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REPORT AND PRELIMINARY RESULTS OF POSEIDON CRUISE 360, LAS PALMAS (SPAIN) – LAS PALMAS (SPAIN) Oct. 29th – Nov. 6th, 2007

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Report and preliminary results of R/V POSEIDON Cruise P360, Las Palmas (Spain) - Las Palmas (Spain), Oct. 29th - Nov. 6th, 2007.

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1. Participants

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Klar, Steffen	Technician	MARUM
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Villagarcía, Marimar	Marine Chemistry	ICCM

DEVELOGIC: Company for hydroacoustics
ICCM: Instituto Canario de Ciencias Marinas
MARUM: Marum, Center for Environmental Research, Univ. Bremen
OPTIMARE: Company for marine sensors

2. Research Objectives

One of the most important upwelling systems in the world is situated in the area of the NW african coast. Due to the high amounts of Sahara dust influencing the transport of nutrients into and their concentration in the ocean, the area plays a major role for the particle production in the ocean and influences the processes of the biological carbon pump system. Despite the main driving force for climatic variability located in the North Atlantic, the upwelling area off NW-Africa is suitable to reconstruct the past climatic variability by monitoring present in-situ environmental changes and variations.

The research topics carried out were in correlation with the project MERSEA (**M**arine **E**nvi**R**onment and **S**ecurity for the **E**uropean **A**rea – Integrated Project). The main aim of MERSEA is the data management and processing to take aim to the needs of scientific end-users.

The participating institutions during R/V POSEIDON cruise 360, MARUM/University of Bremen and ICCM, are involved in work package 3. They will ensure the availability of real time and delayed-mode and regional in-situ data and products in the form required by the MERSEA modelling, data assimilation and validation systems. The activities are partly research and development, innovation, and partly demonstration. The served research sites, continued from the preceding ANIMATE and DOLAN projects, are DOLAN/ESTOC, Canary Islands; PAP, Porcupine Abyssal Plain; CIS, Central Irminger Sea. The main task during the POS 344-2 cruise will be the work on the DOLAN site. The DOLAN station is located 25 nm west of ESTOC and comprises technical devices for transmission of scientific data sets via satellite into the research institutes which collect the data in a database and make them available in the internet.

3. Narrative

R/V POSEIDON left Las Palmas in the afternoon of Oct 29th, 2007 and steamed to the ESTOC position (Fig. 1). At arrival the ESTOC monthly monitoring work was done (2 CTD casts). After finishing the CTD work four NOAA drifters have been released at the location. Overnight RV “Poseidon” steamed to the westerly situated DOLAN buoy position.

The next morning (Oct. 30th, 2008) the recovery of the buoy mooring started. Due to the fact that the mooring cables breaked at 100m water depth the buoy was drifted away some weeks after deployment. It was catched and brought to the ICCM for maintenance. The residual rest of the mooring has been successfully recovered until noon. Afterwards the work was continued with the deployment of short-time acoustic mooring for testing purposes of acoustic modems. Overnight RV “Poseidon” steamed to the beginning of a planned CTD transect starting southwest of the DOLAN position.

On Oct. 31st, 2008 the CTD transect should start. Due to technical problems the CTD/Rosette could not be used. Instead a transect of XBTs and XCTDs started until noon of the following day (Nov. 1st, 2008). This work was followed by four CTD stations and several XBT/XCTD stations until Nov. 4th, 2008, 0:00h.

The following morning of Nov.4th, 2008 the recovery of the acoustic short-time mooring at the DOLAN position had been accomplished. In the afternoon the maintained buoy mooring had been deployed with an installed dummy buoyancy in the surface position. In the late afternoon a CTD cast followed which is necessary as pre-calibration for the Microcat CTDs of the buoy mooring.

Nov. 5th, 2008 started with the successful exchange of the dummy buoyancy against the buoy and the installed sensors. Afterwards a mooring was deployed close to the buoy's position containing an acoustic modem. It was planned to use this mooring for a test with a half year duration to transmit data acoustically from the bottom to the buoy and relay it via satellite.
In the early afternoon the scientific work was finished and RV "Poseidon" steamed towards Las Palmas where it arrived the next morning.

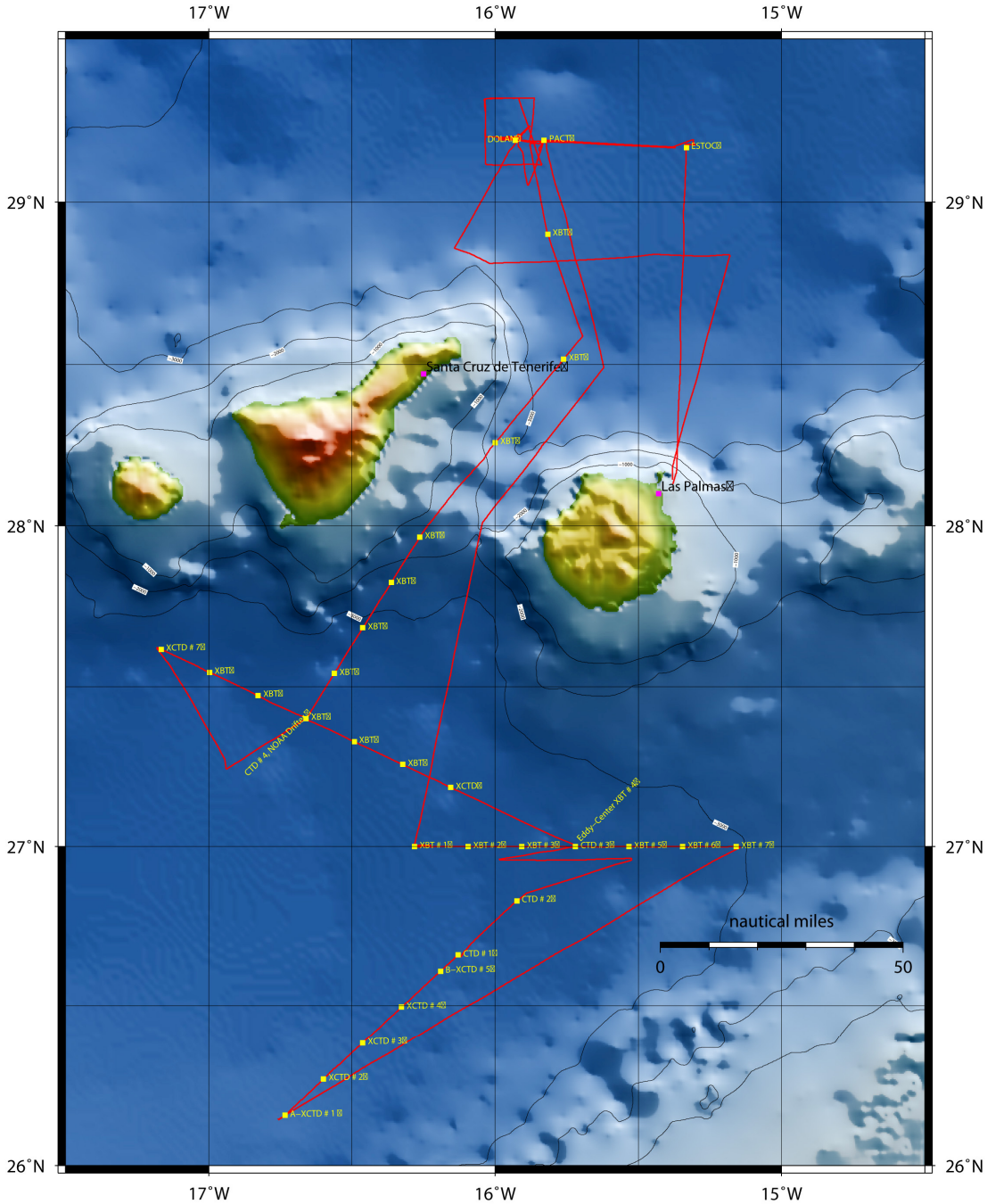

Fig. 1: Course plot and stations of the Poseidon cruise Pos-360.

4. Equipment Development and Tests

4.1 DOLAN Surface Buoy (SBU)

The Surface Buoy Unit (SBU) operates since 1997 and was formerly part of the DOMEST project. The unit can carry several meteorological sensors, satellite telemetry links and sub sea telemetry links like ORCA acoustic modem and now a cable telemetry down to 100m.
The DOLAN SBU unit with the upper 100m of the mooring was broken in April 2007. The buoy and all sensors have been recovered by the Spanish Coast Guard some days later.
The buoy and the sensors were refurbished during the first days of the POS-360 cruise. All sensors, the telemetry and the power supply were working well after.
The rest of the DOLAN mooring was completely recovered on the Oct. 30th, 2007.
The last routine maintenance has been carried out during R/V Sybilla S. Merian cruise MSM04-4b in March 2007.
The redeployment of the whole DOLAN SBU mooring took place on the November 5th , 8 days later.
There were no major damages visible on the buoy, all antennas, solar panels and cables on deck were in a good shape.

Status of the DOLAN Buoy before maintenance

The visual inspection of the buoy's body shows cracks and damages at 8 different locations. The visible damage has been repaired. Some more serious repairs can be expected for the next cruises.
- The wind sensor and the compass were working fine during the tests.
- The air pressure sensor has been working well all the time and the data was in the online telemetry during the whole past mooring period. This sensor has not been replaced.
- The weather sensors with relative humidity and air temperature were working well.
- The DOLIX GPS including antenna was working well.

The maintenance of the buoy electronics shows that the buoy was in a good shape. Both, 12V and 24V power supply were working well.

OFFLINE data retrieval

All data which has been sent via Iridium telemetry and all the offline data have been stored in the buoy. All the data has been read out successfully after recovery.
The data was sent to the responsible project partners (NOC / IFM-GEOMAR).
The online data is also available in an MySQL database.

The calibration for the Microcats took place at November 4th, 2007.
All the data has been downloaded successfully and sent to the responsible partners.

Overview on the installed sensors / telemetry since November 2007

A Fluorometer has not been received for this cruise. The 100m sensor pack contains a nutrient analyser and a Microcat.

Table 1: Status list of used sensors on the SBU.

Sensor	Telemetry	Status
Vaisala PTU200 - air temperature - relative humidity - barometric pressure	ORBCOMM	ONLINE
Vaisala WS245 - windspeed - winddirection	IRIDIUM	ONLINE
TCM2 - buoy heading - pitch and roll for the buoy	Working, delivers data for wind speed calculation	(indirect ONLINE)
Thrane & Thrane - GPS	INMARSAT	Not installed because of interference with Iridium telemetry
Microcat @0.5m	ORBCOMM	ONLINE
Microcat @10m	Not in telemetry	OFFLINE
Microcat @100m	Not in telemetry	OFFLINE
Fluorometer	Not in telemetry	OFFLINE
Nutrient Analyser NAS-3E	Not in telemetry	OFFLINE
DOLIX GPS	IRIDIUM	ONLINE
Orbcomm GPS	ORBCOMM	ONLINE

Results of the tests before and after deployment

All tested sensors and systems were working well during the tests prior to the deployment.

The tests after the deployment were successful as well. We performed a successful login on the DOLIX computer via Iridium from Bremen and restarted the system after a check.

DOLAN configuration November 2007

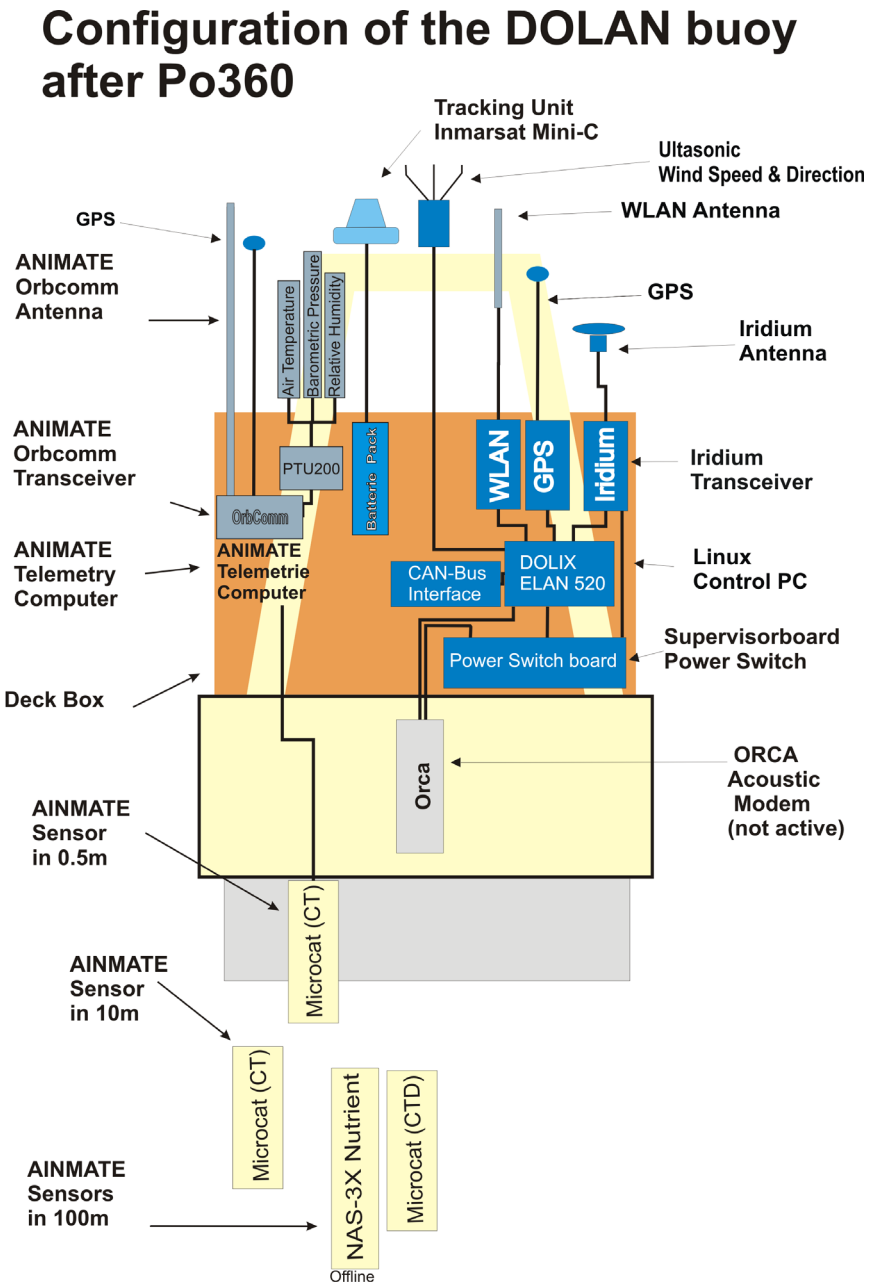

Fig. 2: Configuration of the DOLAN SBU after cruise POS-360.

The redeployment of the mooring took place at Nov. 5th, 2007.
Tests of all sensors on the DOLIX took place after the deployment of the DOLAN buoy.
All sensors like windspeed, Microcat DOLIX GPS were working fine.
These tests have been performed via the WLAN link on the buoy.
The test of the maximum range of the WLAN link shows that a very stable communication with a signal level of -74dBi was possible at a distance of 500m. Also the internal Laptop WLAN cards could be used for this distance. The maximum distance where a communication was not longer reliable was 1km with a signal level of -90dBi. A high rate of lost packets makes a telnet connection instable at this distance.
The tests shows that WLAN at a distance of 500m is a very useful and reliable Link for communication with the buoy. This distance was also accepted by the ships crew in terms of a safety distance.

Status of the tasks from the MSM04-4b cruise

- Redeployment of the upper mooring and the sensors
  Status: deployed
- Test of all sensors on the buoy
  Status: all tests were successful
- Test of the Orbcomm and Iridium Telemetry
  Status: All Satellite links are operational

Tasks for the next cruise

- Recovery of the whole DOLAN mooring / End of the project

4.2 PACT System trials

During the cruise, two trials for testing PACT (Pressure acoustically coupled Tsunameter) units were conducted.

The first short trial focused on testing acoustic data transmission between bottom and surface unit and switching between different operating modes of the bottom unit. During this test, one subsurface mooring with the bottom PACT unit at around 3800m and the surface modem at approx. 500m depth was deployed.

The mooring was recovered after 5 days. Evaluation of logged data showed that reliable communication between bottom and surface unit was established. Altogether 393 messages with bottom pressure and status data were received from the surface unit - 2 messages were lost. In the diagram (Fig. 3), each point marks a transmitted message.

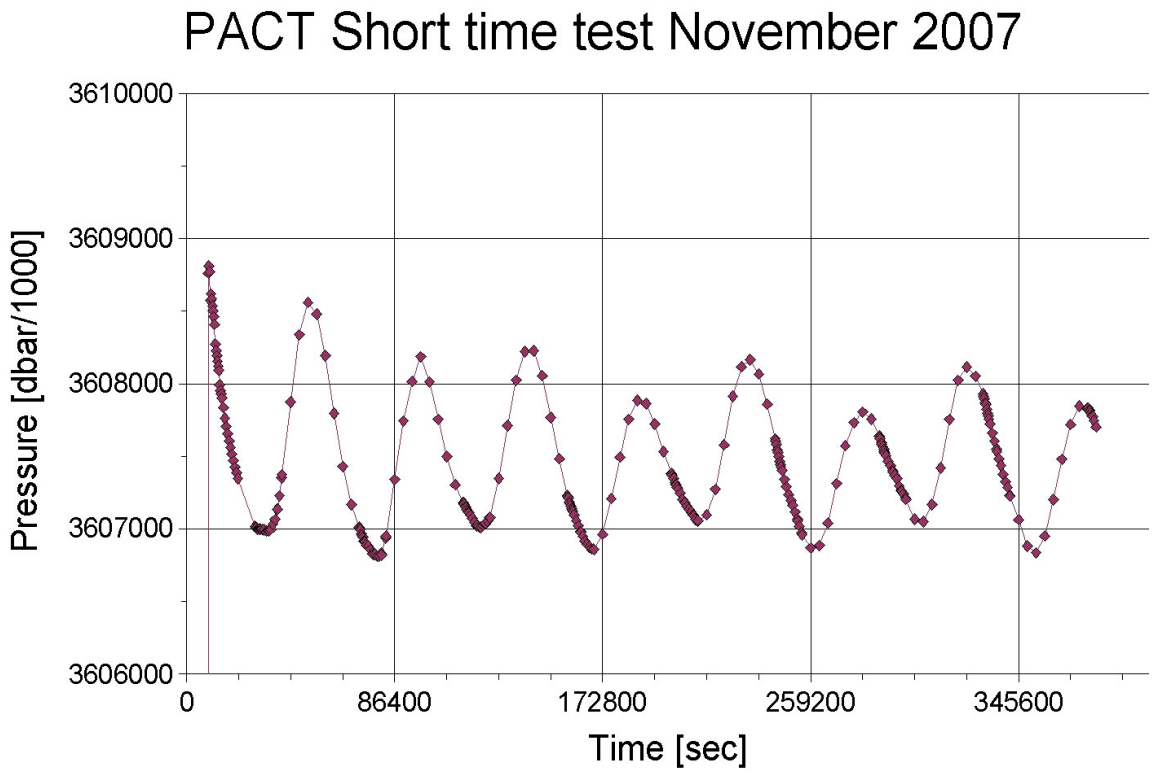

Fig. 3: Pressure measurements against the time show the pressure cycles influenced by the tides.

The second trial targeted the long term testing of those units. Again the bottom unit was deployed in a separated mooring at approx 1nm distance from the DOLAN surface buoy in 3330m waterdepth.

The HAM.Node receiver modem was mounted to the DOLAN buoy mooring in 12m depth and connected to an IRIDIUM satellite transceiver residing on top of the buoy. Data received from the PACT bottom unit is relayed to the AWI/Bremerhaven via the satellite link.

The satellite link also provides basic diagnostic functionality (like pinging the bottom unit, information about battery status ...)

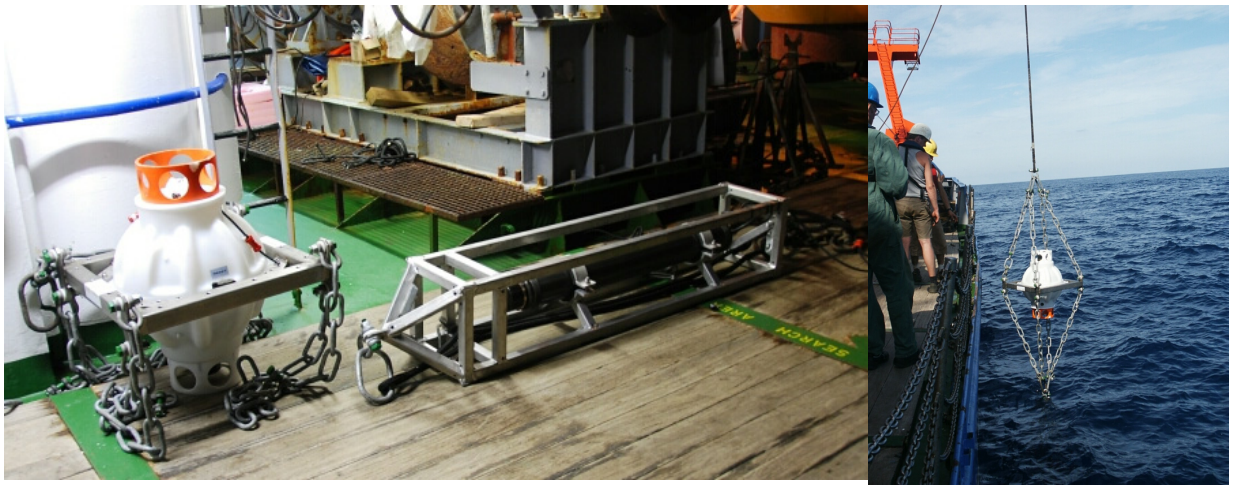

Fig. 4: PACT modems in mooring frames and while deploying the test mooring.

5. Marine Chemistry

5.1 Objectives and scientific questions

Along P360 the ANIMATE/ ESTOC mooring that stayed in the water was recovered and redeployed again complete according to the requirements of the MERSEA project of mooring exchange. It had been put in place in March 2007 during cruise MSM04/4, but in May part of the mooring broke and went adrift towards the southwest until it could be rescued and took it to the ICCM. Therefore some sensors were only in the water for two months, including the nitrate sensor #2400. The ICCM provide a complete refurbished nitrate sensor (#2625) to deploy it in the mooring during this cruise.

At the same time it was necessary to do the biogeochemical monthly samplings at the ESTOC station (**E**uropean **S**tation for **T**ime series in the **O**cean **C**anary islands), that it has been continuously done since 1994. A calibration casts with CTD and microcats was also made to accomplish the requirements of the sensors being deployed.

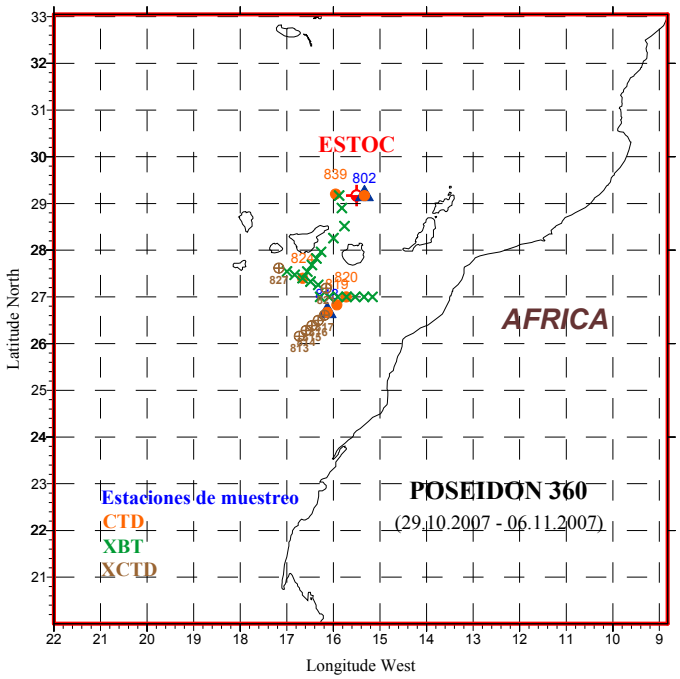

Fig. 5: Position of the the different stations (CTD+ Rosette, CTD only, XBT and XCTD) made along Poseidon Pos-360.

Along this cruise it was intended to work within some eddies usually located at the south of the Canary Islands, as part of a joint project between the Physics Dptm. of the University of Las Palmas and the ICCM. Previous to the cruise, several satellite images (MODIS, see Fig. 6) have shown some possible eddies that were adequate to sample in time and space along the cruise. It was intended to characterize their physical and chemical characteristics by means of the CTD/rosette and XBTs and XCTDs probes, depending on the time availability. However, the rosette failed after two stations (only ESTOC and station #818) because water entered into the electronic system;

hence, the eddies could only be physically characterized by means of the CTD mounted in the rosette which it was still working, and by XCTDs and XBTs otherwise (Fig. 5).

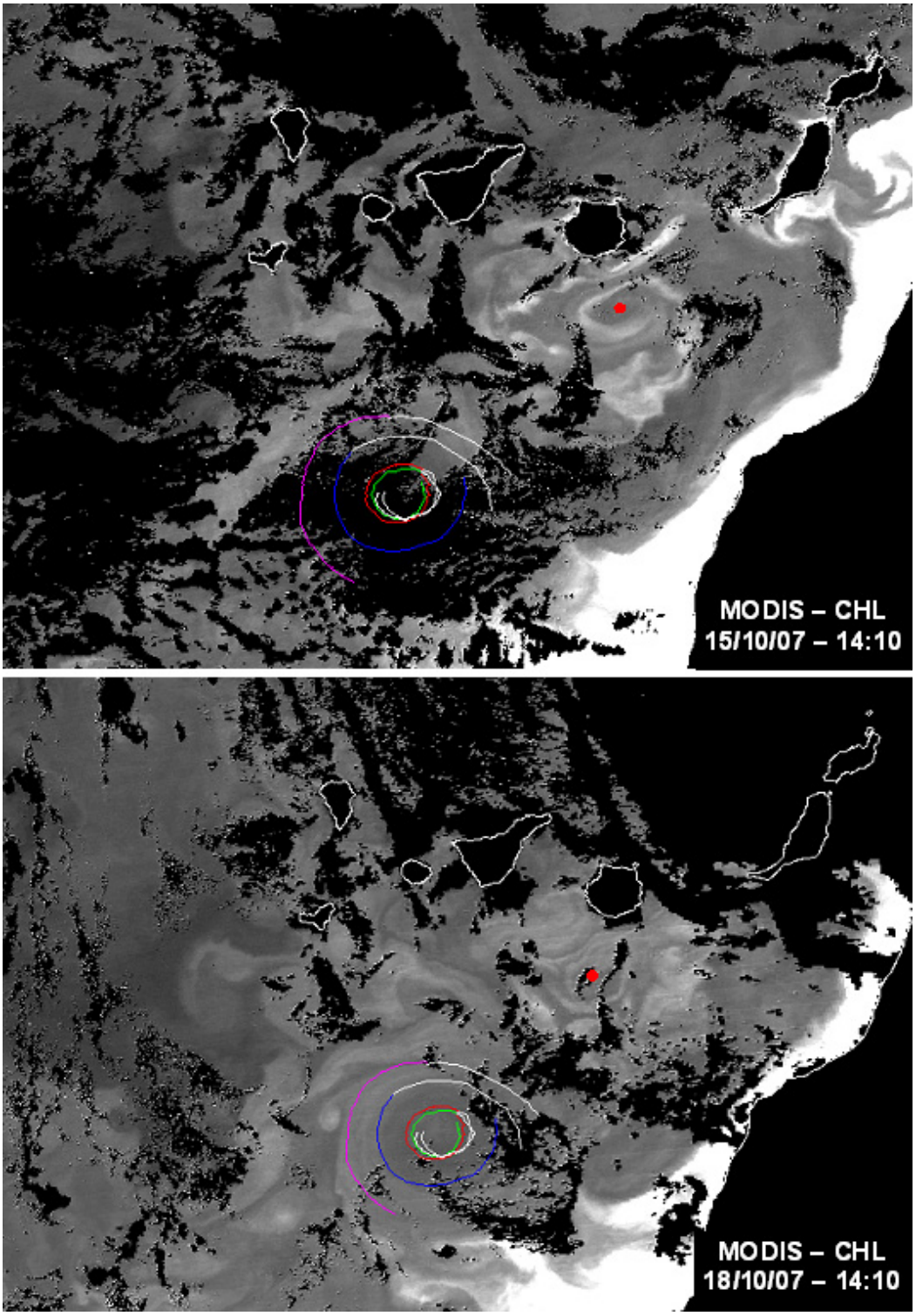

Fig. 6: MODIS images previous to the cruise taken 15th and 18th October 2007. Sea surface temperature is shown in the upper part and chlorophyll in the lower one. The colour lines show some drifters in an eddy. The red dot appears where it was intended to sample along the cruise because other eddy (cyclonic) was arriving to that site.

Further XBTs were deployed in the passage between Tenerife and Gran Canaria Islands, taking advantage of the ship going north to redeploy the mooring; the main objective was to track the

presence of the Antarctic Intermediate Water (AAIW). There is a great controversy whether the AAIW presence will seasonally change and to which extent in the north of the archipelago, due to the circulation through the passages between the different islands.

5.2. Data

At the beginning of the cruise the ESTOC station monthly sampling took place (st. 802, 2 profiles, sampled to the bottom), including the release of 4 NOAA drifters. Then the DOLAN/ MERSEA part of the mooring was recovered. Then at a latitude of 27º00'N, it was done a diameter transect of XBTs trying to identify the changes and looking for eddies. According to the last position given by the receiving images provided by the land team and further south, another station with two casts of CTD/rosette (#818, to 200m and 2000m) were sampled to start the eddy physical/chemical identification. Unfortunately, the rosette stop working and therefore, a transect with XCTDs was done to try to characterize the eddy at least from the physical point of view; this sampling ended by doing a CTD station and a NOAA drifter deployment.

Table 2: List of stations sampled along the cruise P360, Las Palmas-Las Palmas (0=oxygen, N=nutrients, S=salinity, C=chlorophyll "a", Ca = Carbon system, Inc= Incidences) .

Date Time (hh:m	St. #, CTD, Cast	Depth sta, m	Lat. N	Long. W	Depth Ro,db	Nisk bot.	Depth samp,db	PARAMETERS O	N	S	C	Ca		Inc
29.10. 2007	802, Cast 1	3615	29º10,01'	15º 19,97'	800			Station ESTOC, October 2007 Alkalinity (only this station)						
						1	800	√	√	√		√		
						2	600	√	√	√		√		
						3	400	√	√	√		√		
						4	300	√	√	√		√		
						5	200	√	√	√	√	√		
						6	150	√	√	√	√	√		
						7	125	√	√	√	√	√		
						8	100	√	√	√	√	√		
						9	75	√	√	√	√	√		
						10	50	√	√	√	√	√		
						11	25	√	√	√	√	√		
						12	10	√	√	√	√	√		
29.10. 2007	802, Cast 2	3615	29º10,01'	15º 19,97'	3500			Station ESTOC, October 2007 Alkalinity (only this station)						
						1	3500	√	√	√		√		
						2	3000	√	√	√		√		
						3	2800	√	√	√		√		
						4	2500	√	√	√		√		
						5	2000	√	√	√		√		
						6	1800	√	√	√		√		
						7	1500	√	√	√		√		
						8	1300	√	√	√		√		
						9	1200	√	√	√		√		
						10	1100	√	√	√		√		
						11	1000	√	√	√		√		

Date Time (hh:m	St. #, CTD, Cast	Depth sta, m	Lat. N	Long. W	Depth Ro,db	Nisk bot.	Depth samp,db	PARAMETERS O	N	S	C	Ca		Inc
						12	0	√	√	√	√	√		
30.10. 2007	803	3615	29º10'	15º20'	0			4 NOAA drifters were launched at the same time, see table for details						
01.11. 2007	818 Cast 1	3473	26º39.60'	16º07.71'	200									
						1	200	√	√		√			
						2	150	Niskin bottle did not close						
						3	125	√	√		√			
						4	100	√	√		√			
						5	75	√	√		√			
						6	50	√	√		√			
						7	50	Water for Carbon group						
						8	25	√	√		√			
						9	10	√	√		√			
						10	10	Water for Carbon group						
						11	10	Water for Carbon group						
						12	0	√	√		√			
01.11. 2007	818 Cast 2	3473	26º39.57'	16º07.92'	2000									
						1	2000	√	√					
						2	1800	√	√					
						3	1500	√	√	√				
						4	1300	√	√					
						5	1200	√	√					
						6	1100	√	√					
						7	1000	√	√					
						8	800	√	√					
						9	600	√	√					
						10	400	√	√					
						11	300	√	√					
						12	200	√	√	√				
01.11. 2007	819	3416	26º49.82'	15º55.52'	200			Rosette fails to close; it is taken on board, dismounted and found out it is full of water. End of Niskin sample, only CTD sample is possible						

Further, our land team found another eddy that we could possibly sampled, and therefore we were asked to try to go there and characterize it. Hence a second section of XBTs was done, ending with an XCTD. Finally, to take advantage of the way back to DOLAN to redeploy the mooring, another XBTs transect took place in the passage between Tenerife and Gran Canaria Islands until DOLAN, where a microcat calibration CTD was done. All the details of the CTD /rosette samplings are found in Tables 1 and 2.

As the rosette failed, other alternatives were found to try the characterisation of the eddies; as the number of XCTDs was not very high, the first strategy was to use them to make a diameter of the first eddy found; following instructions of the land team that was updating the satellite information, other eddy was sampled by means of XBTs. A total of 7 XCTDs and 20 XBTs were launched along the cruise, showing the detailed information in Table 3.

Table 3: Stations sampled during cruise P360, rosette started to fail functioning at station #819.

Cruise	Sta.	Cast	Date mm/dd/yy	Time UTC hh:mm	Type sta	Depth cast Nom.(db)	Latitude (deg&min)	Longitude (deg&min)	Depth col.,db
P360	802	1	10/29/07	22:09	CTD+ Ros.	800	29º 10,01'N	15º 19,97'W	3595
P360	802	2	10/29/07	23:45	CTD+ Ros.	2000	29º 10,61'N	15º 19,97'W	3593
P360	818	1	11/01/07	13:44	CTD+ Ros.	200	26º 39,60'N	16º 07,71'W	3473
P360	818	2	11/01/07	14:38	CTD+ Ros.	2000	26º 39,57'N	16º 07,92'W	3476
P360	819	1	11/01/07	18:19	CTD	200	26º 49,82'N	15º 55,52'W	3416
P360	819	2	11/01/07	20:48	CTD	2000	26º 49,83'N	15º 55,49'W	3415
P360	820	1	11/02/07	9:05	CTD	2000	27º 00,14'N	15º 43,50'W	3426
P360	824	1	11/02/07	18:08	CTD	2000	27º 23,93'N	16º 39,59'W	3567
P360	824	2	11/02/07	19:28	CTD	80	27º 23,86'N	16º 39,49'W	3567
P360	839	1	11/04/07	19:28	CTD	500	29º 12,04'N	15º 57,16'W	3630

Table 4. XBT's and XCTD's launched along P360, the yellow lines to differentiate among the transects made.

Cruise	Sta.	Date mm/dd/yy	Time UTC hh:mm	Type sonde	#	Latitude (deg. + min.)	Longitude (deg. + min.)
P360	806	10/31/07	9:16	XBT/T5	1	27°00,00'N	016°16,95'W
P360	807	10/31/07	10:34	XBT/T5	2	27°00,00'N	016°05,71'W
P360	808	10/31/07	11:56	XBT/T5	3	27°00,00'N	015°54,21'W
P360	809	10/31/07	13:14	XBT/T5	4	27°00,01'N	015°43,10'W
P360	810	10/31/07	14:40	XBT/T5	5	26°59,99'N	015°31,85'W
P360	811	10/31/07	16:07	XBT/T5	6	26°59,99'N	015°20,56'W
P360	812	10/31/07	17:32	XBT/T5	7	26°59,99'N	015°09,53'W
P360	813	11/01/2007	7:03	XCTD(1)	1	26°09,43'N	016°43,88'W
P360	814	11/01/2007	8:41	XCTD(1)	2	26°16,87'N	016°35,12'W
P360	815	11/01/2007	10:00	XCTD(1)	3	26°23,05'N	016°27,60'W
P360	816	11/01/2007	11:28	XCTD(1)	4	26°29,83'N	016°19,49'W
P360	817	11/01/2007	12:54	XCTD(1)	5	26°36,49'N	016°11,48'W
P360	821	11/02/2007	14:04	XCTD(2)	6	27°11,07'N	016°09,25'W

P360	822	11/02/2007	15:26	XBT/T5	8	27°15,42'N	016°19,43'W
P360	823	11/02/2007	16:42	XBT/T5	9	27°19,62'N	016°29,35'W
P360	825	11/02/2007	21:05	XBT/T5	10	27°28,36'N	016°49,85'W
P360	826	11/02/2007	22:19	XBT/T5	11	27°32,66'N	016°59,86'W
P360	827	11/02/2007	23:39	XCTD(1)	7	27°36,99'N	017°10,18'W
P360	828	11/03/2007	7:02	XBT/T5	12	27°23,98'N	016°39,60'W
P360	829	11/03/2007	8:33	XBT/T5	13	27°32,58'N	016°33,60'W
P360	830	11/03/2007	9:58	XBT/T5	14	27°40,98'N	016°27,70'W
P360	831	11/03/2007	11:22	XBT/T5	15	27°49,44'N	016°21,70'W
P360	832	11/03/2007	12:47	XBT/T5	16	27°57,90'N	016°15,80'W
P360	833	11/03/2007	15:59	XBT/T5	17	28°15,56'N	015°59,88'W
P360	834	11/03/2007	18:45	XBT/T5	18	28°30,82'N	015°45,79'W
P360	835	11/03/2007	22:01	XBT/T5	19	28°54,16'N	015°49,00'W
P360	836	11/03/2007	0:04	XBT/T5	20	29°10,05'N	015°52,61'W

As part of the collaboration between the NOAA and the ICCM during the last 10 years at ESTOC, one NOAA buoys is launched at ESTOC included in the monthly sampling. However, during the last two years, and in order to statistically characterize the data obtained along the years, an exercise is taking place seasonally. In this case, the Autumn exercise was done by deploying 4 buoys at the same time, in order to analyse the variability of the data. Another buoy provided by the University of Las Palmas (64645) was deployed with the intention to put it in the core of one of the eddies, according to the latest satellite images data received on board (Table 4).

Table 5. NOAA drifting buoys launched along P360.

Identification Number	Date (dd/mm/yy)	Time GMT (hh:mm)	Latitude	Longitude
62326	30/10/07	02 :50	29º 10.96’ N	015º 18.55’ W
62327	30/10/07	02 :50	29º 10.96’ N	015º 18.55’ W
62328	30/10/07	02 :50	29º 10.96’ N	015º 18.55’ W
71092	30/10/07	02 :50	29º 10.96’ N	015º 18.55’ W
64645	02/11/07	19 :43	27º 23.85’ N	016º 39.45’ W

5.3 Methods

5.3.1 Water Sampling

Samples were collected immediately after the Niskin bottles were on board from each depth. The sampling sequence was as follows:

1.) Oxygen: was taken in glass bottles of about 125 ml of volume which were previously cleaned and washed with HCl acid and was fixed at once; then it was kept for at least six hours according to WOCE regulations and finally it was analysed at the laboratory on board the ship.
2.) Carbon system measurements (only at ESTOC): in this case only alkalinity samples were taken in glass bottles and were fixed immediately on board.
3.) Nutrients: were taken in polypropylene bottles which were previously cleaned and washed with HCl acid and were completely dry. Samples were immediately frozen at -20°C, analysing them as soon as possible after arrival at the laboratory. Freezing the samples is a common practice; it does not or only in a non-significant way affect the nitrate+nitrite and the phosphate values (by a slight decrease) and is not noticeable in the silicate values (Kremling and Wenck,1986; McDonald and McLunghlin, 1982).
4.) Salinity: samples were taken in dark glass bottles which were previously cleaned and washed with HCl acid. Then, they were kept in boxes to protect them from light till analysis on land.
5.) Chlorophyll: samples of one litre of water were taken. The chlorophyll samples were filtered immediately and the filters were frozen subsequently at -20°C. Their analyses takes place at the ICCM laboratory in land.

All samples were taken using the procedures established in the WOCE Operations Manual, WHP Office Report WHPO 91-1/WOCE Report No.68/91.

5.3.2 Analysis

Dissolved Oxygen :The samples were analysed using the method described in the WOCE Operations Manual, WHP Office Report No. 68/91; the final titration point was detected using a Metrohm 665 Dosimat Oxygen Auto-Titrator Analyser.

Carbonate system measurements

The total alkalinity of seawater (AT) was determined by titration with HCl to the carbonic acid end point using two similar potentiometric systems, as described in more detail by Mintrop et al. (2000). In order to yield an ionic strength similar to open ocean seawater, the HCl solution (25 l, 0.25 M) was made from concentrated analytical grade HCl (Merck®, Darmstadt, Germany) in 0.45 M NaCl. The acid was standardised by titrating weighed amounts of Na2CO3 dissolved in 0.7 M NaCl solutions. The total alkalinity of seawater was evaluated from the proton balance at the alkalinity equivalence point, pHequiv = 4.5, according to the exact definition of total alkalinity (Dickson, 1981). The performance of the titration systems was monitored by titrating different samples of certified reference material (CRM, batch 42) with known inorganic carbon and AT values. The agreement between our data and CRM values was within ±1.5 µmol kg-1. Total inorganic carbon (CT) is computed from experimental values of pHt and total alkalinity, using the carbonic acid

dissociation constants of Mehrbach after Dickson and Millero (1987). This set of constants presented the best agreement between CT(pH, AT) calculations and certified CT values for CRM, batch 42, with a CT residual of ± 3 µmol kg-1, n=54 (Millero, 1995, Lee et al., 1997).

Nutrients

The nutrients determination was performed with a segmented continuous-flow autoanalyser, a Skalar® San Plus System (ICCM).

Nitrate+Nitrite: The automated procedure for the determination of nitrate and nitrite is based on the cadmium reduction method; the sample is passed through a column containing granulated copper-cadmium to reduce the nitrate to nitrite (Wood et al.,1967), using ammonium chloride as pH controller and complexer of the cadmium cations formed (Strickland and Parsons, 1972). The optimal column preparation conditions are described by several authors (Nydahl, 1976; Garside, 1993).

Phosphate: Orthophosphate concentration is understood as the concentration of reactive phosphate (Riley and Skirpow,1975) and according to Koroleff (1983a) is a synonym of "dissolved inorganic phosphate". The automated procedure for the determination of phosphate is based on the following reaction: ammonium molybdate and potassium antimony tartrate react in an acidic medium with diluted solution of phosphate to form an antimony-phospho-molybdate complex. This complex is reduced to an intensely blue-coloured complex, ascorbic acid. The complex is measured at 880nm. The basic methodology for this anion determination is given by Murphy and Riley (1962); the used methodology is the one adapted by Strickland and Parsons (1972).

Silicate: The determination of the soluble silicon compounds in natural waters is based on the formation of the yellow coloured silicomolybdic acid; the sample is acidified and mixed with an ammonium molybdate solution forming molybdosilicic acid. This acid is reduced with ascorbic acid to a blue dye, which is measured at 810nm. Oxalic acid is added to avoid phosphate interference. The used method is described in Koroleff (1983b).

Phytoplankton pigments: Pigments were measured using fluorimetric analysis, following the methodology described by Welschmeyer (1994). The determination was achieved using a fluorometer TURNER 10-AU-000.

Salinity: Samples were measured with a salinometer, model Autosal 8400a, whose measurement range was between 0.005-42 (psu), with an accuracy of ±0.003, according to the manufacturer. It was calibrated following the manufacturer´s information and standarizing it with IAPSO Standard Seawater. Salinity values were calculated as practical salinity according to Unesco (1978, 1984).

5.4 Preliminary Results

As already mentioned previously in the data description, during this cruise only two stations could be sampled chemically because the rosette failed by having water inside; therefore, data for oxygen, nutrients, chlorophyll and salinity are restricted to the two stations. However, some other stations could be sampled physically, hence some T/S diagrams could be presented and discussed.

By observing the T/S diagrams, and as usual for this area in the Fall for surface waters, the seasonal thermocline that appears in the Summer starts its breakage, producing the appearance of the mixed

layer. During this cruise, and according to the CTD results, the mixed layer is found at depths ranging from 60 to 90 db for all the stations sampled (Fig. 7, right), starting before the southern the stations are located.

At depths below the surface layer, the temperature/ salinity plots obtained from the CTD's made along P360 (Figure 3, left), a linear transect shows that the North Atlantic Water (NACW) is always present. Values of temperature range between 12ºC and 16ºC, whereas salinity range is 35.6 - 36.4.

The intermediate water masses usually encountered in this area (800-1200 m) are the Antarctic Intermediate Water (AAIW) both at the north and south, and the Mediterranean Water (MW) to the north (warmer and more saline). The amount of these water masses at those depths produces a range of temperature and salinities of 5-12ºC and 35.15-35.55 respectively. As an example in Fig. 7 (left), the T/S corresponding to ESTOC shows at these depths warmer and with more salinity waters than the other stations, reflecting a greater influence of the MW; according to Llinas et al. (2003), the detection limit of the MW is a salinity value of 35.5.

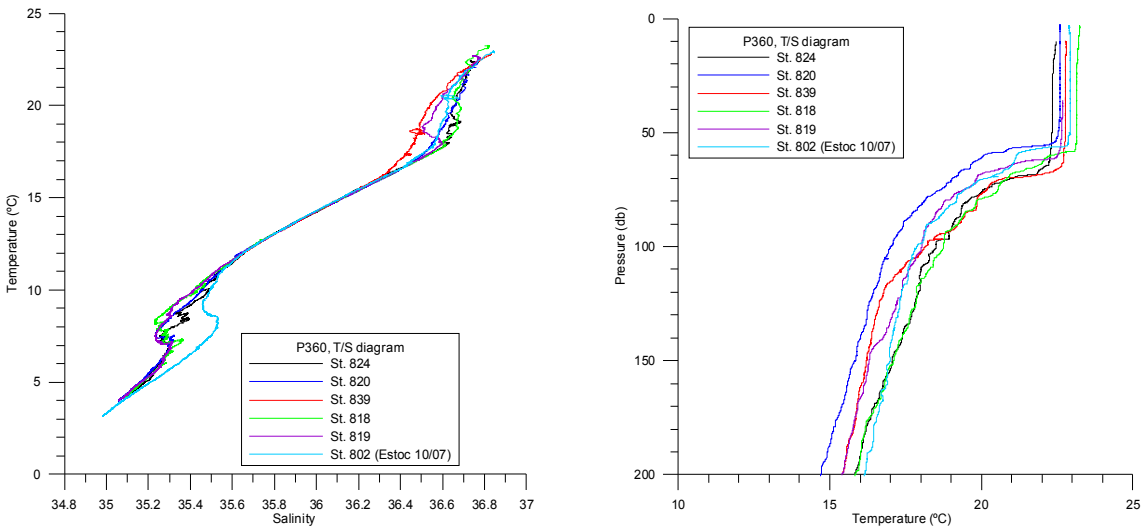

Fig. 7: Left: Diagrams T/S (3500m nominal depth) of the stations sampled with CTD along P360, including station ESTOC (st. 802). To the right: Potential temperature versus pressure for the surface waters for the same stations (colours correspond).

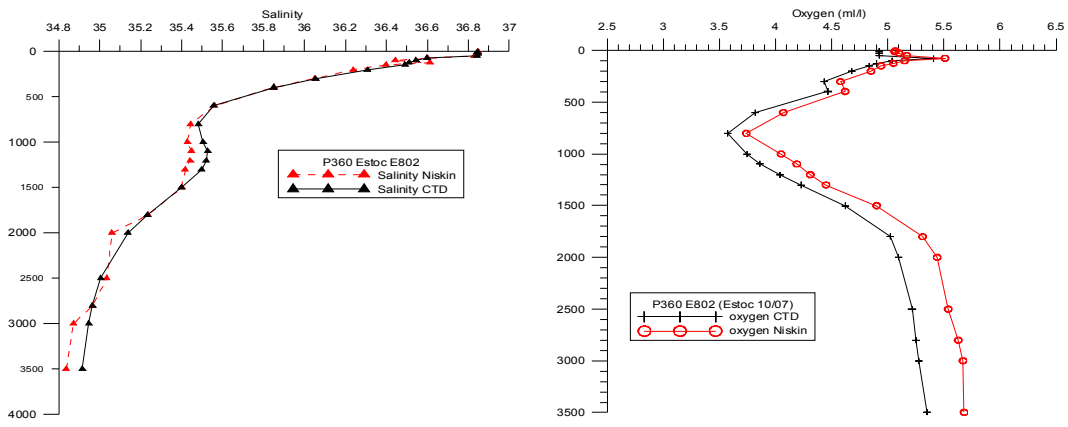

Figure 4. Left: Salinity from the ESTOC site, comparing values obtained from sampling the Niskin bottles (black) and those measured by the CTD for the same site (red). To the right: the same comparison with the oxygen values.

Salinity values taken at ESTOC were compared with those of the CTD, stating the fact that certain important intermediate areas are not well obtained for salinity by the CTD (Figure 4, left). The same occurs with the oxygen data, where the values taken by the CTD are always lower than those measured on board, showing greater differences as going deeper.

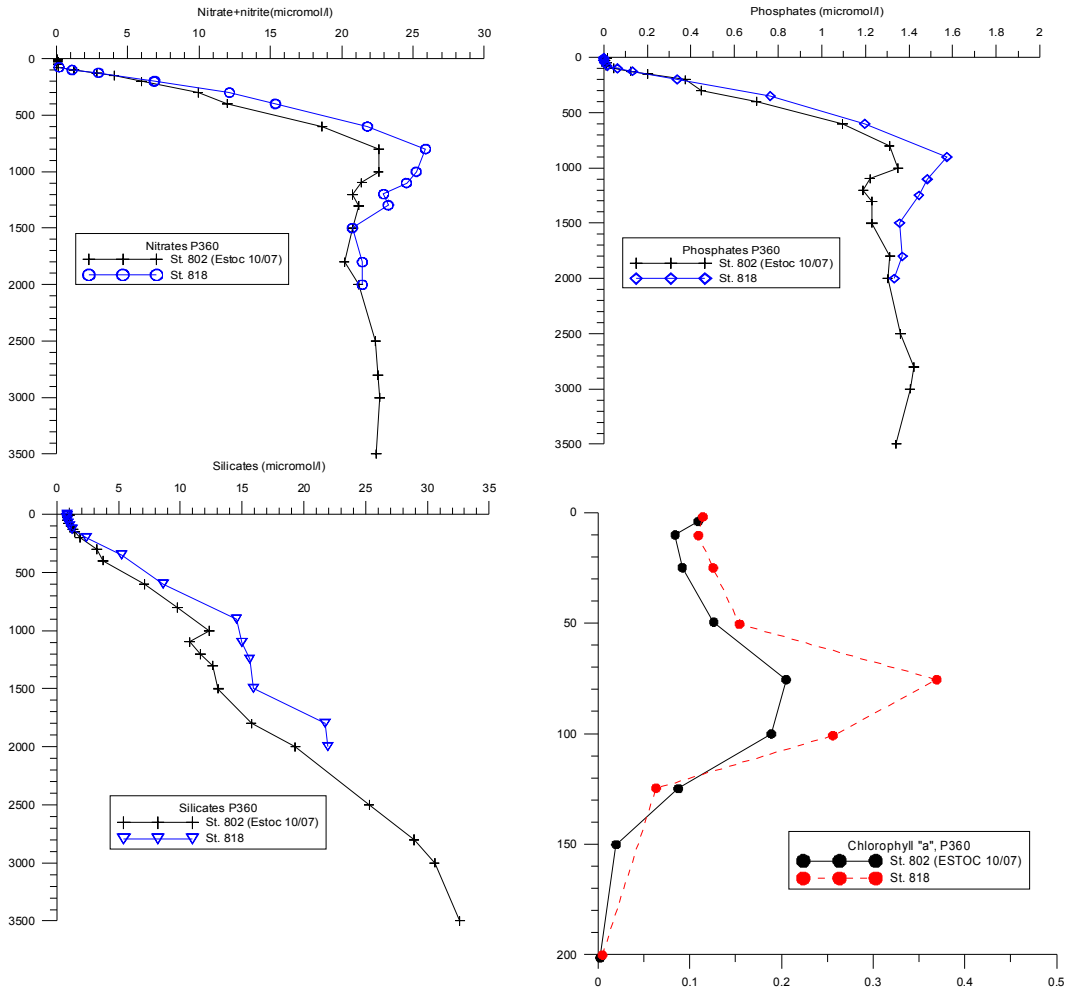

Figure 5. Values of nutrients (nitrate, phosphate and silicate) and chlorophyll „a“ (only to 200db, down right) versus pressure for the two stations where sampling of the Niskin bottles was possible.

The values of nutrients and chlorophyll „a“ (Figure 5) seem adequate for the ESTOC station for this season according to the data obtained during a decade; the more southern station 818 has greater values mainly at intermediate depths due to the longitudinal variation and appearance of water masses; it is remarkable to find out the chlrophyll „a“ maximum at the south, which presents twice the value of the northern station (0.4 µg/l).

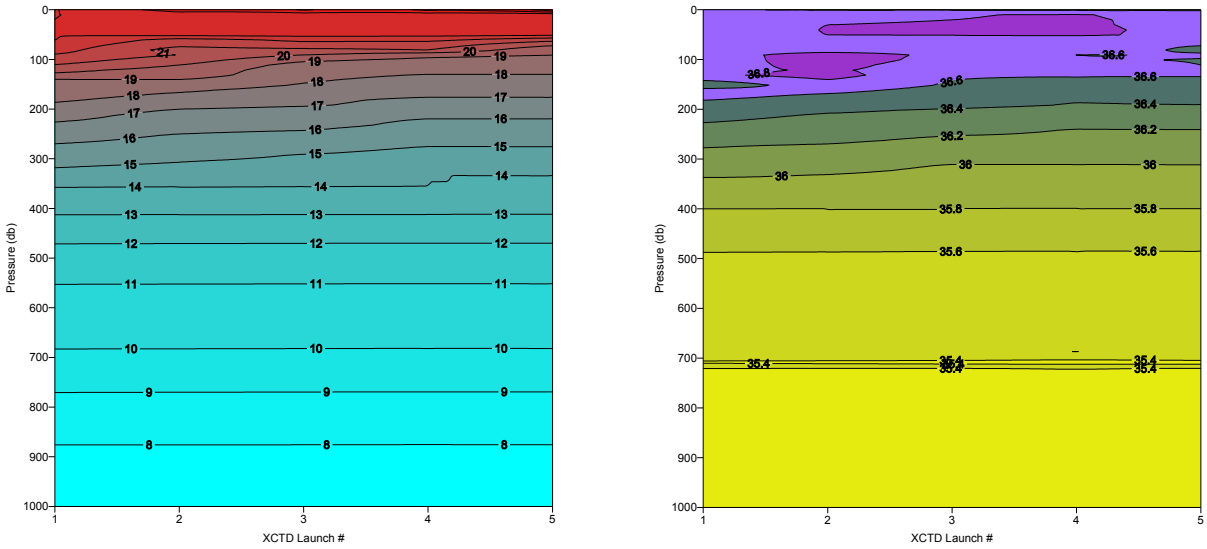

Figure 6. Temperature and salinity of XCTDs from the section going from st. 813 or XCTD #1 (southwest) to st. 817 our XCTD #5 (northeast).

Figure 6 shows the section of XCTD’s temperature and salinity, including the bulking of isotherms due to the presence of a cyclonic eddy, as shown before the cruise. Values of salinity increase too in the same area. Further detailed surface studies are being done to better characterize the intensity of the eddy. Two of the transects of XBTs are presented in Figure 7, to the left along latitude 27ºN from west to east, where it is possible to distinguish the water masses variations at intermediate depthe and the surface isotherms closeness indicating bulking and depressions of the subsurface waters, characteristic of the eddies.

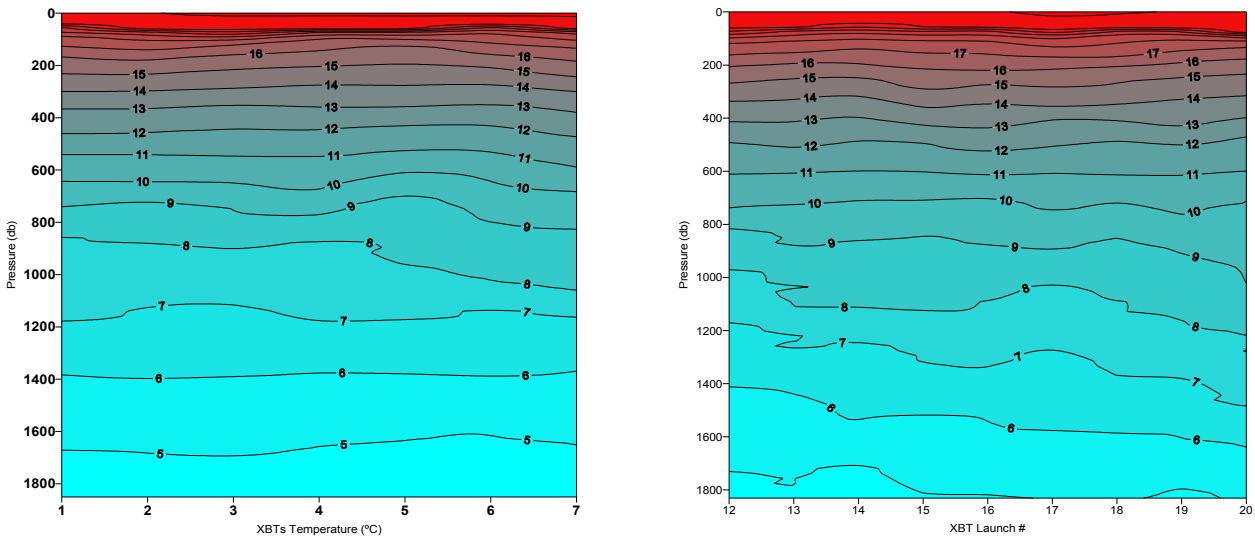

Figure 7. Left: Temperature of XBTs section from shoot #1 (west) to #7 (east); Right: the same but for the northern section, going from XBT #12 (south) to #20 (north).

To the right in Figure 7 it is depicted the section going through the channel between Tenerife and Gran Canaria Islands, starting southwest of Tenerife Island and ending at DOLAN. At intermediate depths, we have found that the stations out of the channel to the south show greater variability, probably affected by the influence of the channel between La Gomera and Tenerife Islands. Within the channel, we find the customary bulky process induced by the channelling of the water masses entering it, ending up with a deepening of the isotherms to the north out of the channel. On the surface waters, no significant influences or features are found.

6. References

- Garside, C. (1993): Nitrate reductor efficiency as an error source in seawater analysis. *Mar. Chem*., 4(1), 25-30.
- Koroleff, F., 1983. Determination of dissolved inorganic phosphate. In Methods of Seawater Analysis. K. Grasshoff, A. Ehrhardt and K. Kremling (eds), Verlag Chemie, 126-129.
- _____, 1983b. Determination of dissolved inorganic silicate. In Methods of Seawater Analysis. K. Grasshoff, A. Ehrhardt and K. Kremling (eds), Verlag Chemie, 175-180.
- Kremling, K. & A. Wenck, 1986. On the storage of dissolved inorganic phosphate, nitrate and reactive silicate in Atlantic Ocean water samples. *Meeresforsch*, 31, 69-74.
- Llinás O.,M.J. Rueda, J.Pérez-Marrero,E.Pérez-Martell, R.Santana, M.G.Villagarcía, A.Cianca, J.Godoy and L.Maroto, 2002. Variability of the Antarctic Intermediate Waters in the Northern Canary Box. *Deep Sea Research. II,49(17)*:3441-3453.
- McDonald, R.W. & F.A. McLaughlin, 1982. The effect of storage by freezing of dissolved inorganic phosphate, nitrate and reactive silicate for samples from coastal and internal water. *Water Research*, 16, 95-104.
- Murphy, J. & J.P. Riley, 1962. A modified single solution method for the determination of phosphate in natural waters. *Anal. Chim. Acta*, 27, 31-36.
- Nydahl, F., 1976. On the optimum conditions for the reduction of nitrate by cadmium. *Talanta*, 23, 349-357.
- Riley, J.P. & J.P. Skirpow, 1975. The Micronutrient Element. *Chemical Oceanography*, 2, 245-297.
- Strickland, J.D.H & Parsons, 1972. A practical handbook of seawater analysis. *Fisheries Research Board of Canada*, 167 pp.
- Unesco (1978): Technical Papers in Marine Science, 28, 35pp.
- UNESCO (1984): La escala de salinidades practicas de 1978 y la ecuacion internacional de estado del agua de mar de 1980. Documentos tecnicos de la Unesco sobre Ciencias del Mar, no. 36.
- Welschmeyer, N.A., 1994. Fluorometric Analysis of Chlorophyll “a” in presence of Chlorophyll ”b” and Phaeopigments. *Limnol. Oceanog*. 39 (8), 1985-1992.
- Woods, E.D., F.A.J. Armstrong & F.A. Richards (1967). Determination of nitrate in seawater by cadmium-cooper reduction to nitrate. *J. Mar. Biol. Ass. UK.,*47, 31-43.

7. List of stations

Stat.No.	Date	Time	Description	Latitude	Longitude	Waterdepth
802	29.10.2007	22:04	Ship @ station	29° 09.97' N	015° 19.98' W	3595.0
		22:09	CTD/Ro t/water	29° 10.01' N	015° 19.97' W	3595.0
		22:52	CTD/Ro @ deck	29° 10.15' N	015° 19.73' W	3595.0
		22:53	Station completed	29° 10.15' N	015° 19.73' W	3595.0
802-2	29.10.2007	23:42	Ship @ station	29° 10.61' N	015° 20.10' W	3595.0
		23:45	CTD/Ro t/water	29° 10.61' N	015° 20.09' W	3593.0
	30.10.2007	02:04	CTD/Ro @ deck	29° 10.54' N	015° 18.26' W	3594.0
		02:46	Station completed	29° 10.92' N	015° 18.50' W	3592.0
803	30.10.2007	02:46	Ship @ station	29° 10.92' N	015° 18.50' W	3592.0
		02:49	4 x NOAA Drifter t/water	29° 10.94' N	015° 18.53' W	3592.0
		02:51	Station completed	29° 10.95' N	015° 18.54' W	3592.0
804	30.10.2007	08:02	Ship @ station	29° 11.45' N	015° 55.70' W	n/a
		09:27	SBU Mooring sighted	29° 11.41' N	015° 55.82' W	n/a
		11:42	Station completed	29° 10.45' N	015° 55.20' W	n/a
805	30.10.2007	14:02	Ship @ station	29° 08.46' N	015° 50.86' W	3623.0
		15:45	Deployment PACT short time mooring	29° 10.70' N	015° 50.05' W	3626.0
		16:21	Station completed	29° 10.04' N	015° 50.28' W	3627.0
806	31.10.2007	08:10	Ship @ station	26° 59.98' N	016° 16.93' W	3511.0
		08:10	XBT # 1 t/water	26° 59.98' N	016° 16.93' W	3511.0
		08:48	Station completed	27° 00.03' N	016° 14.00' W	3500.0
806-2	31.10.2007	09:16	Ship @ station	27° 00.00' N	016° 16.95' W	3511.0
		09:16	XBT # 1 t/water	27° 00.00' N	016° 16.95' W	3511.0
		09:21	Station completed	26° 59.99' N	016° 16.46' W	3511.0
807	31.10.2007	10:34	Ship @ station	27° 00.00' N	016° 05.71' W	3466.0
		10:34	XBT # 2 t/water	27° 00.00' N	016° 05.71' W	3466.0
		10:41	Station completed	26° 59.99' N	016° 05.03' W	3469.0
808	31.10.2007	11:54	Ship @ station	27° 00.00' N	015° 54.37' W	3402.0
		11:56	XBT # 3 t/water	27° 00.00' N	015° 54.21' W	3399.0
		12:01	Station completed	26° 59.98' N	015° 53.69' W	3395.0
809	31.10.2007	13:12	Ship @ station	27° 00.01' N	015° 43.21' W	3331.0
		13:14	XBT # 4 t/water	27° 00.01' N	015° 43.10' W	3330.0
		13:19	Station completed	27° 00.01' N	015° 42.55' W	3322.0
810	31.10.2007	14:39	Ship @ station	27° 00.01' N	015° 32.87' W	3244.0
		14:40	XBT # 5 t/water	26° 59.99' N	015° 31.85' W	3244.0
		14:44	Station completed	26° 59.99' N	015° 31.43' W	3240.0
811	31.10.2007	16:07	Ship @ station	26° 59.99' N	015° 20.56' W	3127.0
		16:07	XBT # 6 t/water	26° 59.99' N	015° 20.56' W	3127.0
		16:13	Station completed	26° 59.97' N	015° 19.95' W	3120.0
812	31.10.2007	17:31	Ship @ station	27° 00.01' N	015° 09.64' W	3011.0
		17:32	XBT # 7 t/water	26° 59.99' N	015° 09.53' W	3010.0
		17:37	Station completed	26° 59.99' N	015° 09.00' W	3005.0
813	01.11.2007	07:01	Ship @ station	26° 09.31' N	016° 44.04' W	3548.0
		07:03	XCTD t/water	26° 09.43' N	016° 43.88' W	3548.0
		07:08	Station completed	26° 09.71' N	016° 43.52' W	3545.0
814	01.11.2007	08:36	Ship @ station	26° 16.59' N	016° 35.46' W	3573.0
		08:41	XCTD t/water	26° 16.87' N	016° 35.12' W	3571.0
		08:47	Station completed	26° 16.23' N	016° 34.69' W	3568.0
815	01.11.2007	09:58	Ship @ station	26° 22.91' N	016° 27.27' W	3537.0
		10:00	XCTD t/water	26° 23.05' N	016° 27.60' W	3537.0
		10:04	Station completed	26° 23.25' N	016° 27.37' W	3536.0
816	01.11.2007	11:27	Ship @ station	26° 29.72' N	016° 19.61' W	3497.0

		11:28	XCTD t/water	26°	29.83'	N	016°	19.49'	W	3496.0
		11:33	Station completed	26°	30.11'	N	016°	19.50'	W	3492.0
817	01.11.2007	12:53	Ship @ station	26°	36.40'	N	016°	11.59'	W	3485.0
		12:54	XCTD t/water	26°	36.49'	N	016°	11.48'	W	3483.0
		13:04	Station completed	26°	37.18'	N	016°	10.67'	W	3483.0
818	01.11.2007	13:41	Ship @ station	26°	39.59'	N	016°	07.75'	W	3476.0
		13:44	CTD/Ro t/water	26°	39.60'	N	016°	07.71'	W	3473.0
		14:01	CTD/Ro @ deck	26°	39.58'	N	016°	07.48'	W	3473.0
		14:02	Station completed	26°	39.58'	N	016°	07.48'	W	3473.0
818-2	01.11.2007	14:37	Ship @ station	26°	39.57'	N	016°	07.93'	W	3475.0
		14:38	CTD/Ro t/water	26°	39.57'	N	016°	07.92'	W	3476.0
		15:58	CTD/Ro @ deck	26°	39.30'	N	016°	07.17'	W	3469.0
		16:19	Station completed	26°	39.80'	N	016°	06.80'	W	3469.0
819	01.11.2007	18:16	Ship @ station	26°	49.81'	N	015°	55.52'	W	3415.0
		18:19	CTD/Ro t/water	26°	49.82'	N	015°	55.52'	W	3416.0
		18:37	CTD/Ro @ deck	26°	49.83'	N	015°	55.45'	W	3422.0
		18:37	Station completed	26°	49.83'	N	015°	55.45'	W	3422.0
819-2	01.11.2007	20:48	Ship @ station	26°	49.83'	N	015°	55.49'	W	3415.0
		20:48	CTD/Ro t/water	26°	49.83'	N	015°	55.49'	W	3415.0
		22:00	CTD/Ro @ deck	26°	49.69'	N	015°	55.39'	W	3414.0
		22:01	Station completed	26°	49.69'	N	015°	55.39'	W	3415.0
820	02.11.2007	08:06	Ship @ station	26°	59.96'	N	015°	43.27'	W	3330.0
		09:05	CTD/Ro t/water	27°	00.14'	N	015°	43.50'	W	3426.0
		10:18	CTD/Ro @ deck	26°	59.91'	N	015°	43.13'	W	3327.0
		10:19	Station completed	26°	59.91'	N	015°	43.13'	W	3327.0
821	02.11.2007	14:03	Ship @ station	27°	11.07'	N	016°	09.25'	W	3464.0
		14:04	XCTD t/water	27°	11.07'	N	016°	09.25'	W	3464.0
		14:18	Station completed	27°	11.46'	N	016°	10.19'	W	3471.0
822	02.11.2007	15:25	Ship @ station	27°	15.42'	N	016°	19.43'	W	3515.0
		15:26	XBT # 8 t/water	27°	15.42'	N	016°	19.43'	W	3515.0
		15:39	Station completed	27°	15.96'	N	016°	20.72'	W	3525.0
823	02.11.2007	16:41	Ship @ station	27°	19.62'	N	016°	29.35'	W	3539.0
		16:42	XBT # 9 t/water	27°	19.62'	N	016°	29.35'	W	3538.0
		16:52	Station completed	27°	19.97'	N	016°	30.24'	W	3539.0
824	02.11.2007	18:07	Ship @ station	27°	23.93'	N	016°	39.60'	W	3568.0
		18:08	CTD/Ro t/water	27°	23.93'	N	016°	39.59'	W	3567.0
		19:18	CTD/Ro @ deck	27°	23.88'	N	016°	39.50'	W	3567.0
		19:18	Station completed	27°	23.88'	N	016°	39.50'	W	3567.0
824-2	02.11.2007	19:27	Ship @ station	27°	23.86'	N	016°	39.50'	W	3567.0
		19:28	CTD/Ro t/water	27°	23.86'	N	016°	39.49'	W	3567.0
		19:37	CTD/Ro @ deck	27°	23.83'	N	016°	39.49'	W	3567.0
		19:37	Station completed	27°	23.83'	N	016°	39.49'	W	3567.0
824-3	02.11.2007	19:42	Ship @ station	27°	23.84'	N	016°	39.46'	W	3567.0
		19:43	NOAA-Drifter t/water	27°	23.85'	N	016°	39.45'	W	3567.0
		19:44	Station completed	27°	23.86'	N	016°	39.42'	W	3567.0
825	02.11.2007	21:04	Ship @ station	27°	28.31'	N	016°	49.70'	W	3582.0
		21:05	XBT # 10 t/water	27°	28.36'	N	016°	49.85'	W	3582.0
		21:10	Station completed	27°	28.49'	N	016°	50.20'	W	3582.0
826	02.11.2007	22:18	Ship @ station	27°	32.61'	N	016°	59.74'	W	3588.0
		22:19	XBT # 11 t/water	27°	32.66'	N	016°	59.86'	W	3587.0
		22:25	Station completed	27°	32.83'	N	017°	00.33'	W	3588.0
827	02.11.2007	23:33	Ship @ station	27°	36.96'	N	017°	09.90'	W	3591.0
		23:39	XCTD t/water	27°	36.99'	N	017°	10.18'	W	3591.0
		23:43	Station completed	27°	37.16'	N	017°	10.42'	W	3589.0

828	03.11.2007	07:01	Ship @ station	27°	23.94'	N	016°	39.67'	W	3569.0
		07:02	XBT # 12 t/water	27°	23.98'	N	016°	39.60'	W	3569.0
		07:09	Station completed	27°	24.26'	N	016°	39.27'	W	3567.0
829	03.11.2007	08:31	Ship @ station	27°	32.47'	N	016°	33.68'	W	3528.0
		08:33	XBT # 13 t/water	27°	32.58'	N	016°	33.60'	W	3528.0
		08:38	Station completed	27°	32.83'	N	016°	33.43'	W	3529.0
830	03.11.2007	09:57	Ship @ station	27°	40.89'	N	016°	27.76'	W	3431.0
		09:58	XBT # 14 t/water	27°	40.98'	N	016°	27.70'	W	3429.0
		10:02	Station completed	27°	41.14'	N	016°	27.59'	W	3425.0
831	03.11.2007	11:21	Ship @ station	27°	49.39'	N	016°	21.76'	W	2878.0
		11:22	XBT # 15 t/water	27°	49.44'	N	016°	21.70'	W	2871.0
		11:27	Station completed	27°	49.69'	N	016°	21.56'	W	2840.0
832	03.11.2007	12:46	Ship @ station	27°	57.87'	N	016°	15.87'	W	2583.0
		12:47	XBT # 16 t/water	27°	57.90'	N	016°	15.80'	W	2577.0
		12:52	Station completed	27°	58.24'	N	016°	15.55'	W	2548.0
833	03.11.2007	15:57	Ship @ station	28°	15.35'	N	016°	00.04'	W	2792.0
		15:59	XBT # 17 t/water	28°	15.56'	N	015°	59.88'	W	2816.0
		16:03	Station completed	28°	15.73'	N	015°	59.71'	W	2816.0
834	03.11.2007	18:44	Ship @ station	28°	30.75'	N	015°	45.84'	W	3535.0
		18:45	XBT # 18 t/water	28°	30.82'	N	015°	45.79'	W	3535.0
		18:51	Station completed	28°	31.20'	N	015°	45.46'	W	3541.0
835	03.11.2007	21:59	Ship @ station	28°	54.04'	N	015°	48.94'	W	3616.0
		22:01	XBT # 19 t/water	28°	54.16'	N	015°	49.00'	W	3617.0
		22:05	Station completed	28°	54.40'	N	015°	49.08'	W	3617.0
836	04.11.2007	00:03	Ship @ station	29°	09.93'	N	015°	52.58'	W	3626.0
		00:04	XBT # 20 t/water	29°	10.05'	N	015°	52.61'	W	3626.0
		00:10	Station completed	29°	10.35'	N	015°	52.67'	W	3626.0
837	04.11.2007	08:05	Ship @ station	29°	10.93'	N	015°	49.95'	W	3626.0
		08:16	PACT mooring sighted	29°	10.96'	N	015°	50.02'	W	---
		09:43	Station completed	29°	10.93'	N	015°	50.66'	W	3626.0
838	04.11.2007	13:02	Ship @ station	29°	11.69'	N	015°	58.47'	W	3628.0
		15:40	Deployment SBU mooring	29°	11.77'	N	015°	54.47'	W	3628.0
		16:00	Station completed	29°	11.93'	N	015°	56.38'	W	3628.0
839	04.11.2007	16:40	Ship @ station	29°	12.03'	N	015°	57.11'	W	3630.0
		16:47	CTD/Ro t/water	29°	12.04'	N	015°	57.16'	W	3630.0
		17:36	CTD/Ro @ deck	29°	12.05'	N	015°	57.40'	W	3631.0
		17:36	Station completed	29°	12.05'	N	015°	57.57'	W	3631.0
840	05.11.2007	09:11	Ship @ station	29°	12.39'	N	015°	54.87'	W	3630.0
		09:56	Deployment SBU	29°	12.44'	N	015°	55.10'	W	3631.0
		09:56	Station completed	29°	12.44'	N	015°	55.10'	W	3631.0
841	05.11.2007	10:55	Ship @ station	29°	11.74'	N	015°	55.82'	W	3630.0
		12:18	Deployment PACT mooring	29°	11.73'	N	015°	55.82'	W	3630.0
		13:08	Station completed	29°	11.38'	N	015°	55.63'	W	3629.0

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The teamwork among the crew and scientists was friendly and relaxed as known from several other cruises on R/V POSEIDON. The cruise could be realized successfully.

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