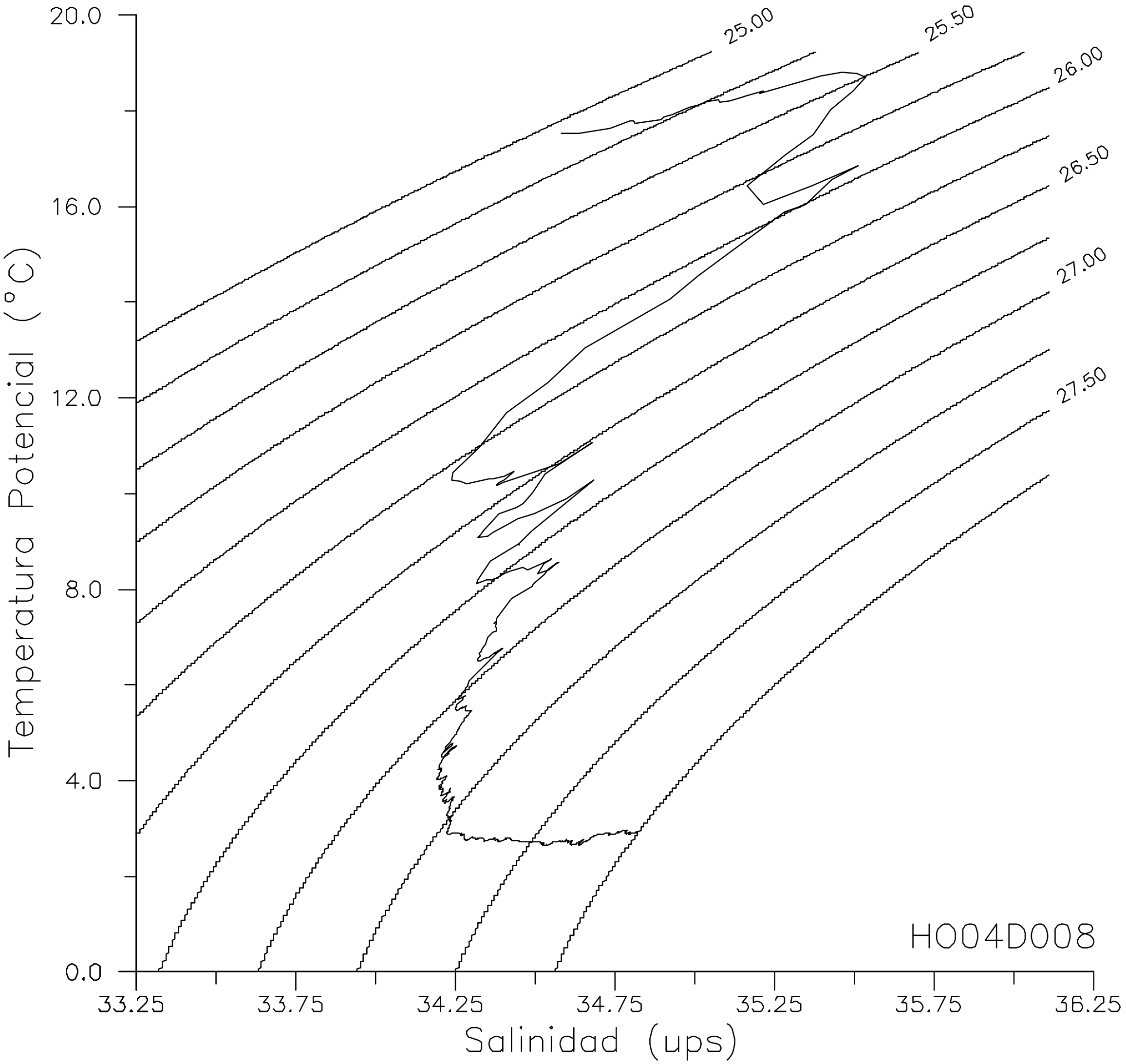

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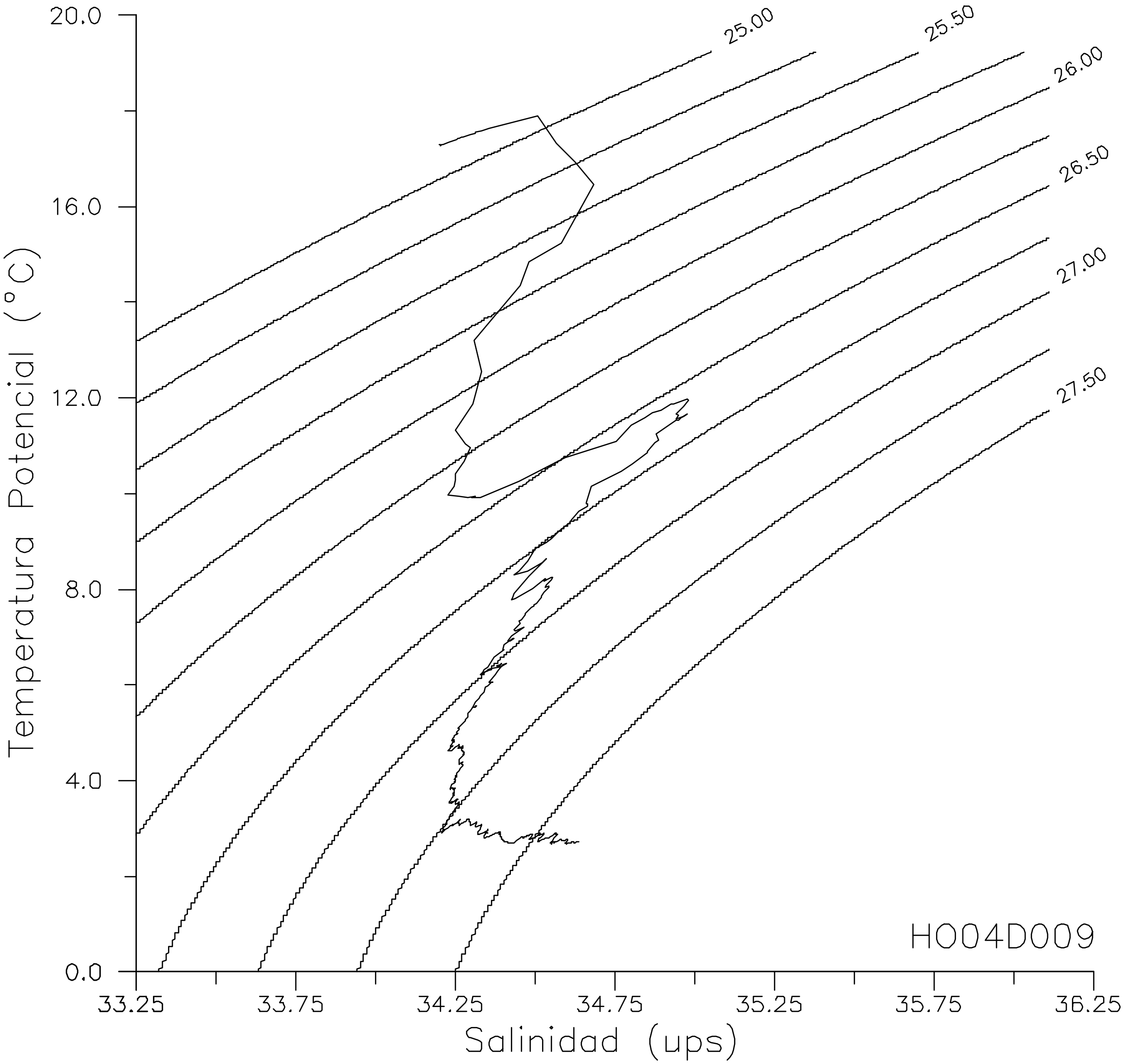

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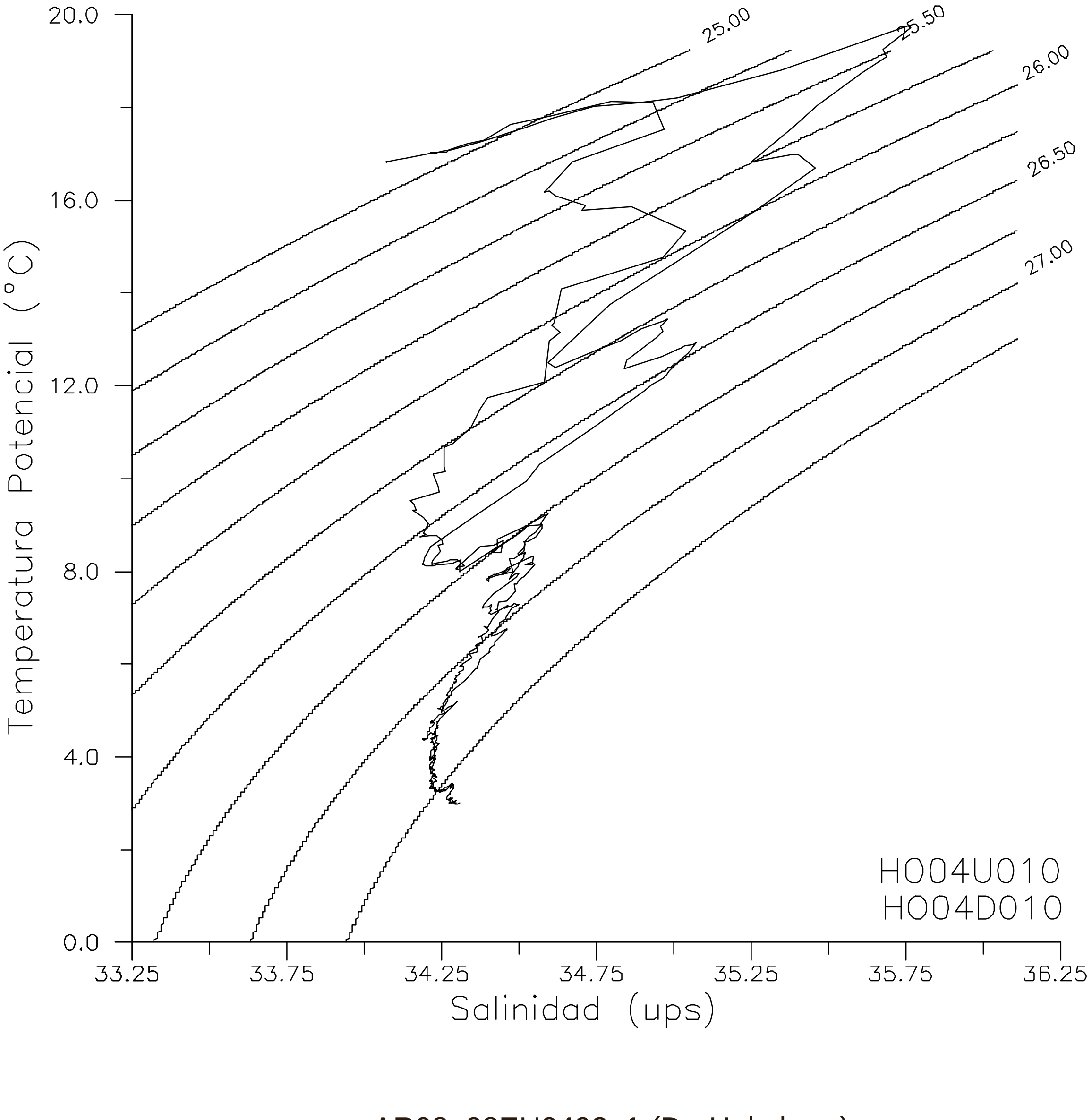

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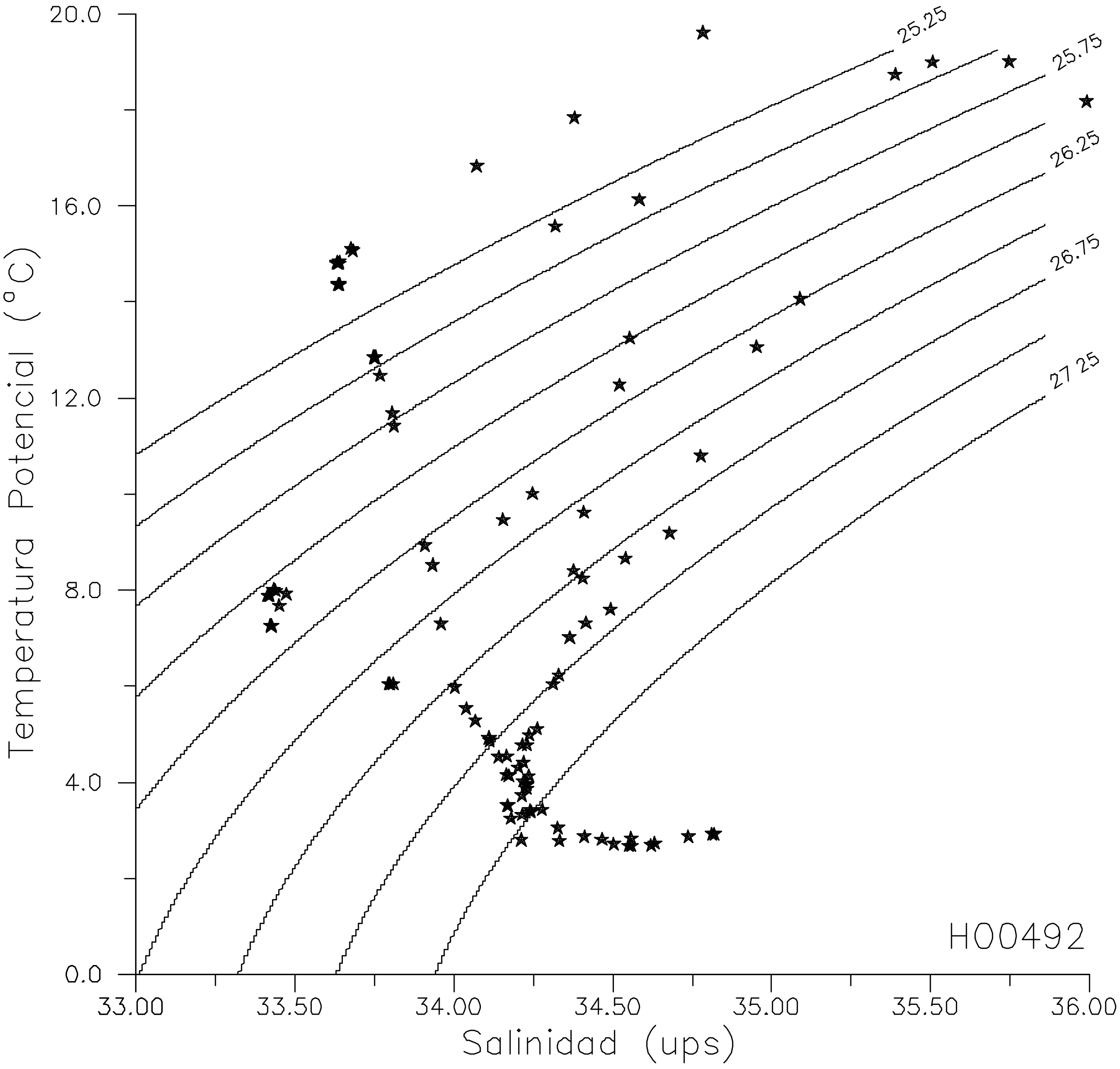

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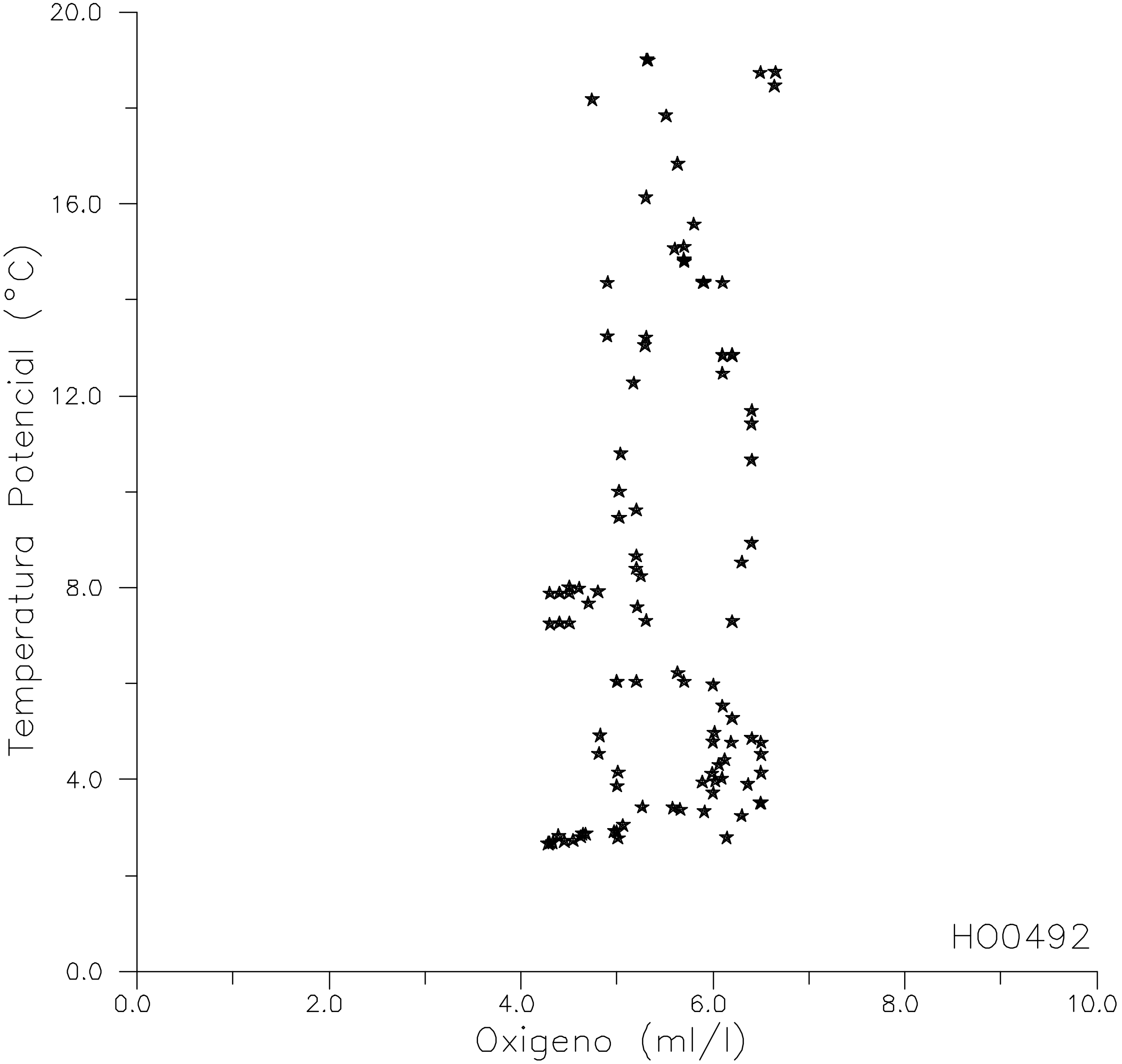

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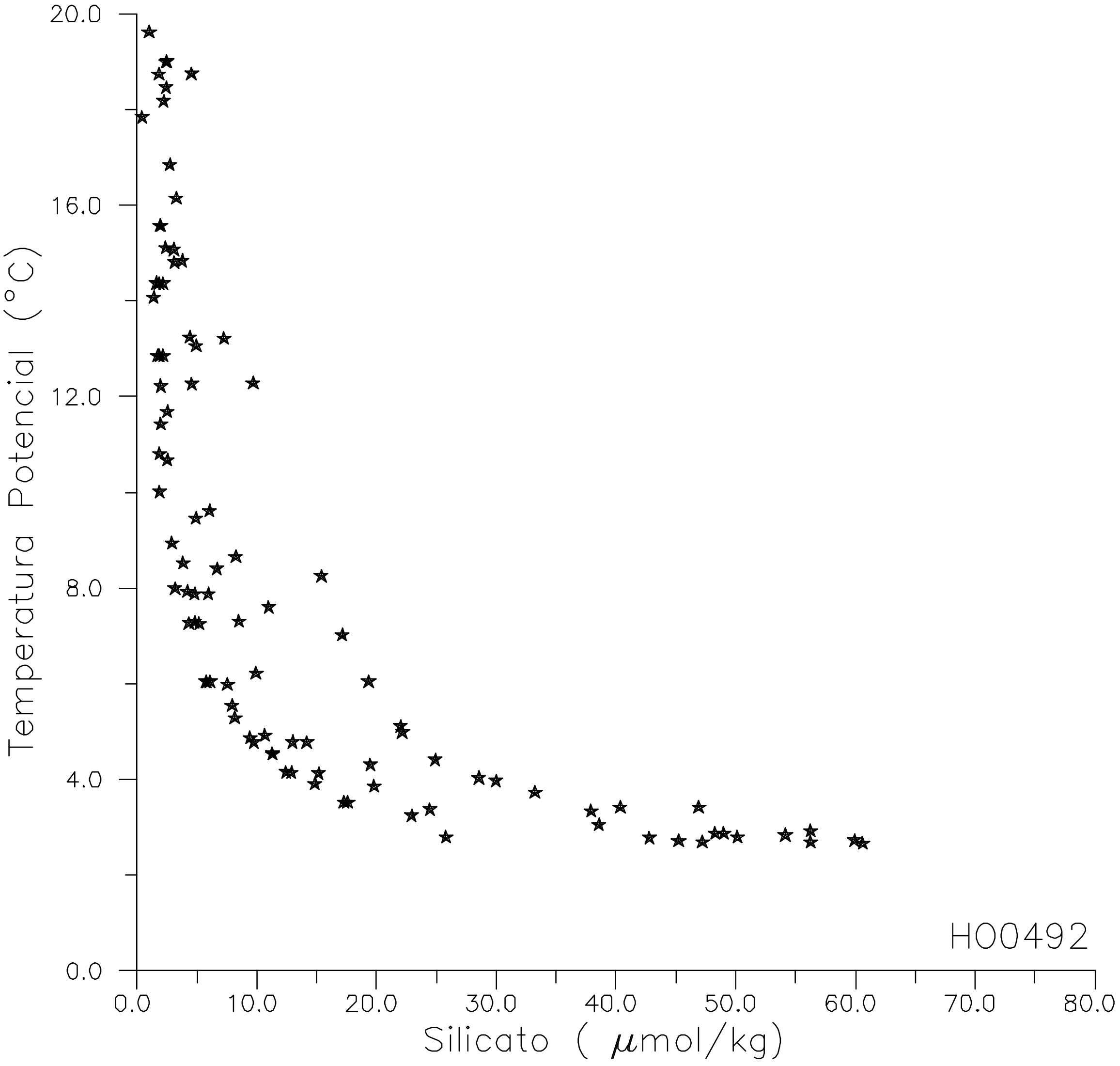

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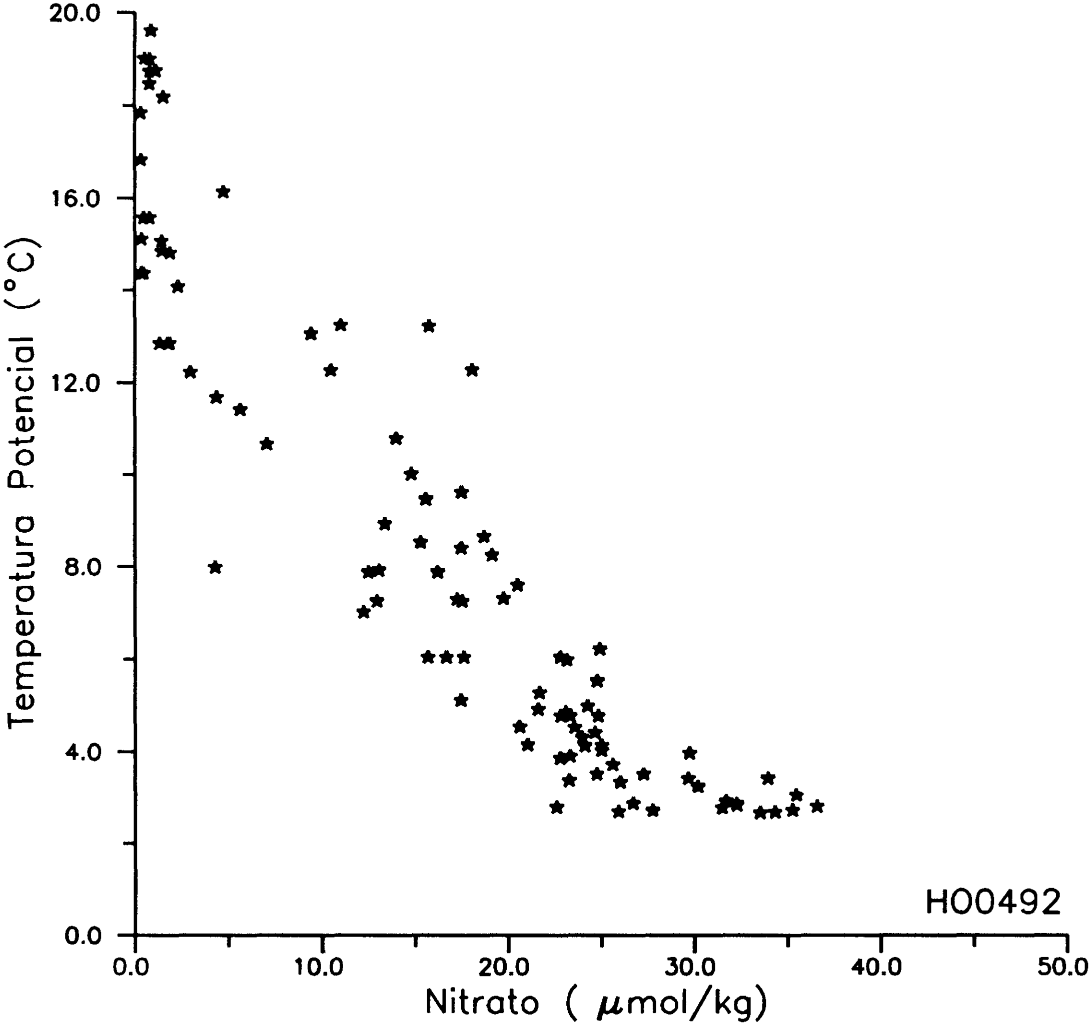

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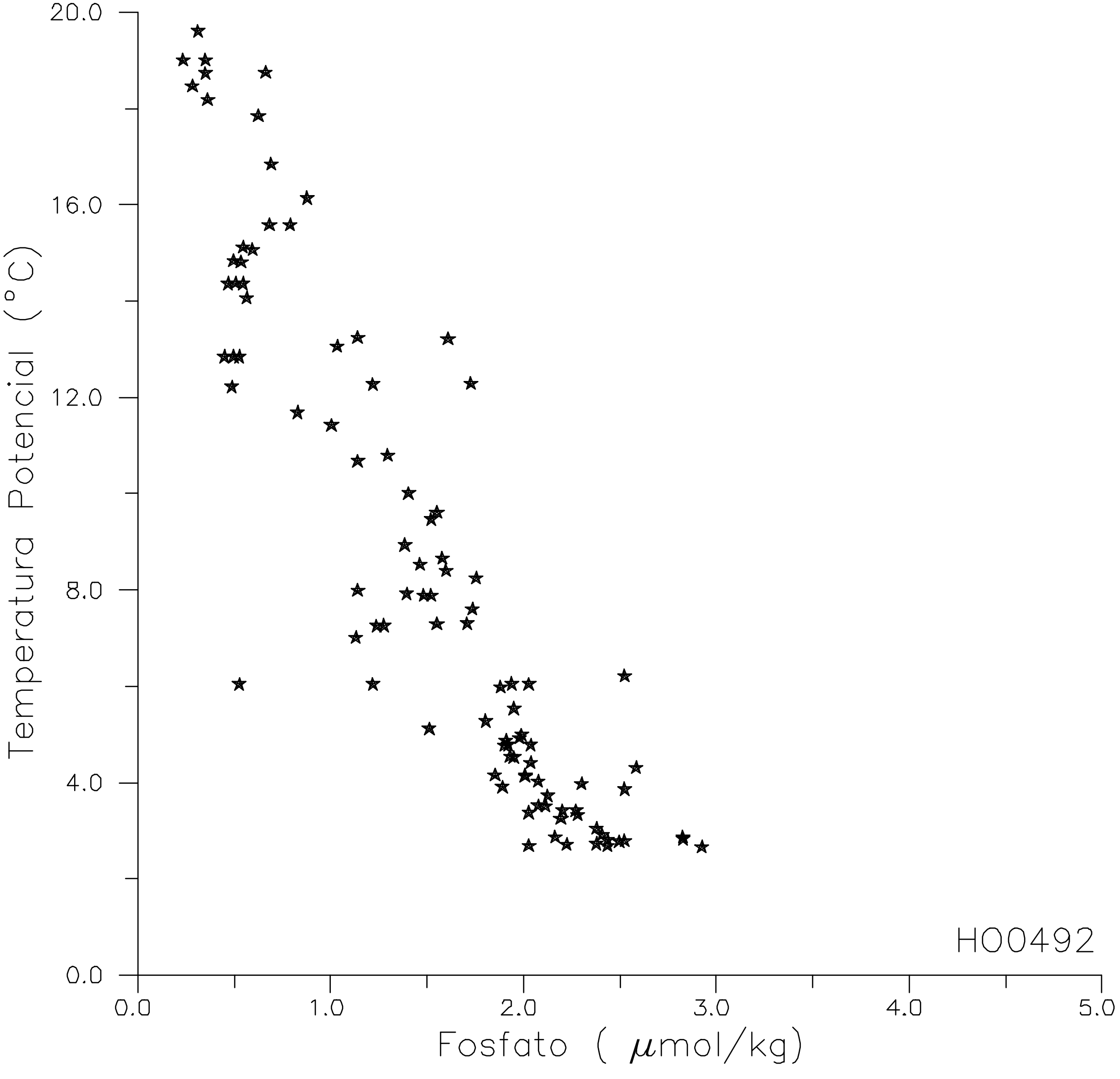

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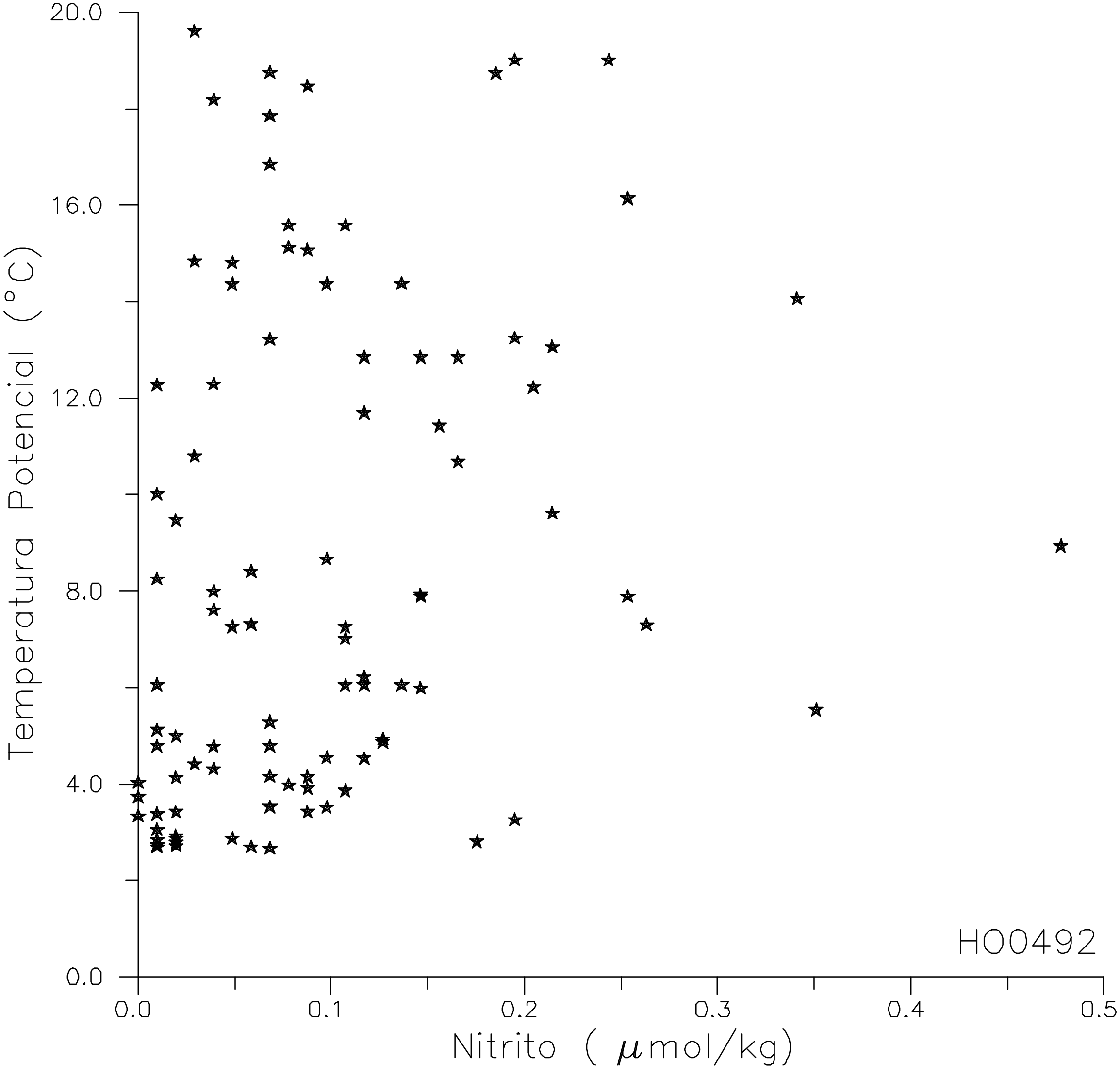

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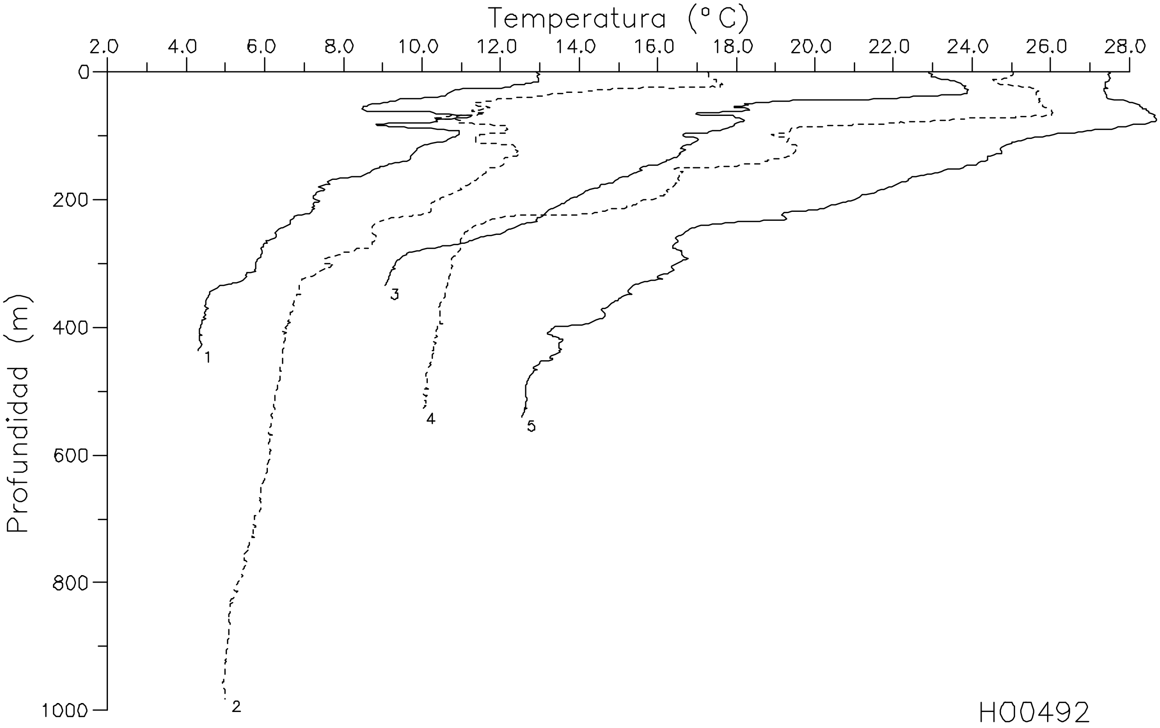

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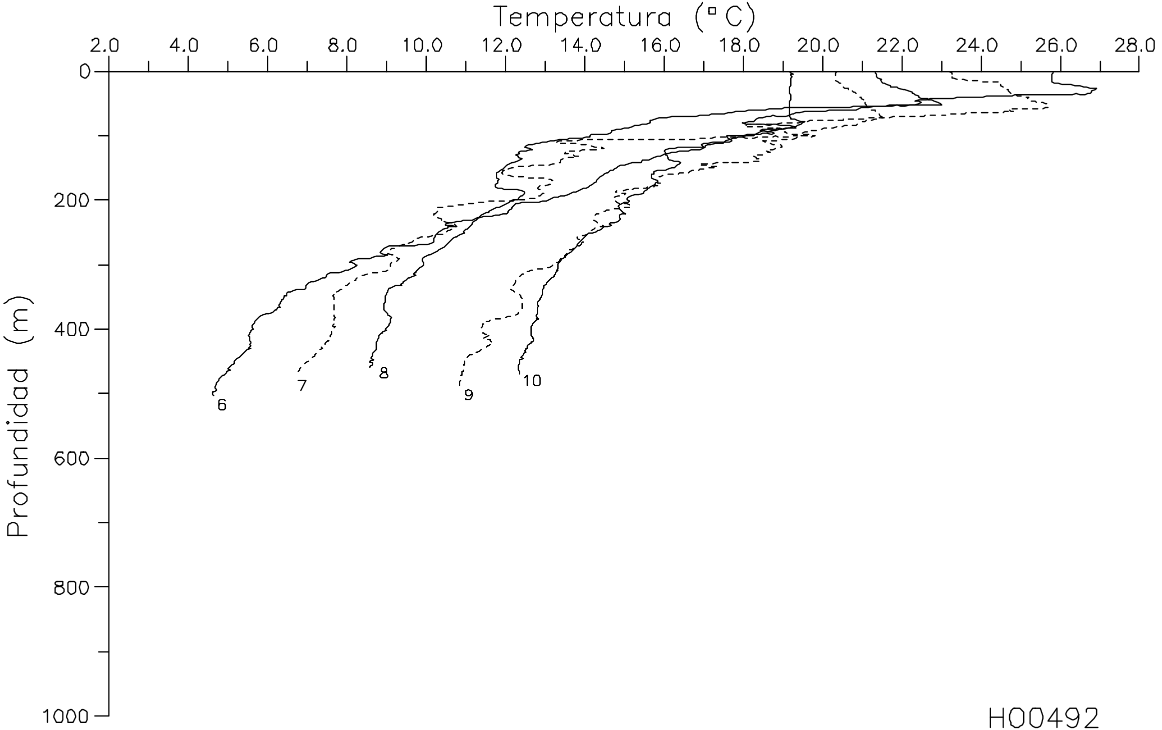

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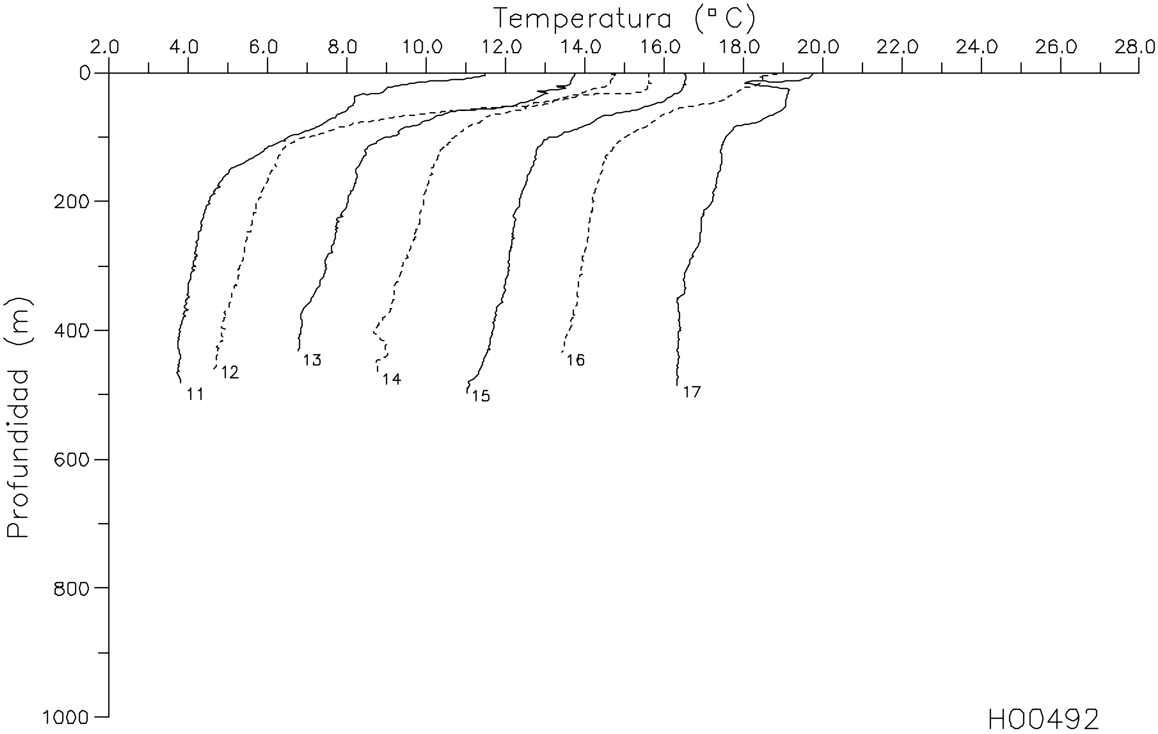

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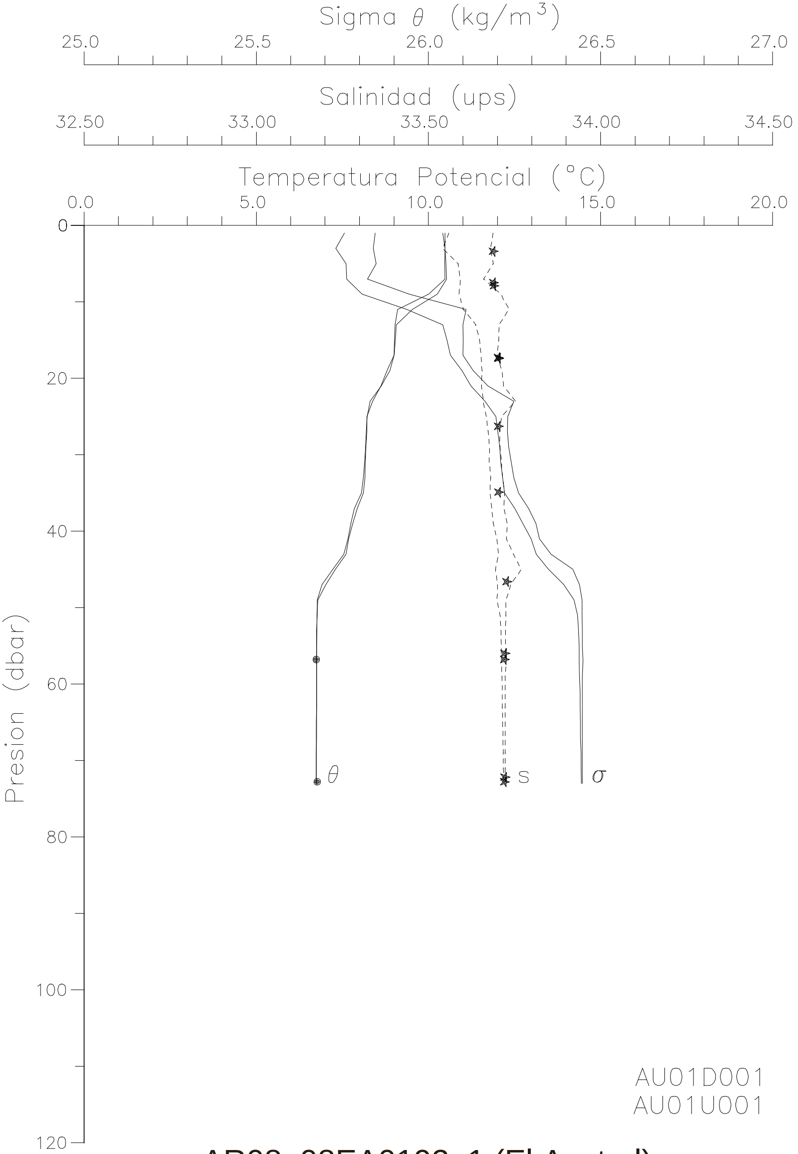

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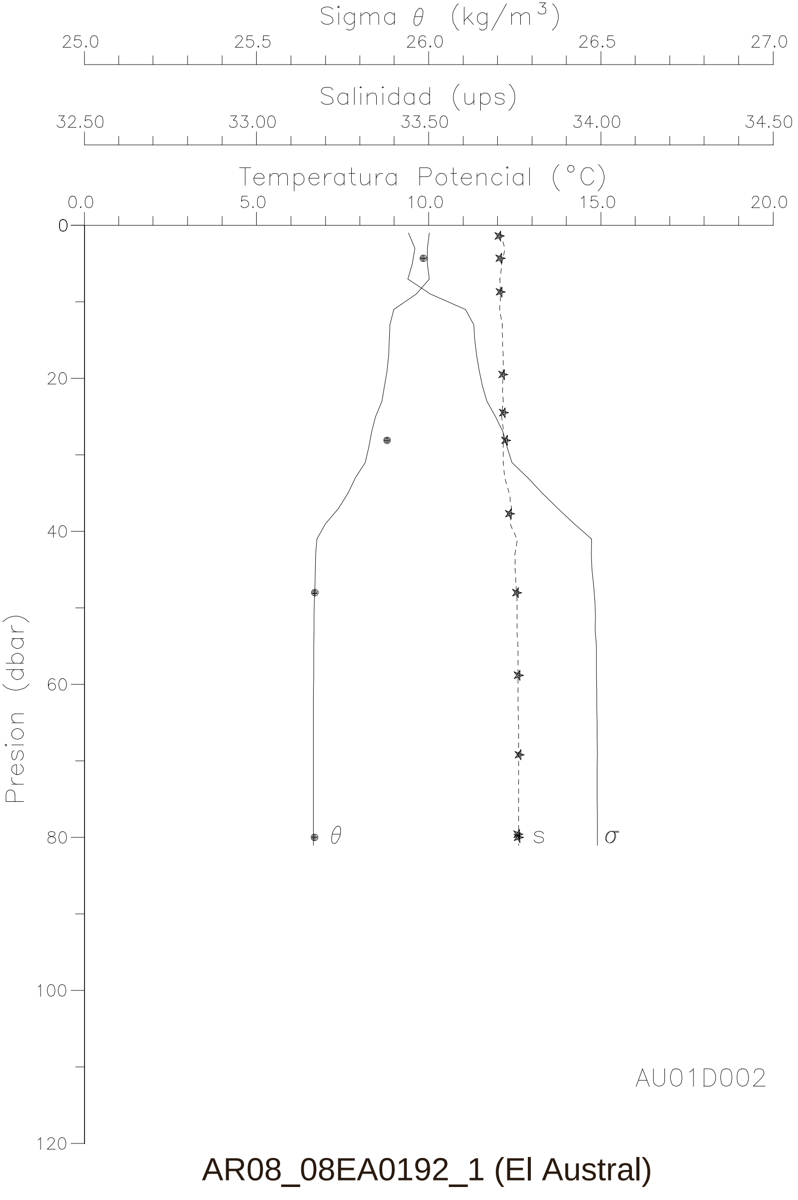

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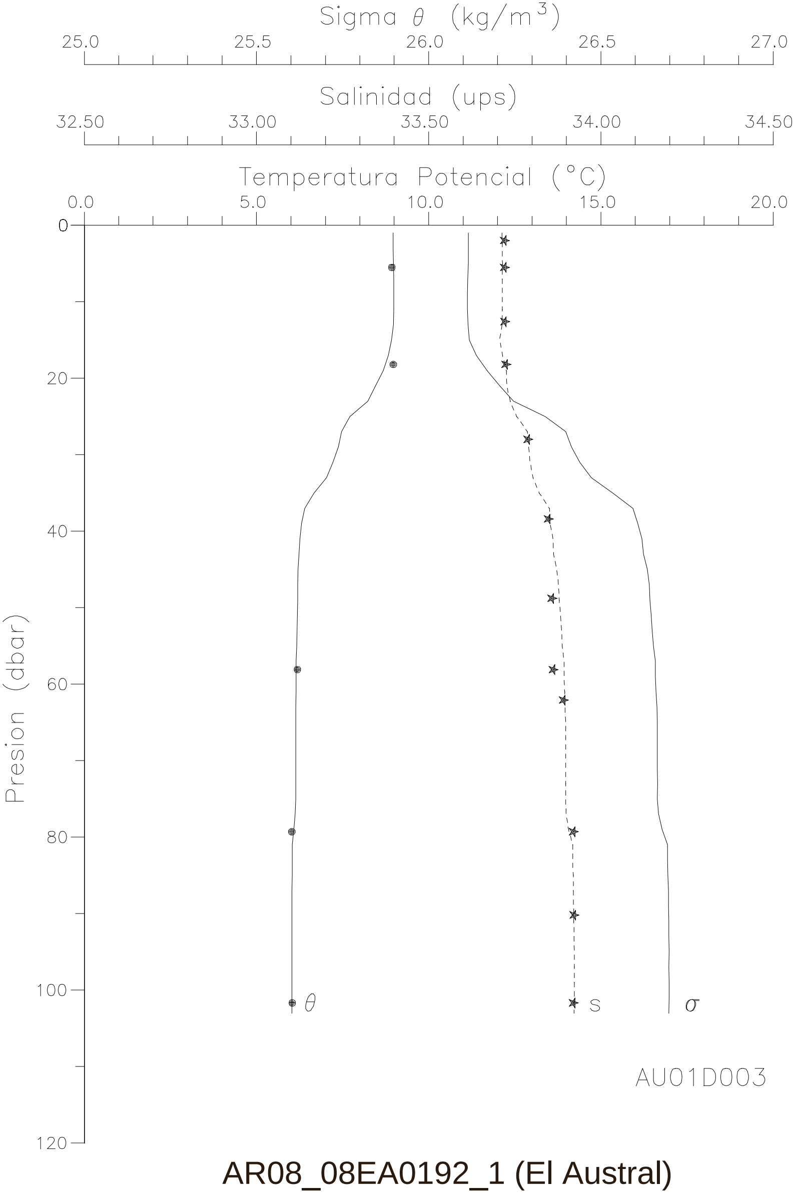

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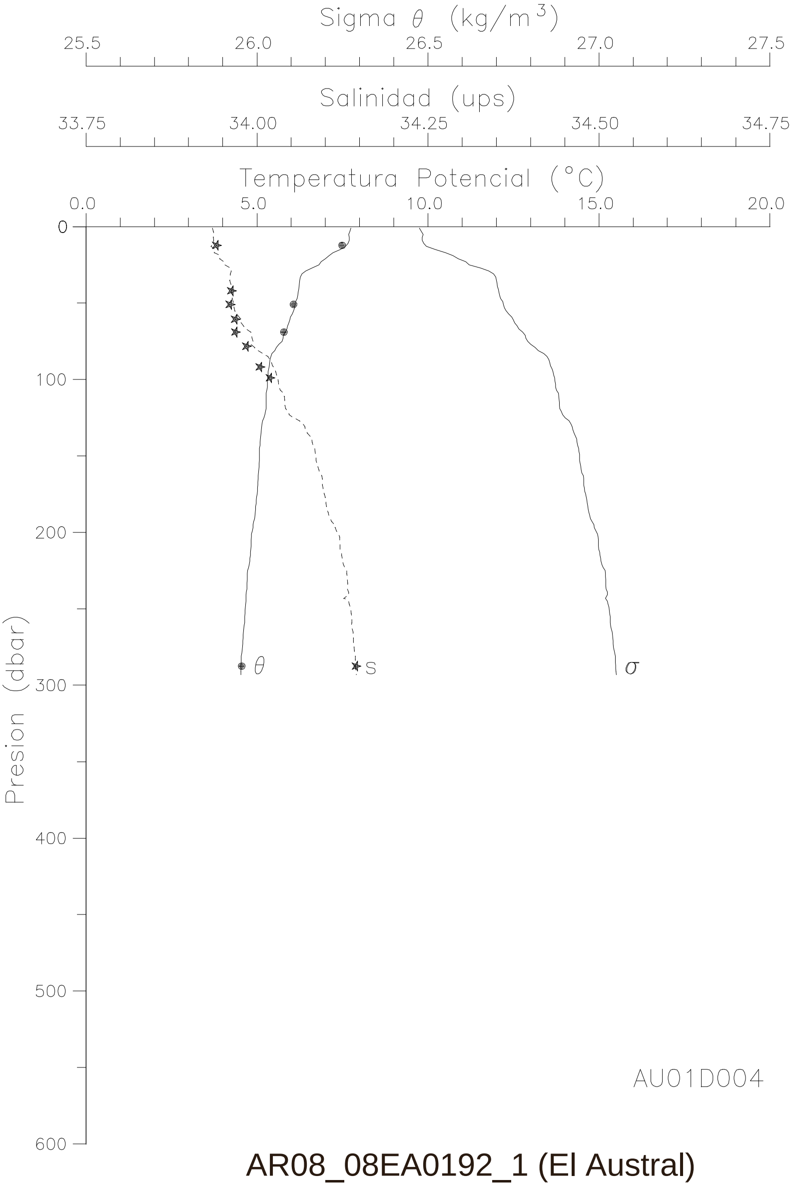

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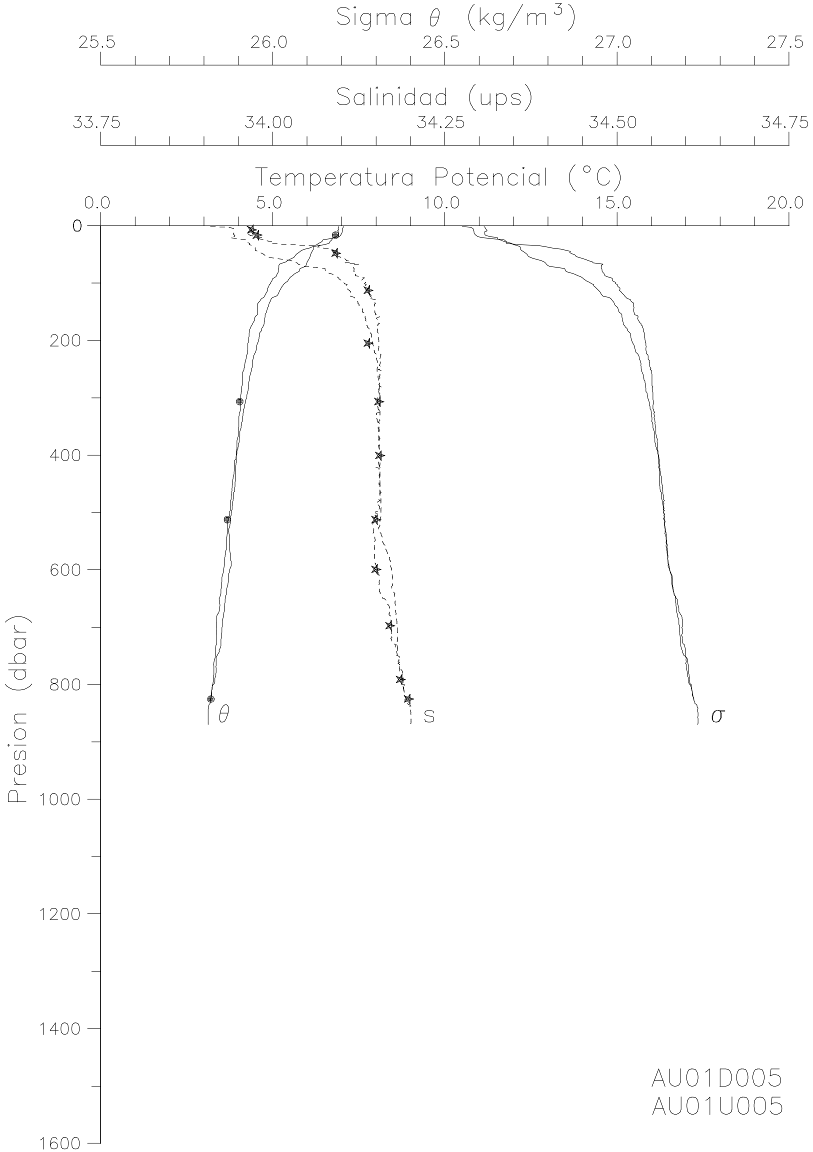

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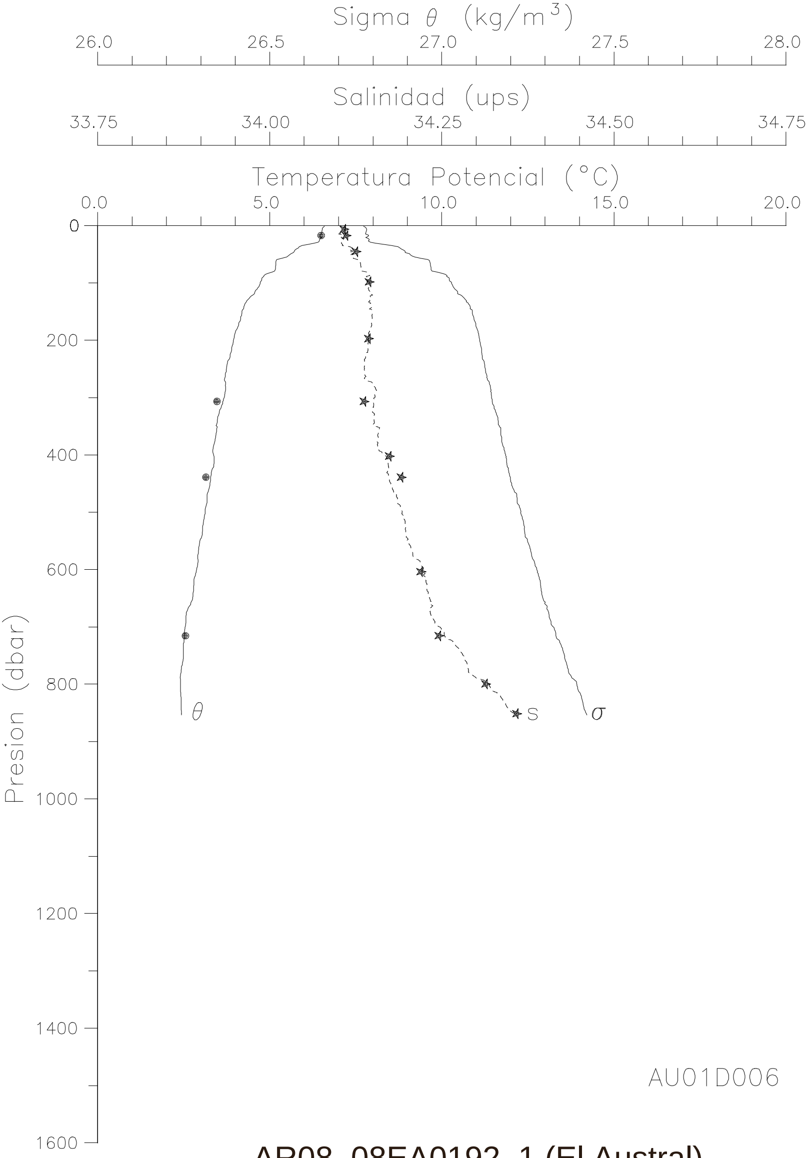

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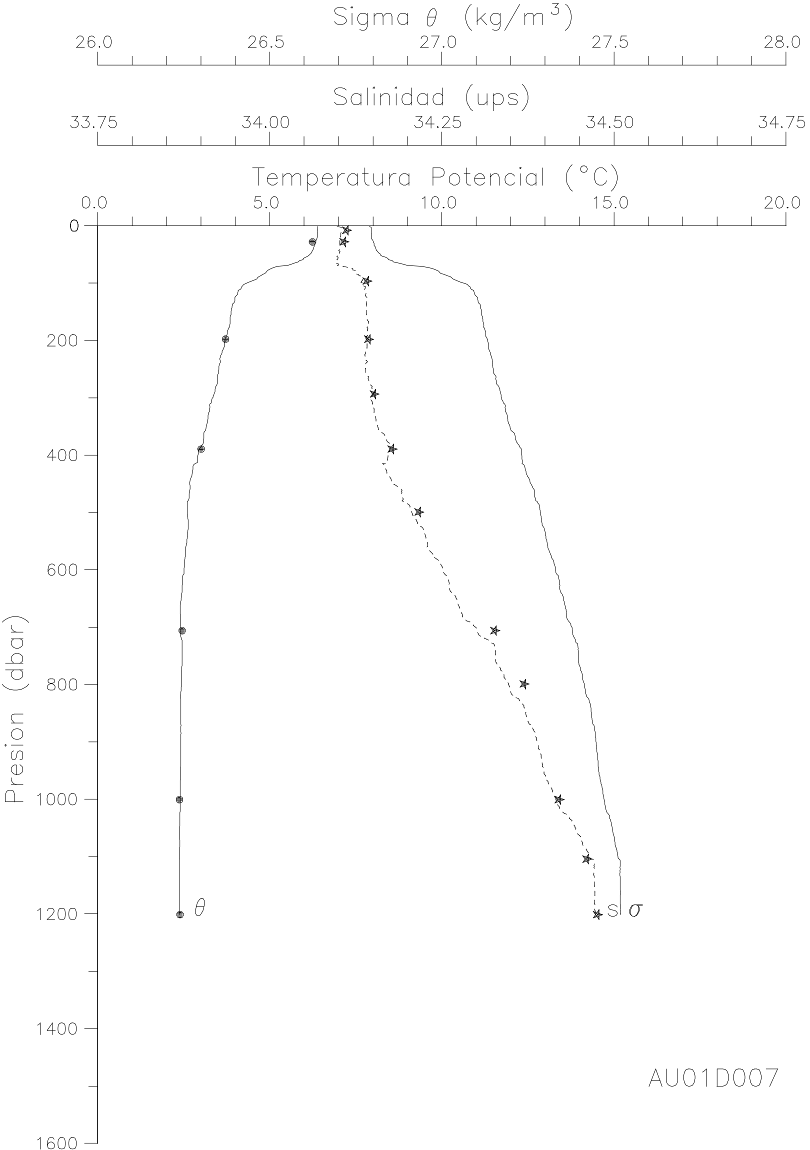

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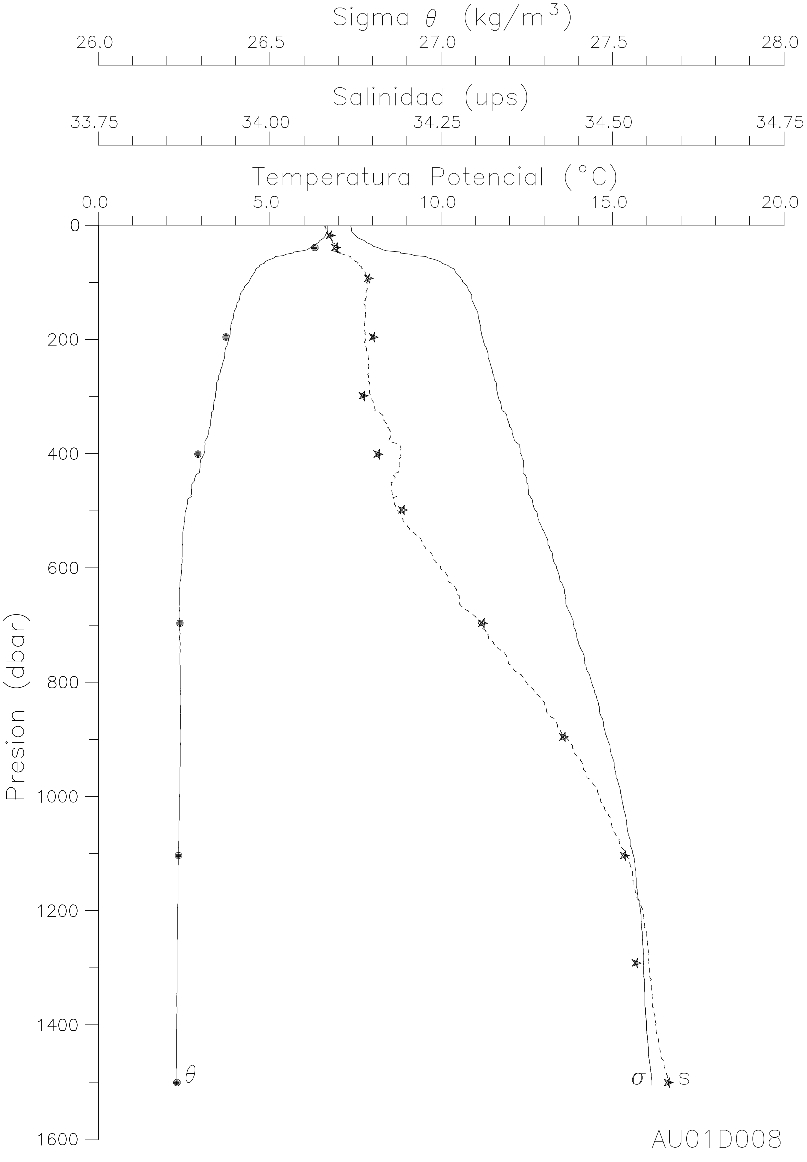

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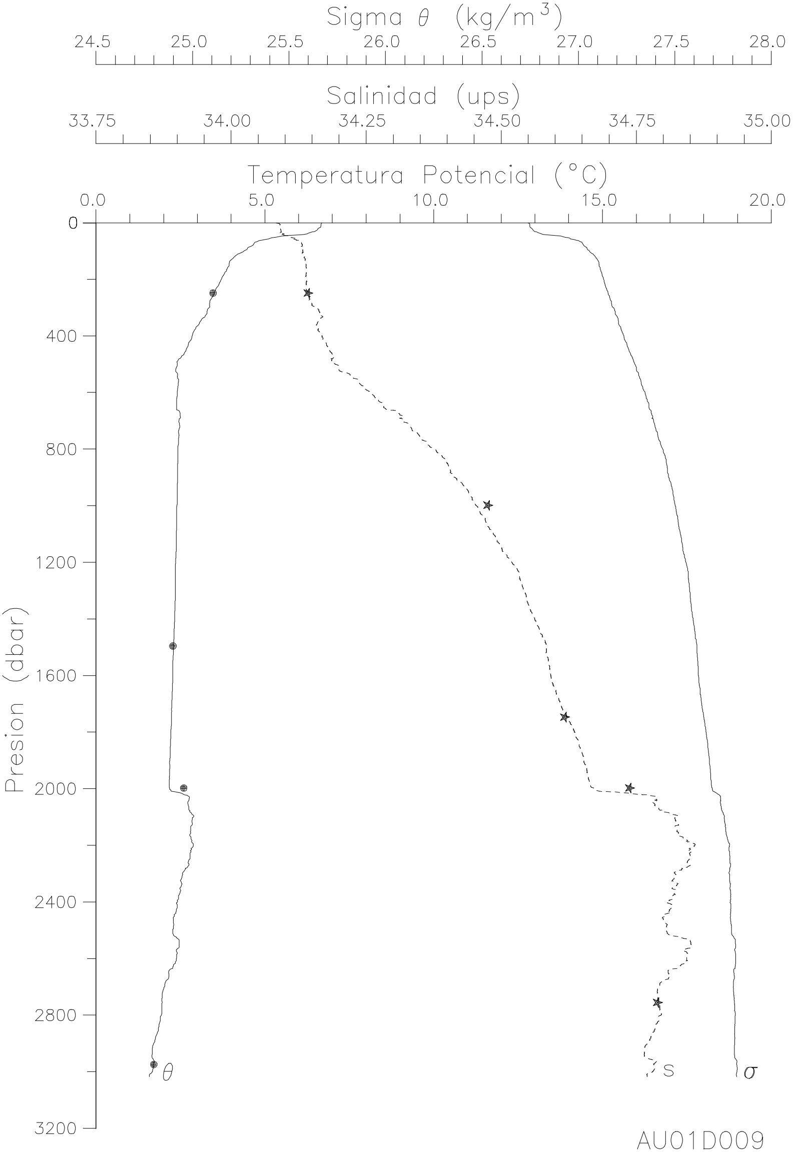

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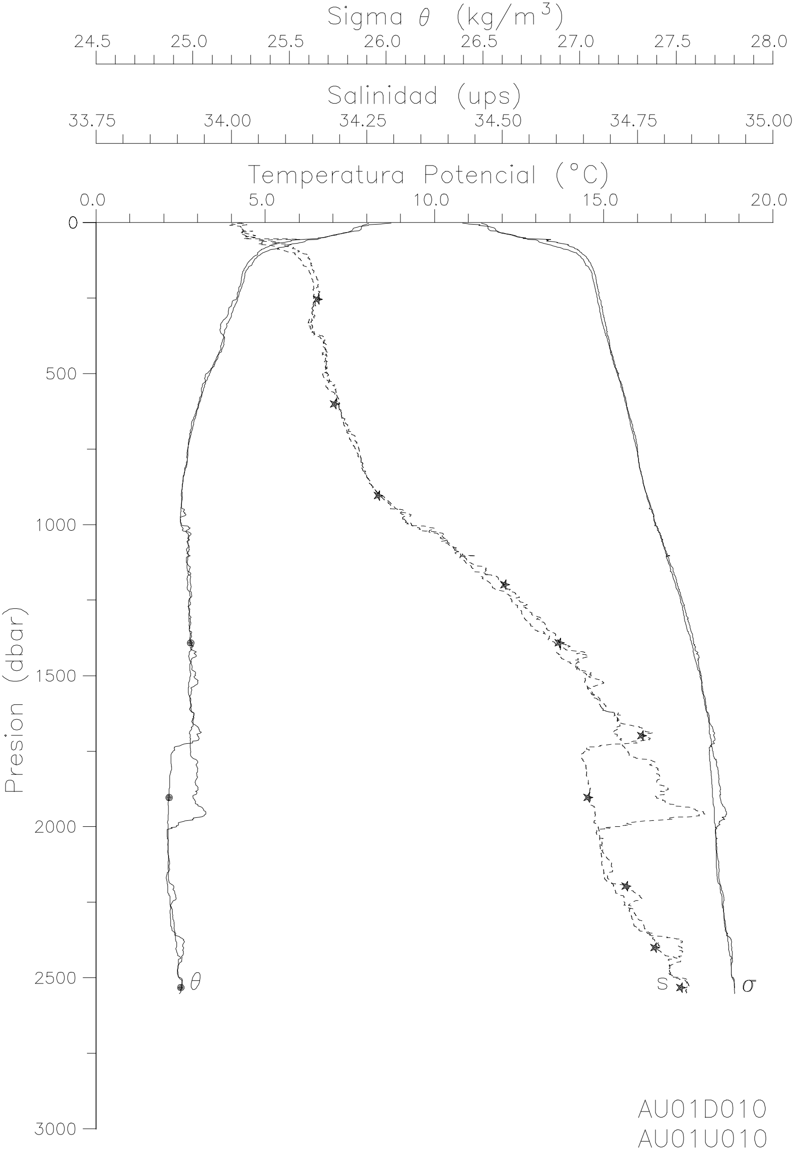

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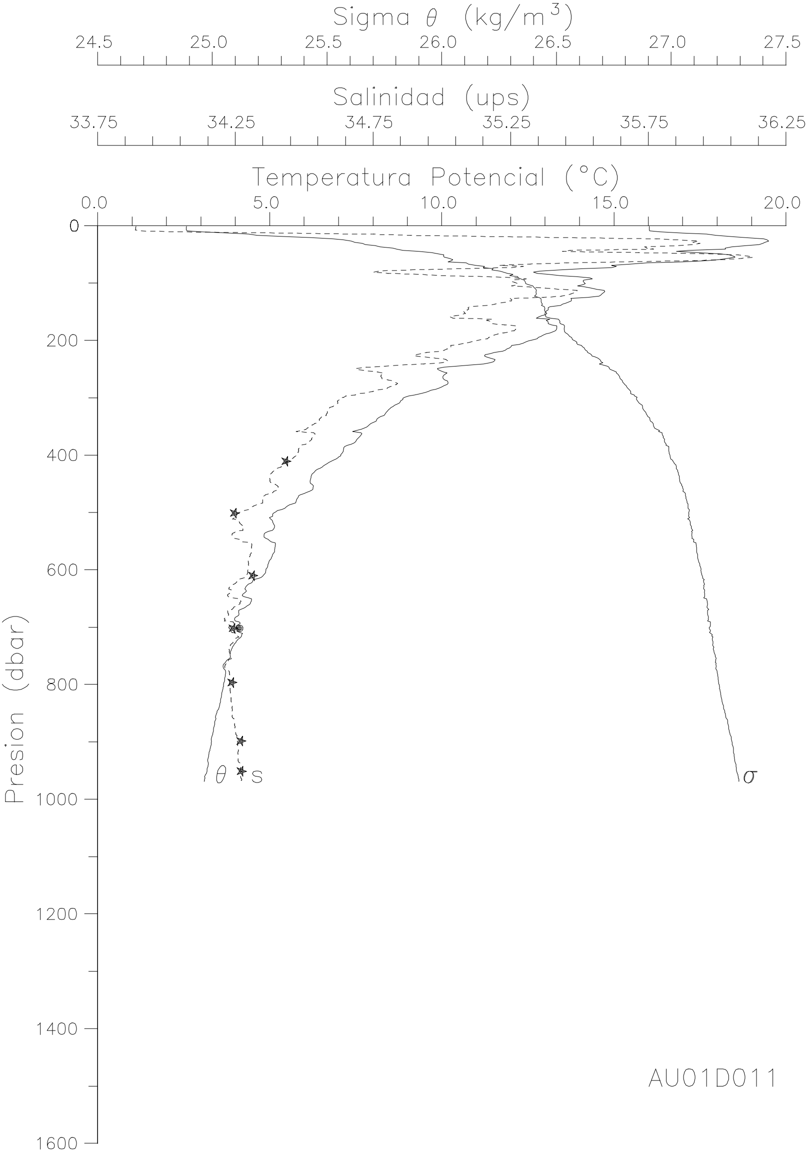

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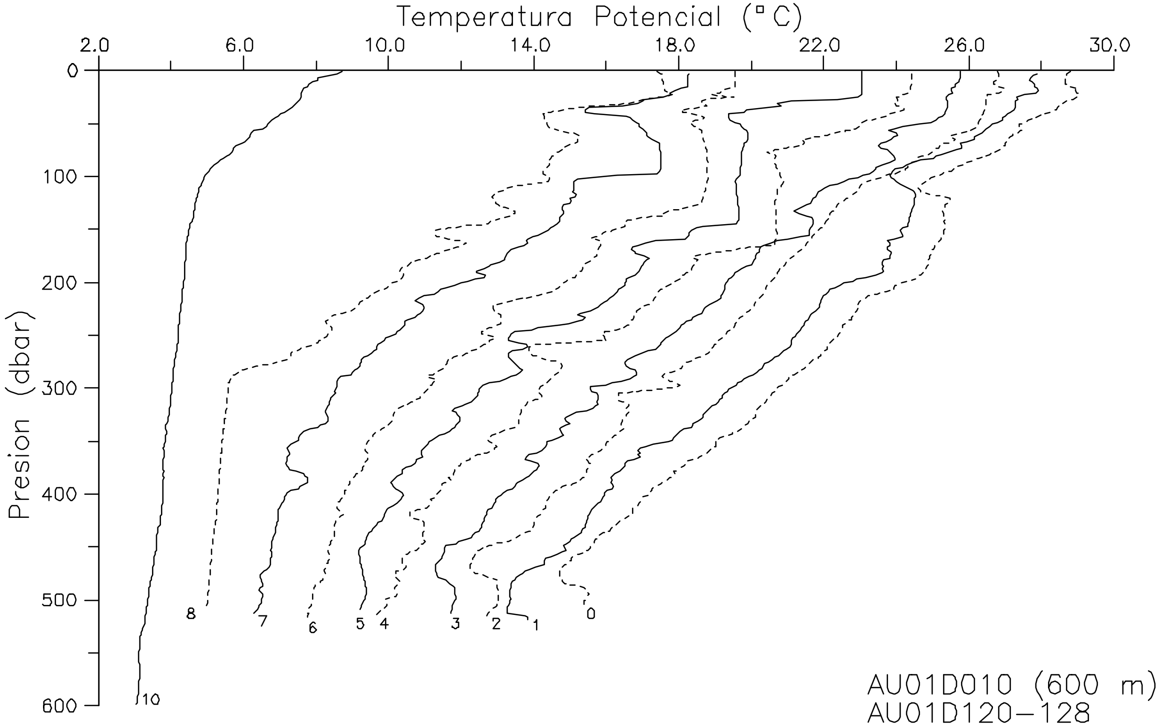

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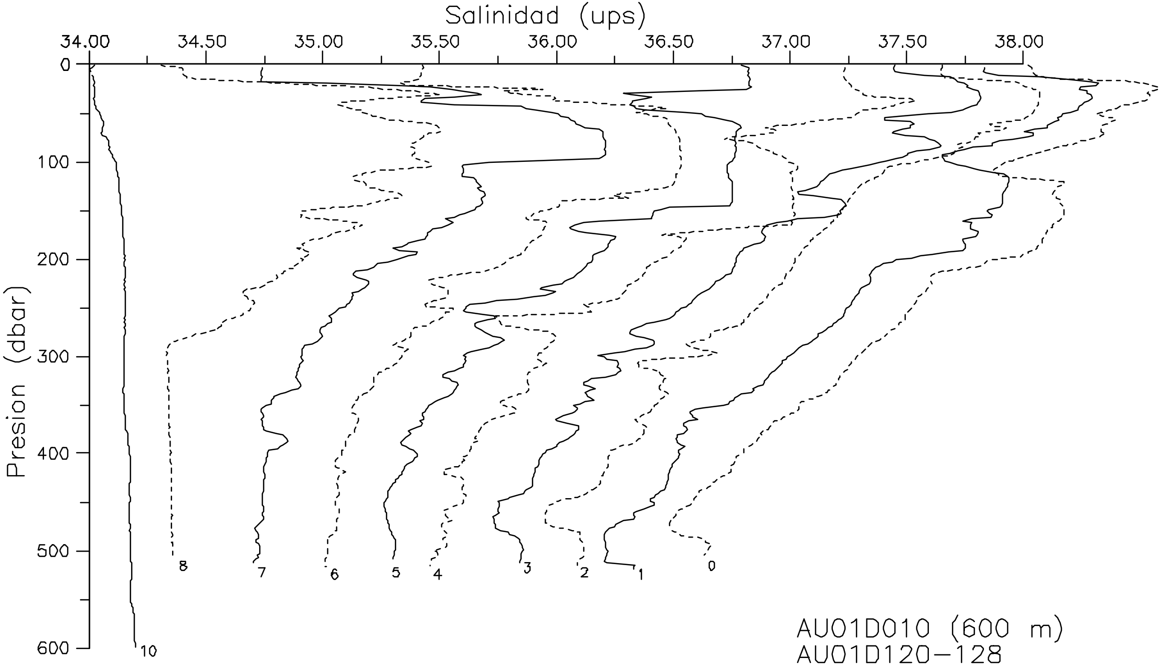

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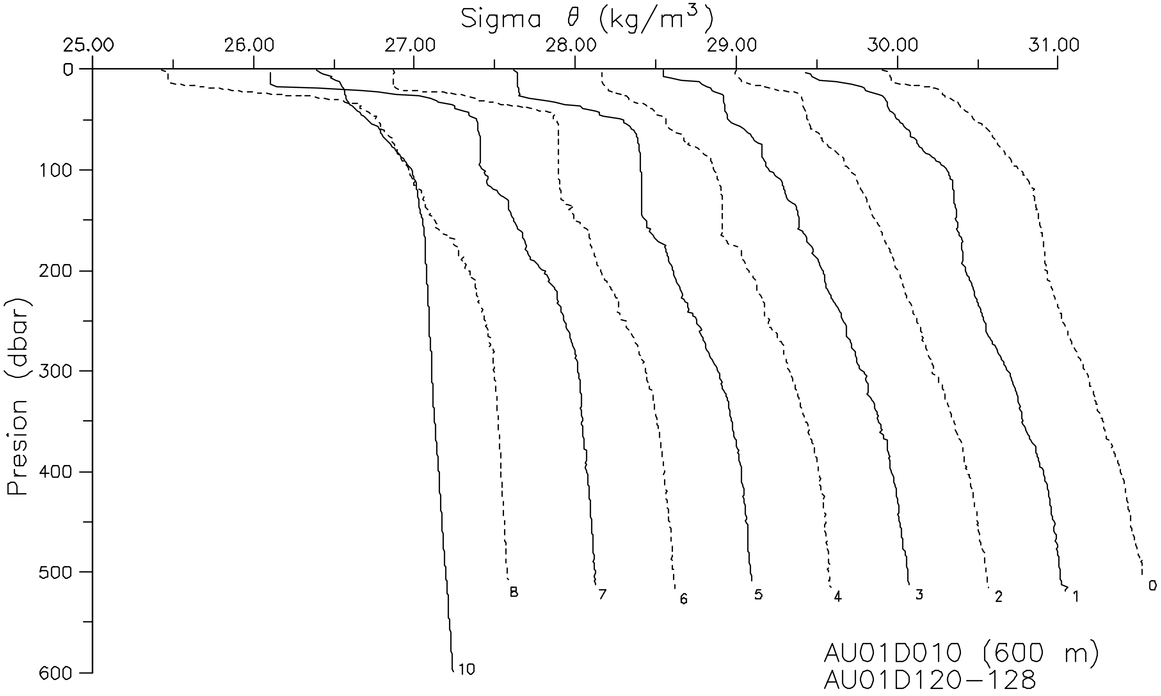

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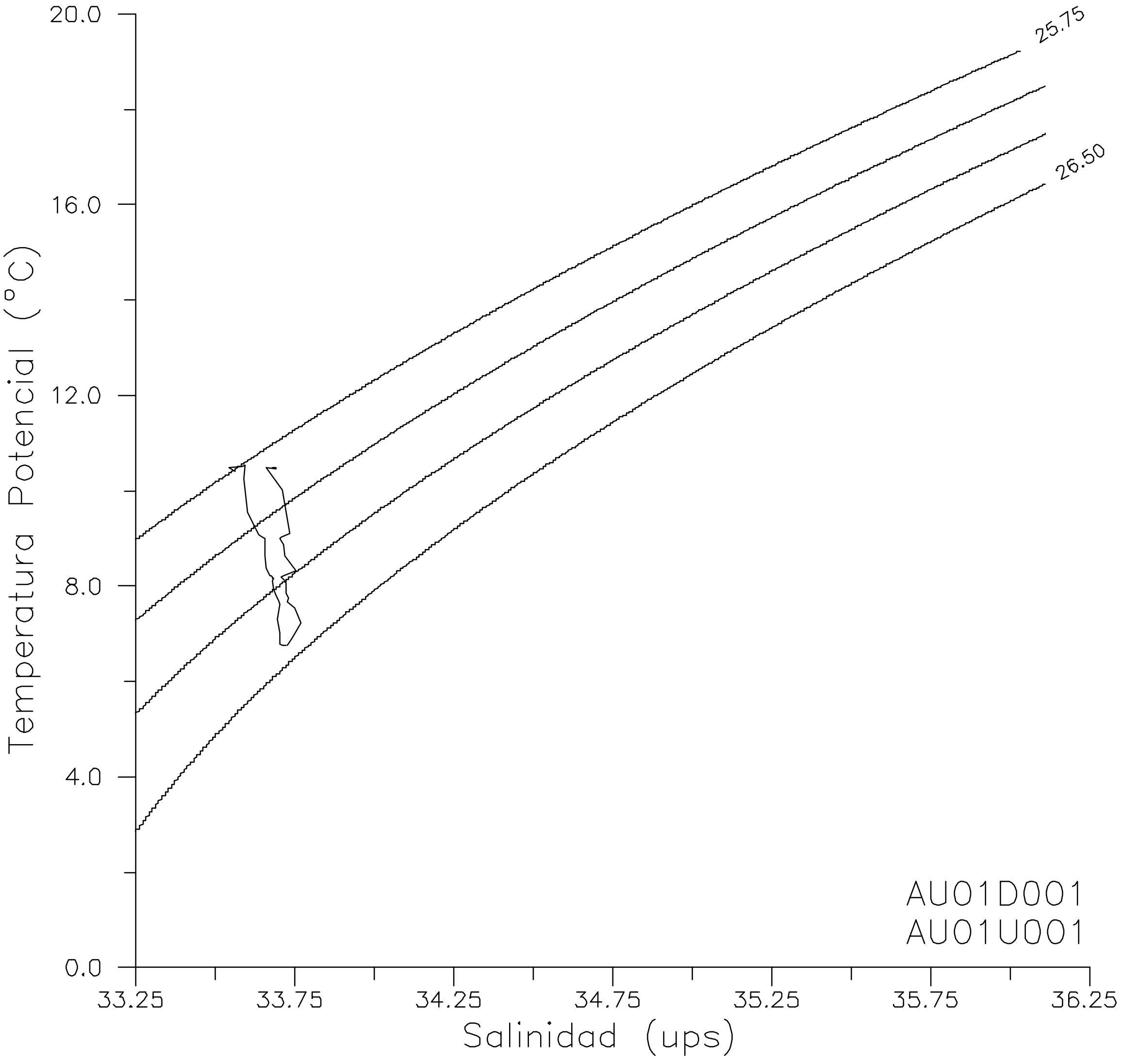

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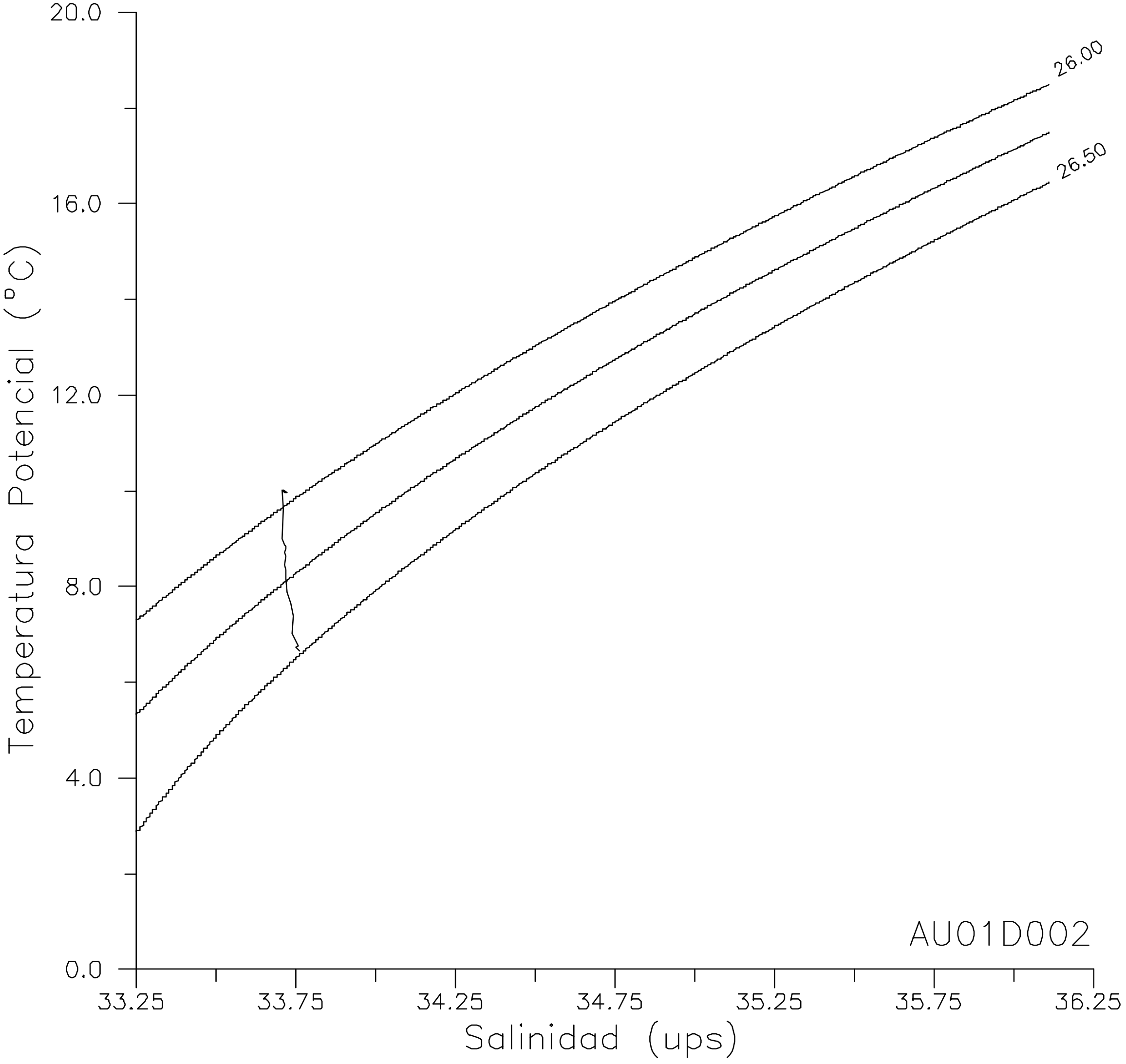

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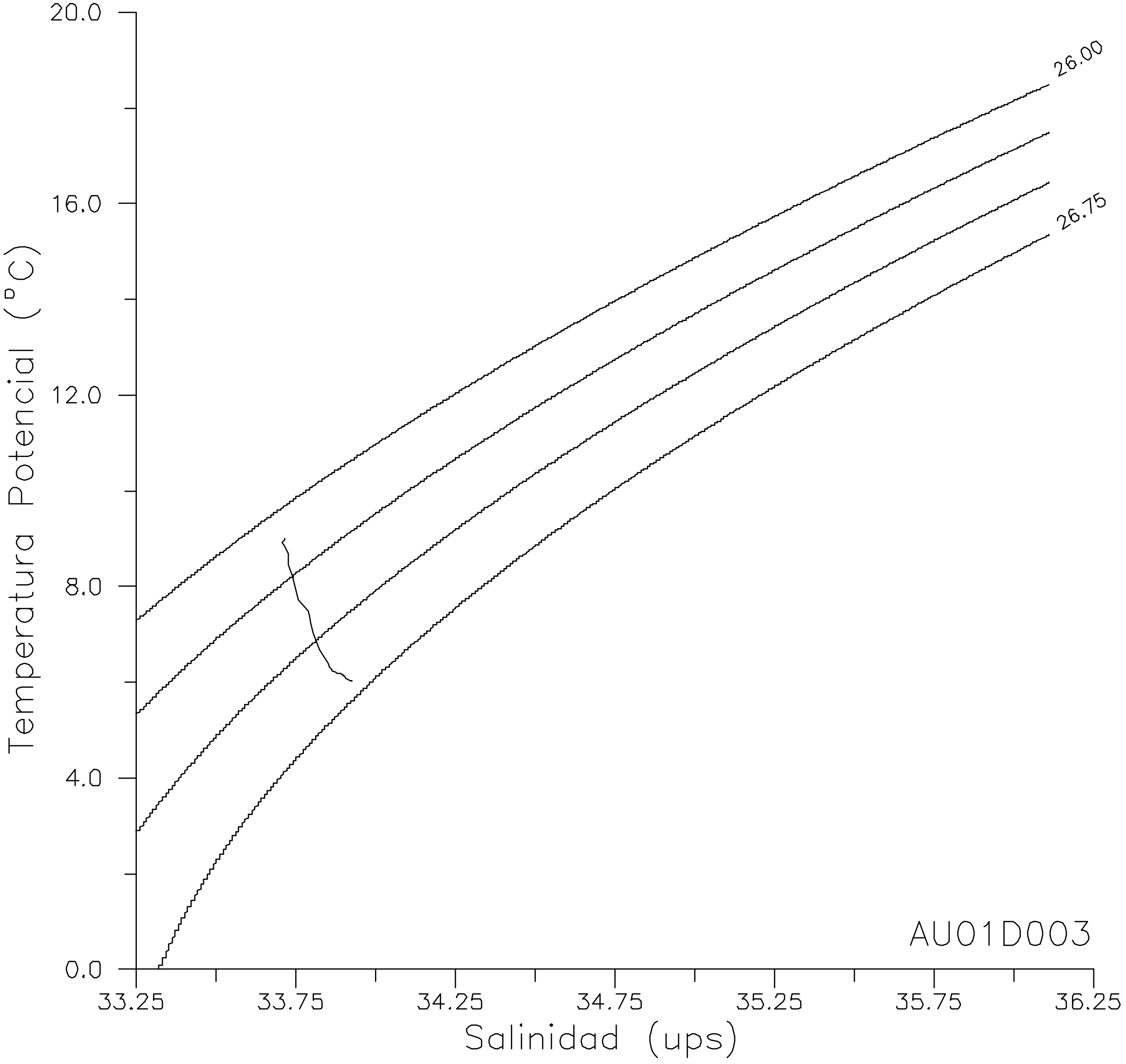

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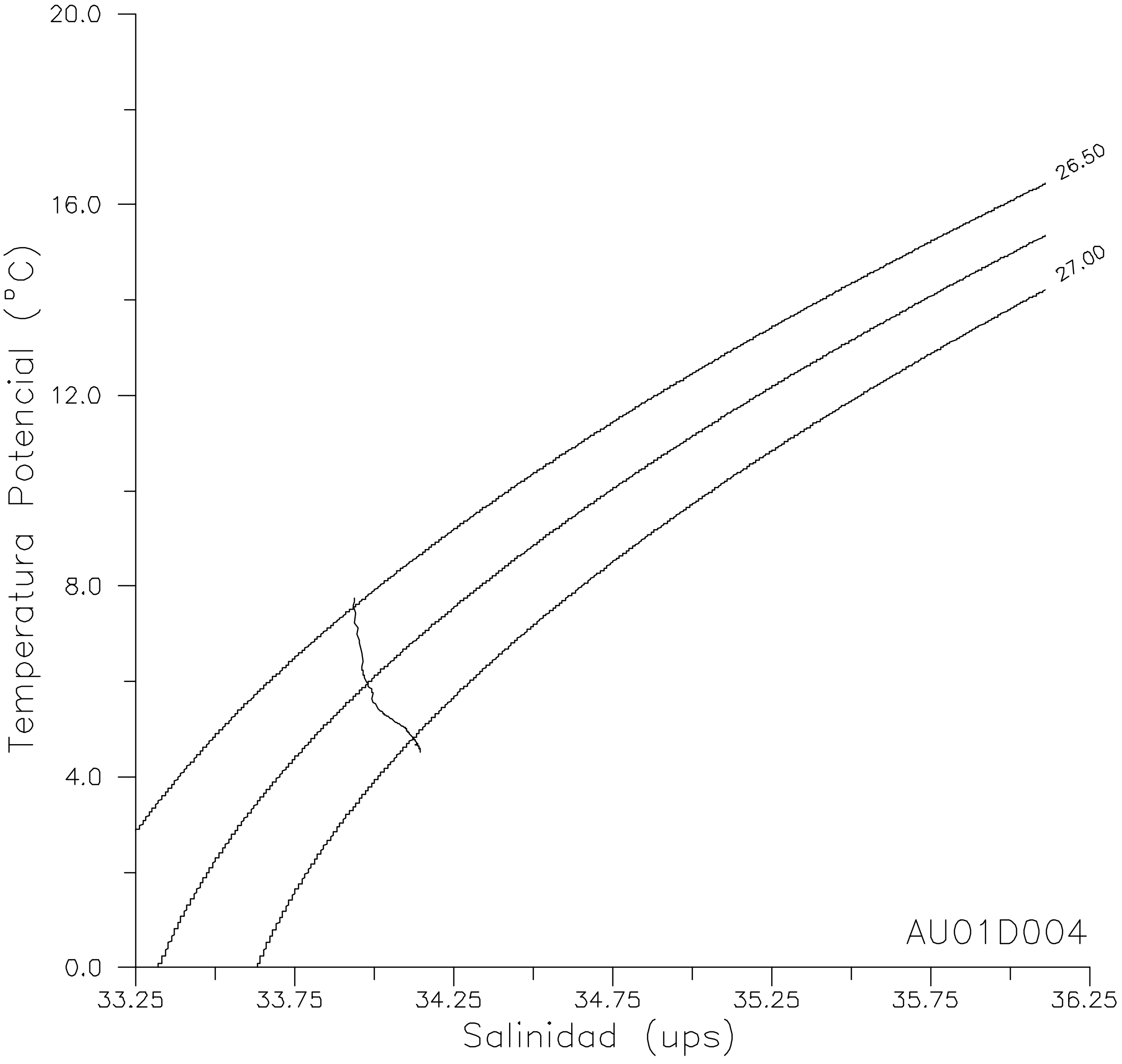

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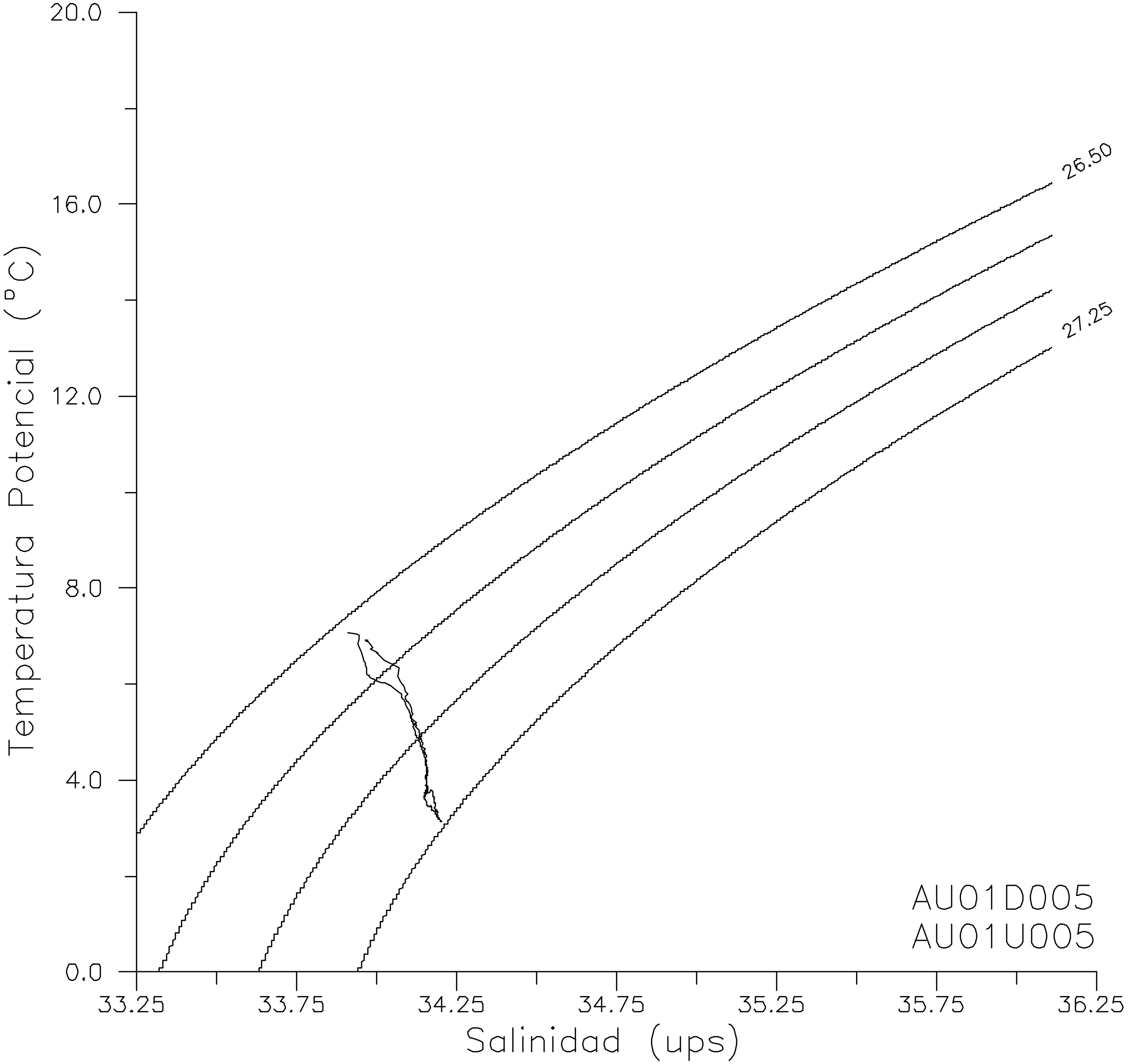

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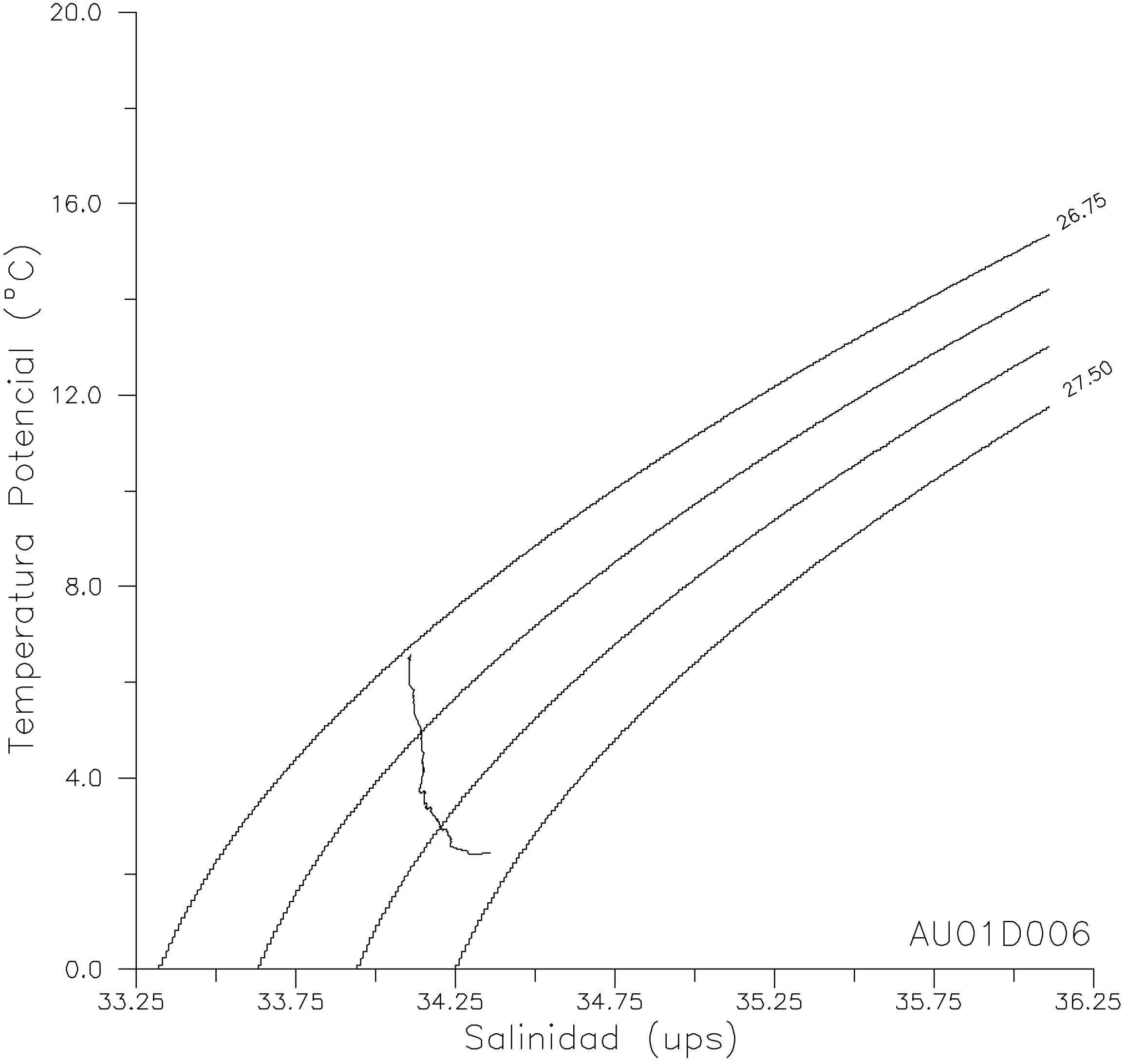

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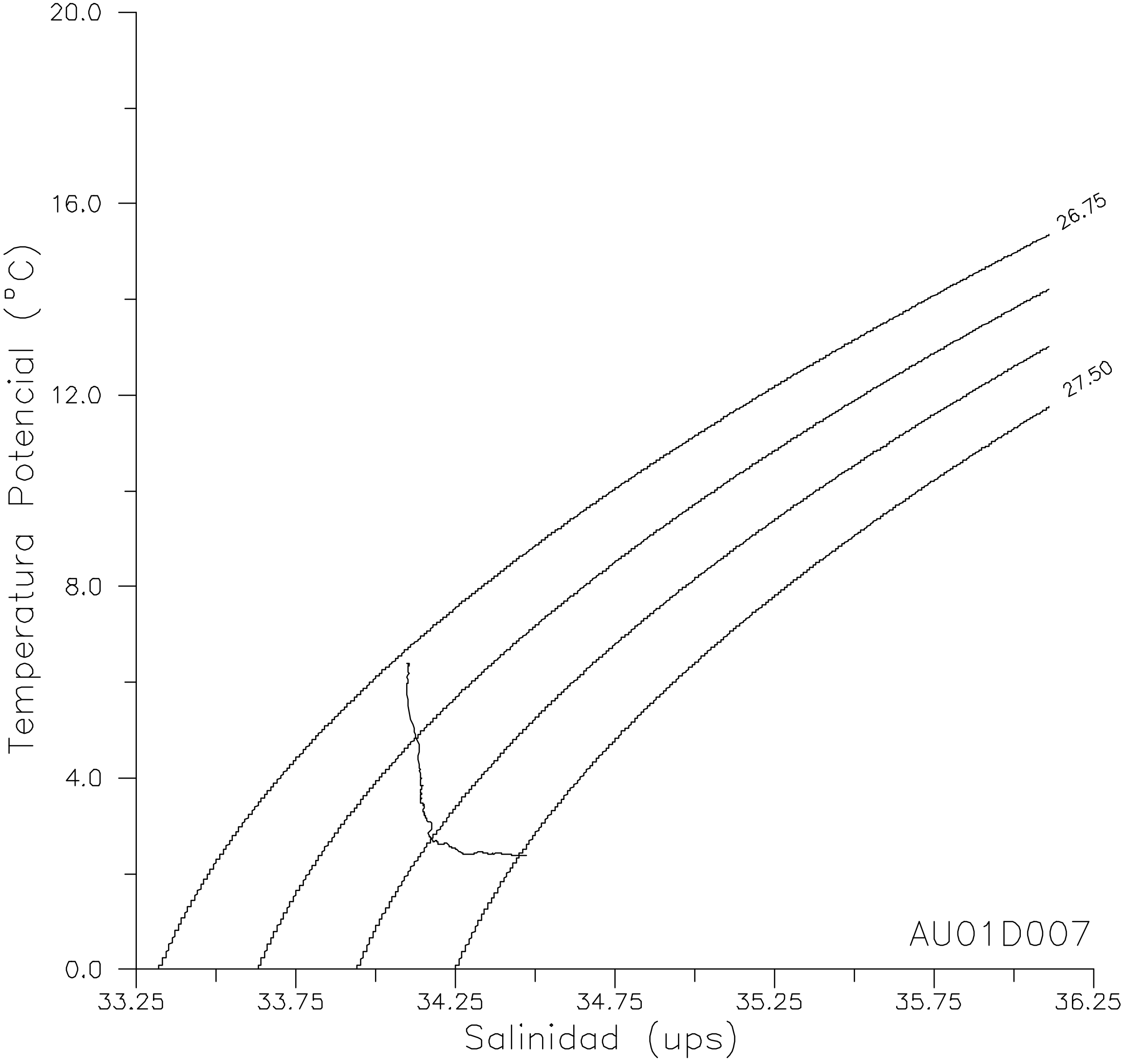

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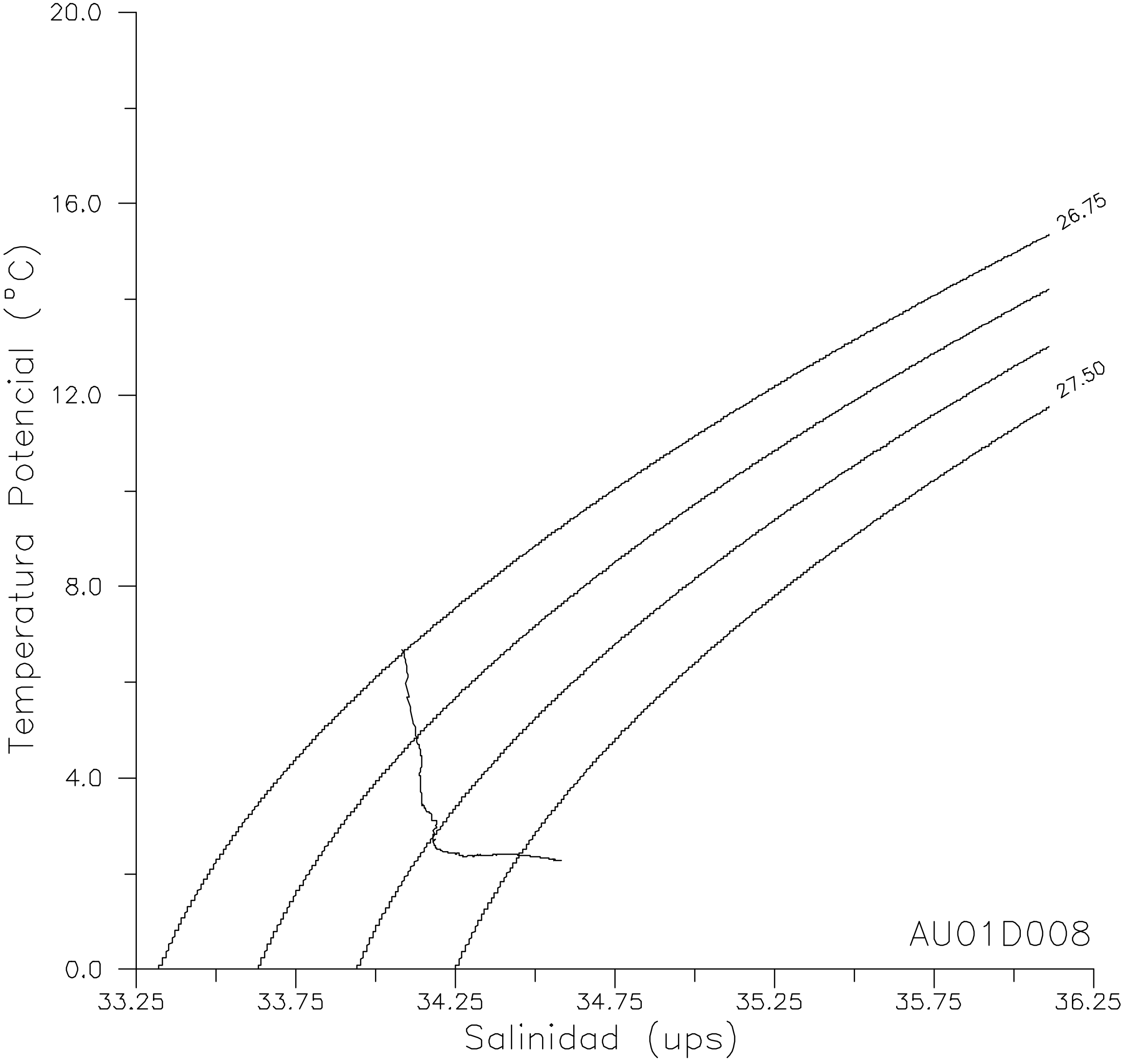

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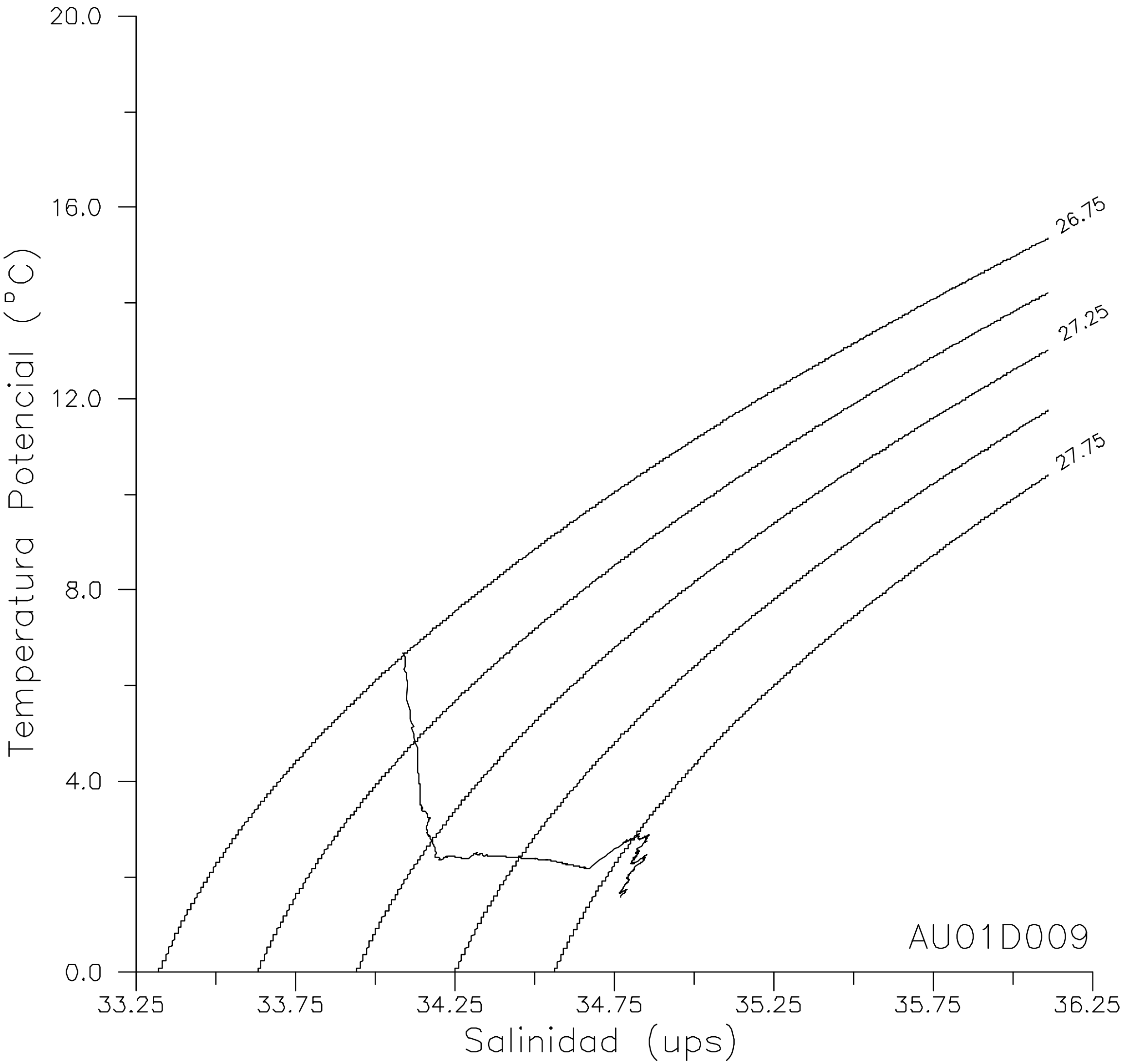

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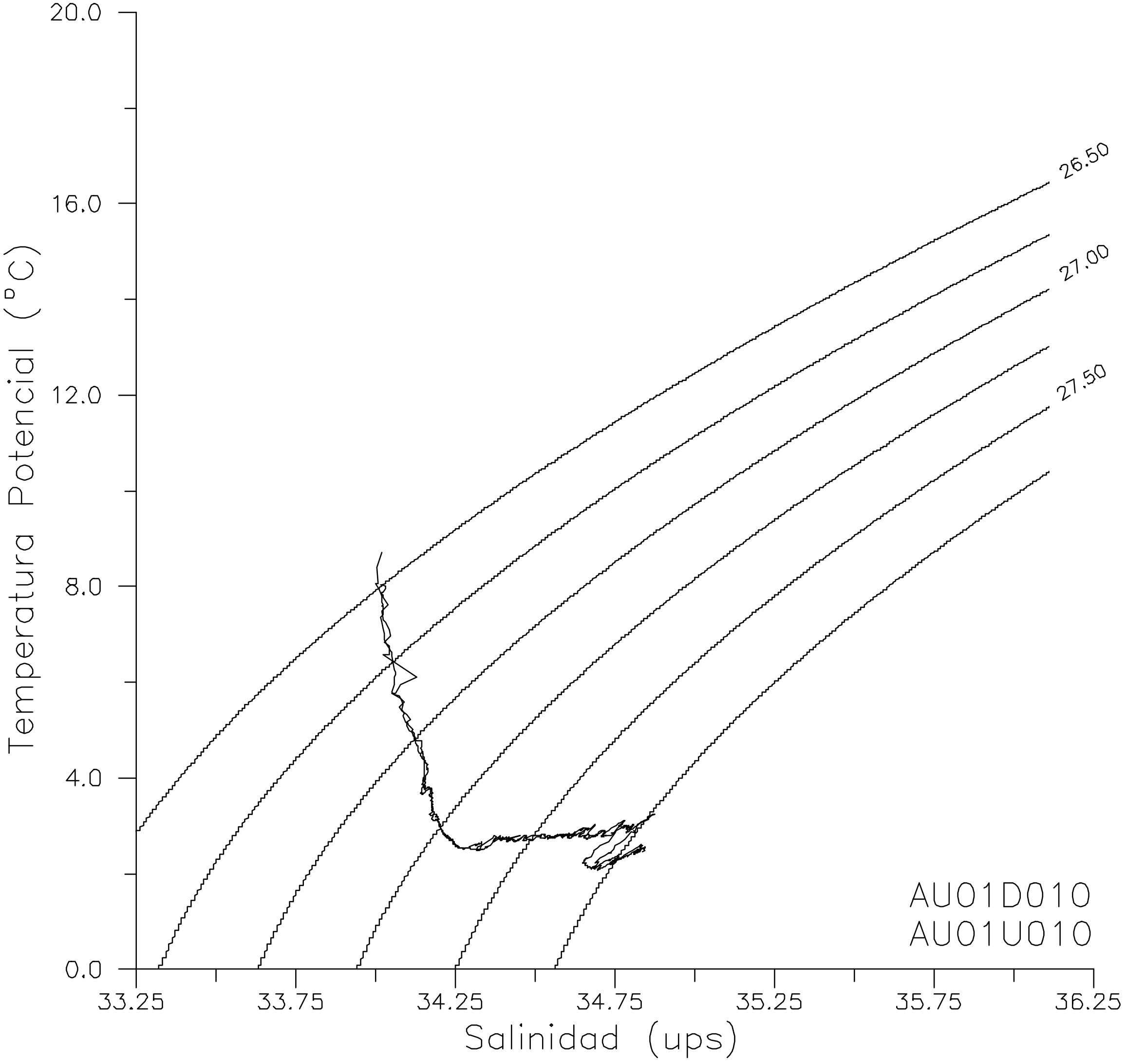

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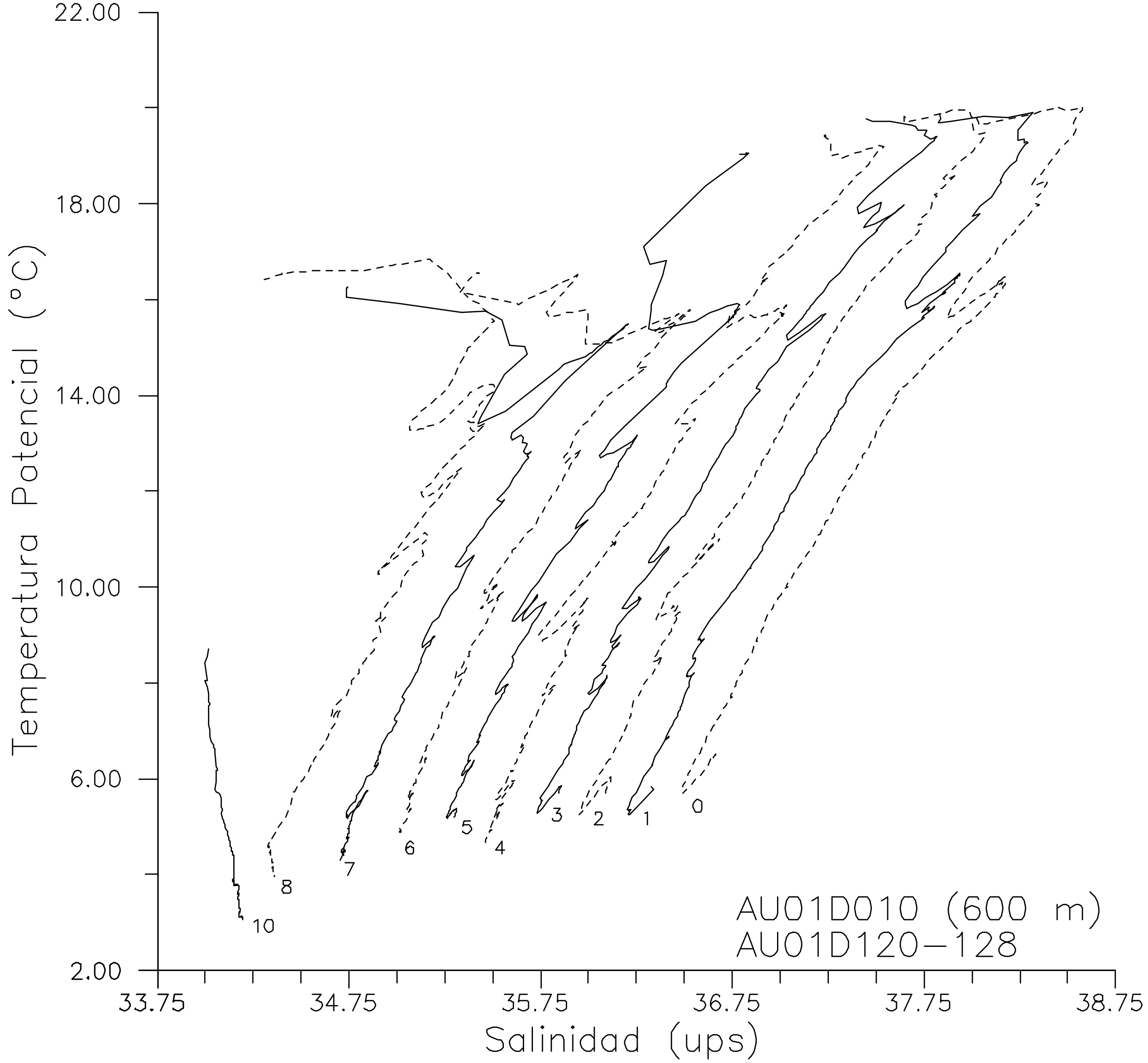

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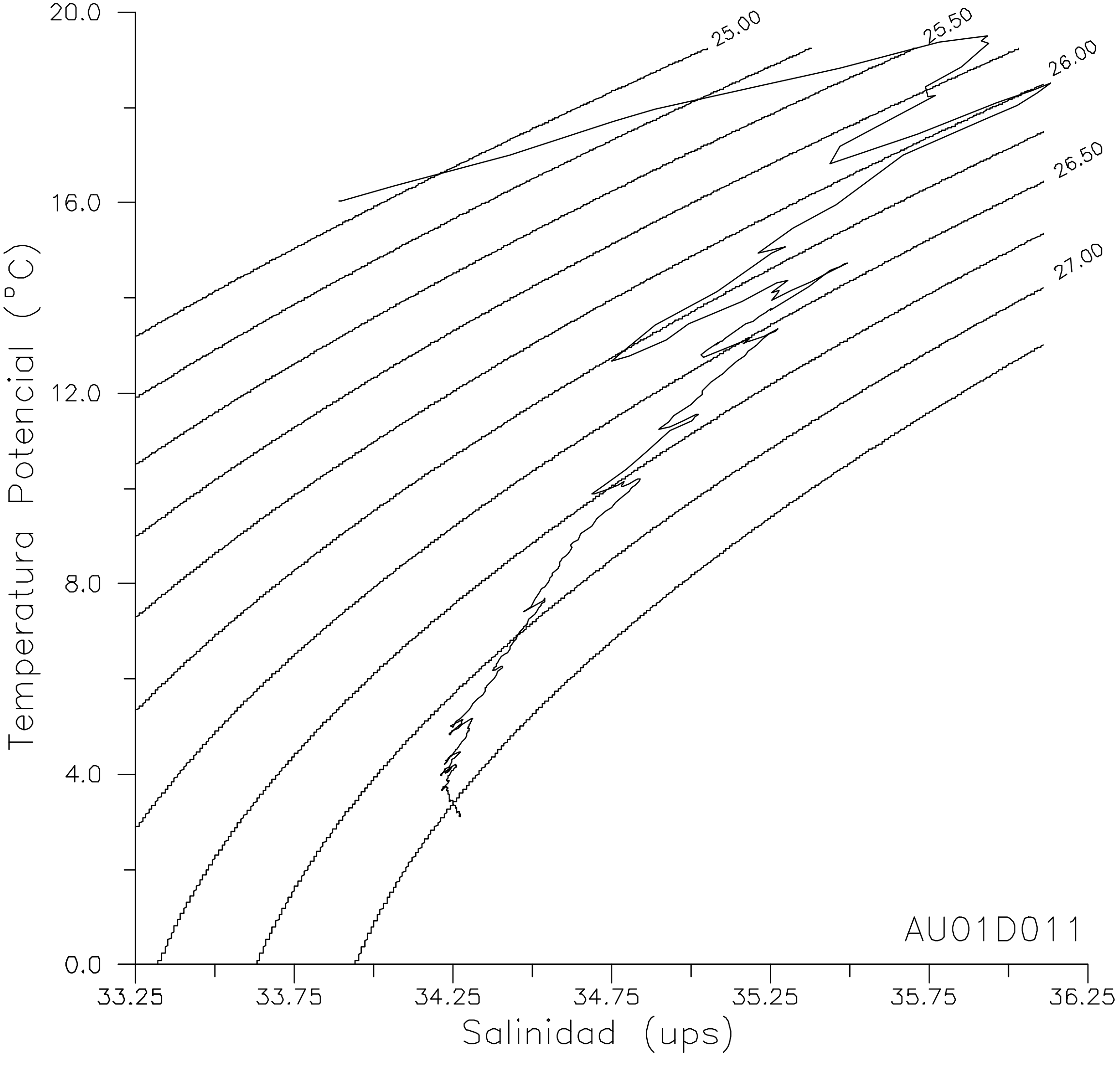

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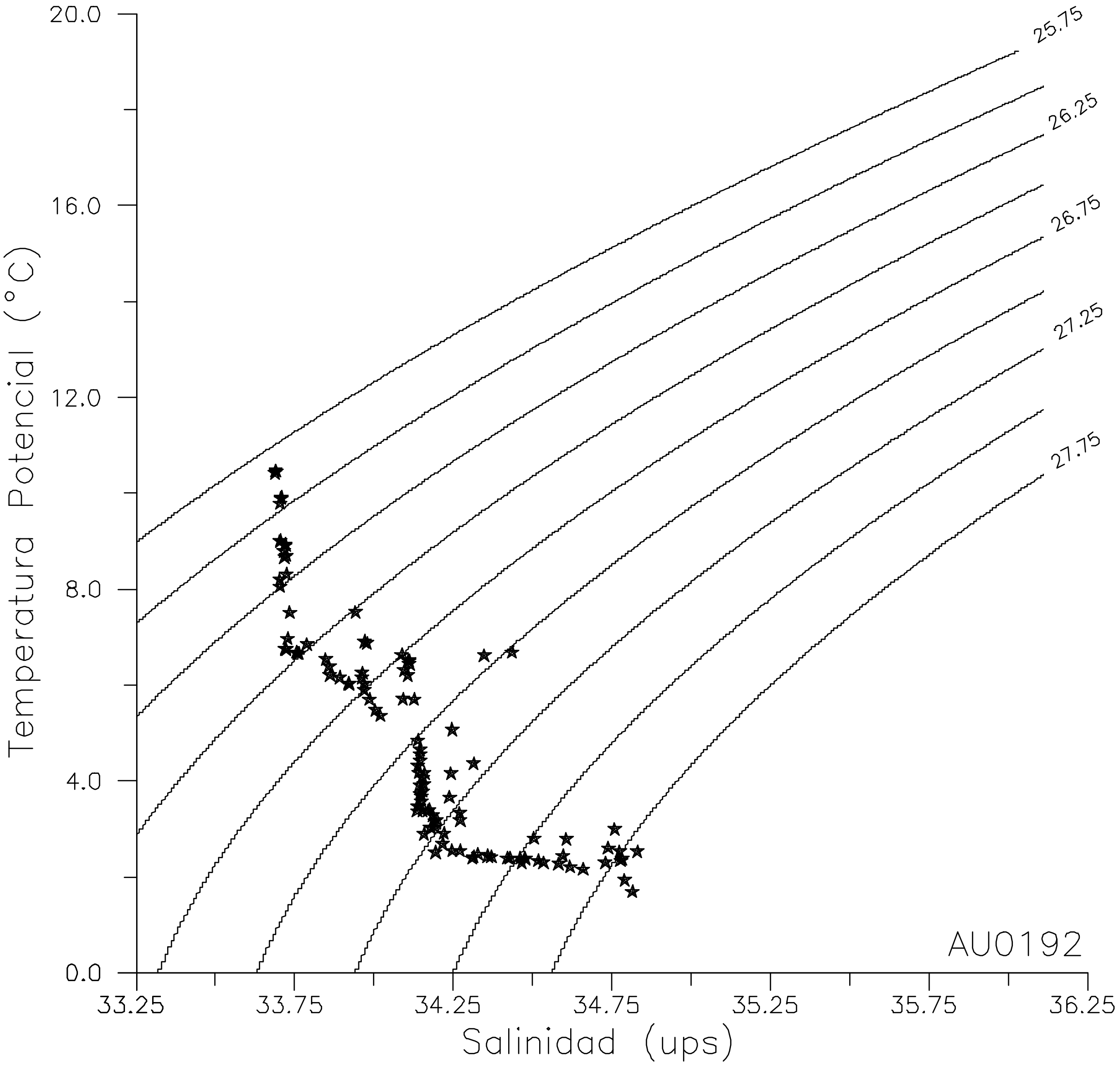

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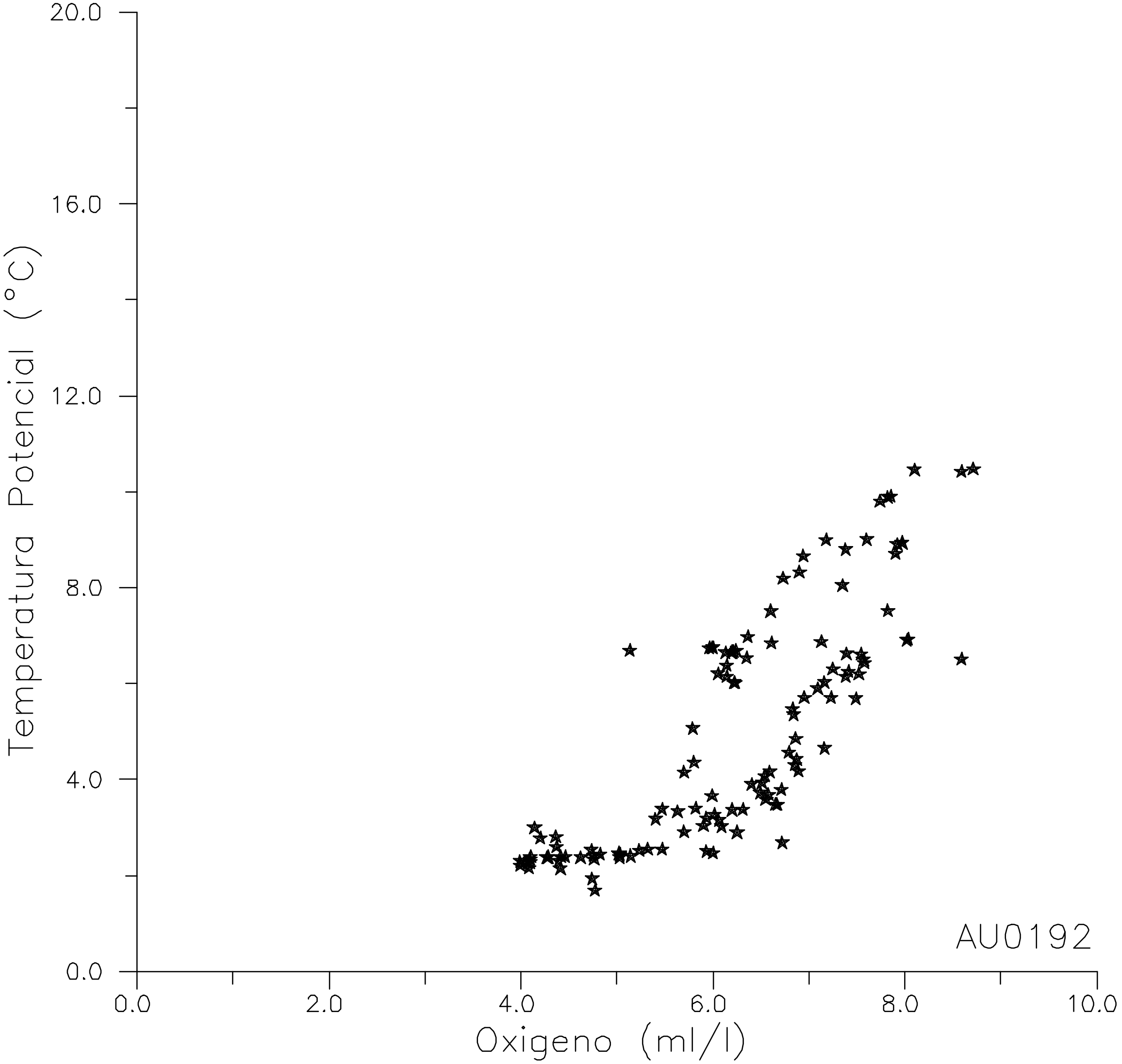

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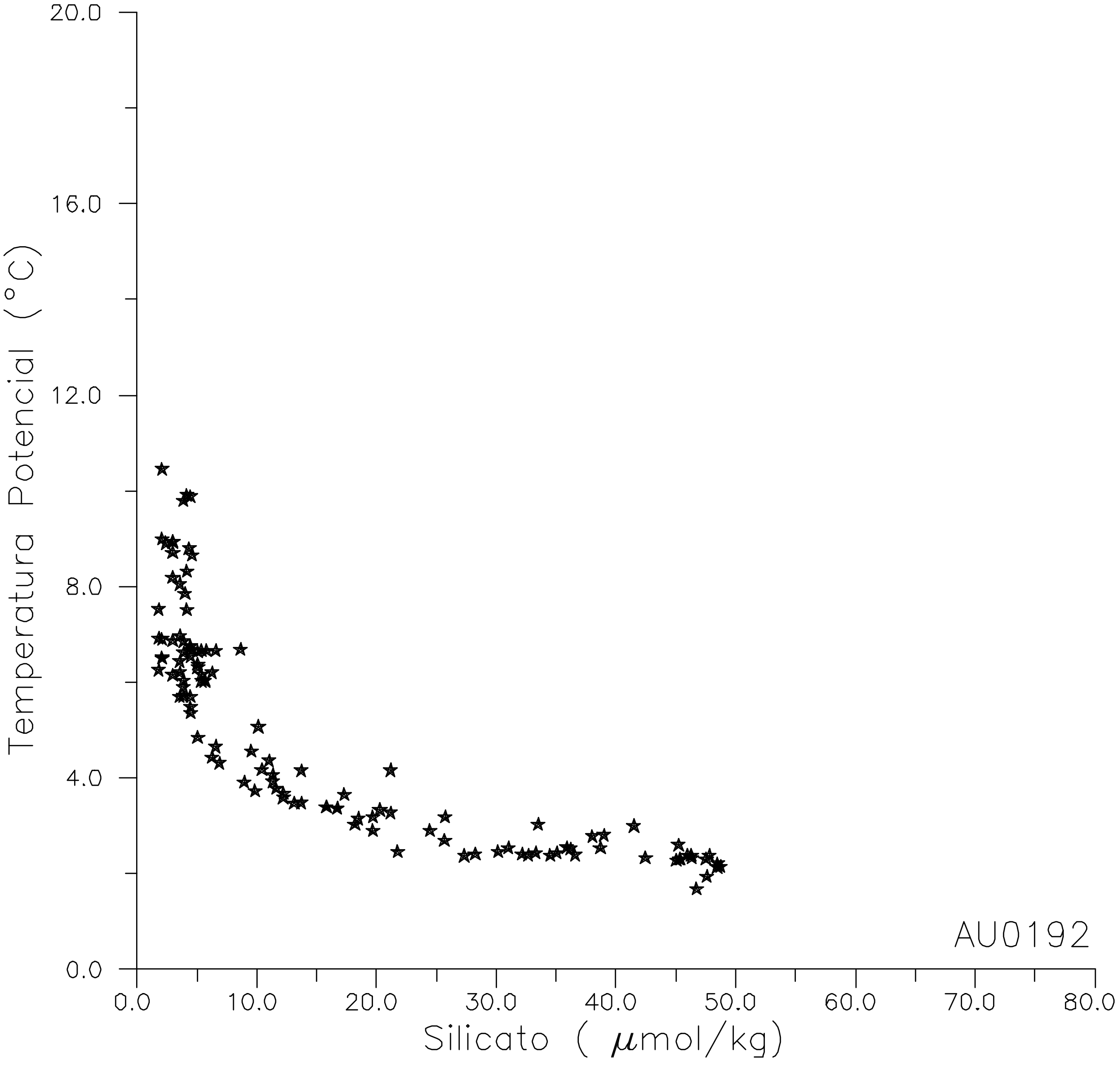

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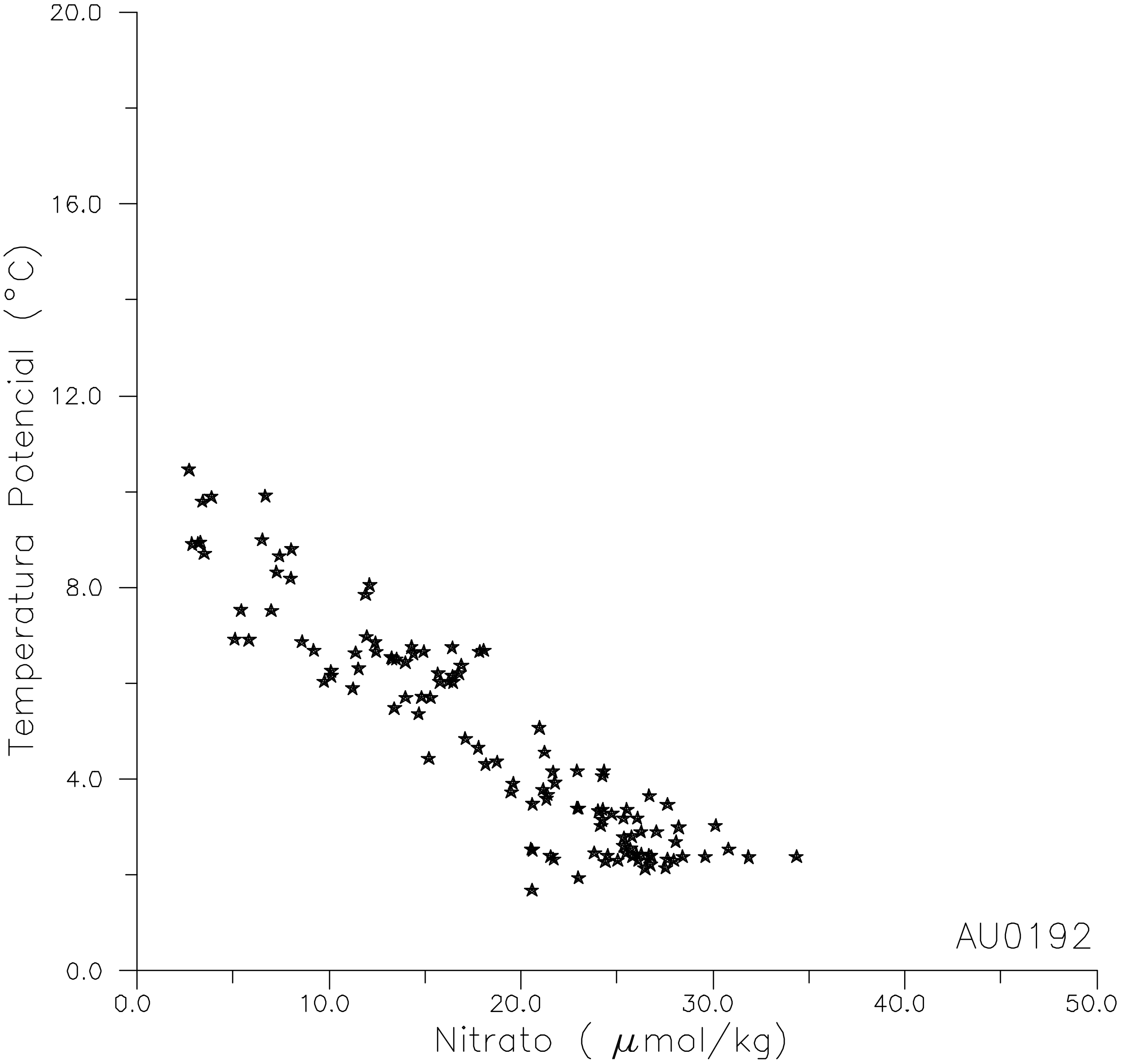

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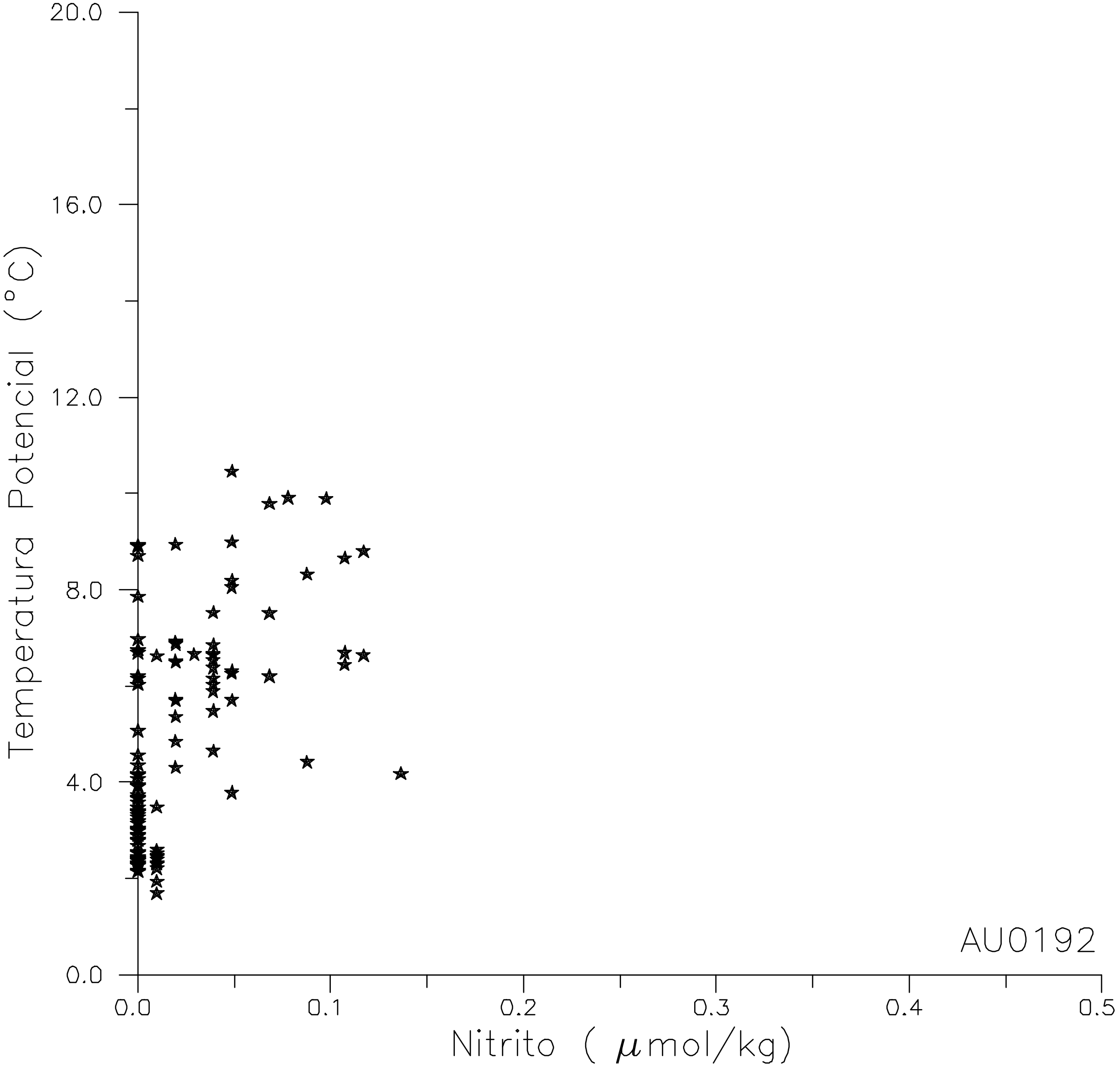

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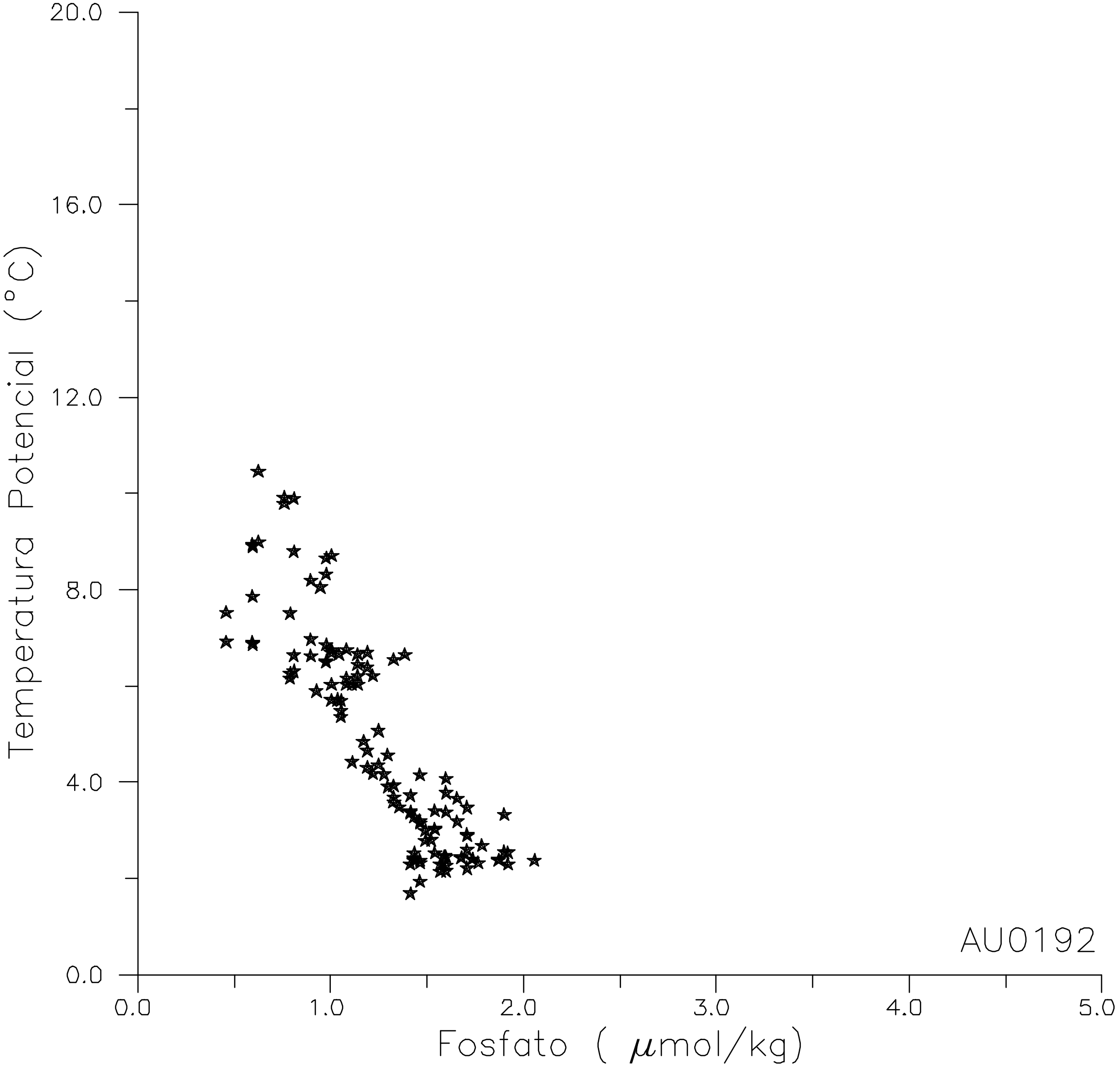

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