

# **Cruise report Subtropical Cells 1**

## **1 Cruise narrative**

### **1.1 Highlights**

#### **1.1.1 Expedition**

R/V Oceanus 365-4

#### **1.1.2 Chief scientist**

Claudia Schmid

#### **1.1.3 Ship**

R/V Oceanus

#### **1.1.4 Crew**

Lawrence T. Bearse	Captain
Courtenay Barber	Chief mate
Michael J. Conda	2 <sup>nd</sup> mate
Jeffrey M. Stolp	Boatswain
Darrell Hanna	AB
Leonidas Byckovas	AB
Colin Walcott	OS
Partick S. Mone	Chief engineer
Nelson V. Botsford	Jr. engineer
Marcel Vieira	Jr. engineer
Christopher Moody	Steward
Brett Bluestein	MA

#### **1.1.5 Ports of call**

Fortaleza, Brazil  
Bridgetown, Barbados

#### **1.1.6 Cruise dates**

5 March – 25 March 2001

## **1.2 Principal Investigators**

Robert Molinari	AOML	<a href="mailto:molinari@aoml.noaa.gov">molinari@aoml.noaa.gov</a>
Claudia Schmid	CIMAS/ AOML	<a href="mailto:schmid@aoml.noaa.gov">schmid@aoml.noaa.gov</a>

### 1.3 Cruise participants

Steven Eykelhoff	networking	WHOI	
Marlos Goes	CTD	Inst. Sao Paulo	
Robert Roddy	CTD, oxygen	AOML	roddy@aoml.noaa.gov
Kathleen Schact	autosol	Univ. Wash.	
Claudia Schmid	Chief scientist	AOML/ CIMAS	schmid@aoml.noaa.gov
Derrick Snowden	ADCP, CTD	AOML	snowden@aoml.noaa.gov
John Steger	ADCP, CTD	AOML	thomas@aoml.noaa.gov

### 1.4 Abbreviations and addresses

**AOML** National Oceanic and Atmospheric Administration  
Atlantic Oceanographic and Meteorological Laboratory  
4301 Rickenbacker Cswy, Miami 33149, FL, USA

**CIMAS** Cooperative Institute of Marine and Atmospheric Science  
4600 Rickenbacker Cswy, Miami 33149, FL, USA

**WHOI** Woods Hole Oceanographic Institution  
Woods Hole, MA, USA

### 1.5 Primary objective

Studying the subtropical cells and the spreading of the Subtropical Underwater.

### 1.6 Scientific program and methods

#### 1.6.1 Cruise track

Fig. 1

#### 1.6.2 CTD/LADCP and water sampling

Data from 98 CTD/LADCP/rosette stations are available (Table 1, Fig. 1, station 8 was counted but not done). All stations include LADCP. Water samples for salinity and oxygen were taken throughout the upper 1500m.

#### 1.6.3 XBT's deployed

57 XBT with the Mark 12 system (Table 2, Fig. 1).

#### 1.6.4 PALACE floats and drifters deployed

5 PALACE (Table 3, Fig. 1)

6 drifters (Table 4, Fig. 1)

#### 1.6.5 Underway measurements

Underway measurements included thermosalinograph (TSG) data and the various variables of the Oceanus' IMET system (surface temperature, conductivity, oxygen, meteorological parameters, GPS, ship speed, heading and bathymetry).

### 1.7 Problems with scientific equipment

CTD:

The primary conductivity and oxygen sensors failed during the up-cast of station 2. The symptoms were very spiky salinity and oxygen data and the pump indicator showed 10 (which means that the primary pump is off). This seemed to indicate that the pump is the problem. During station 3 the primary conductivity and oxygen sensors failed as expected. The secondary conductivity was OK. Unfortunately the secondary oxygen sensor failed as well. The replacement of the primary conductivity sensor between stations 3 and 4 solved the problems with the secondary oxygen sensor.

Throughout the 35°W section the primary oxygen sensor did not work properly. The oxygen current was reasonable but the oxygen temperature was wrong. A replacement with a backup sensor after CTD station 38 did not solve this problem. In fact the older replacement oxygen sensor did not work at all. The last cast was used as a test of the digitizer in the CTD. The primary oxygen sensor was plugged into a different A/D channel. This did not improve the data in any way. A final test for the digitizer was done on deck. The deck unit was turned on to test two different configurations: (1) The good secondary oxygen sensor was plugged into the A/D channel for the primary sensor and the primary sensor was plugged into the A/D channel for the secondary sensor. (2) The primary and the secondary oxygen sensors were plugged into their original A/D channels. Result: The values for both oxygen sensors were independent of the A/D channel. The primary oxygen sensor had the word display “0 0”, and the secondary sensor had a varying word display (order of magnitude “2000 200”) in both configurations.

Conclusion: Both oxygen sensors used as primaries are bad (serial # 130433 and 230297). The secondary oxygen sensor is good (serial #230531). The digitizer is working correctly.

The tripping of the Niskin bottles proved to be unreliable (stations 5-7). While checking the connections at the CTD between stations 7 and 8 unit a pin broke off the plug to the rosette. The pin was corroded through. It was decided to skip two stations of the high-density section (station 8 was already numbered, but no cast was done). The repairs took about two hours. Afterwards the tripping of the bottles was much more reliable. Towards the end of the cruise the tripping of the bottles started to get more random.

ADCP:

The shipboard 300 kHz ADCP was not working until 8 March in the evening. The software problem could finally be solved with the help of a technician at WHOI.

## **1.8 Other incidents of note**

Condensation in the radar lead to delay of departure by seven hours until 16:00 pm on 6 March.

# **2 Description of measurement techniques**

## **2.1 CTD/LADCP/rosette**

A CTD with two sensors for temperature, conductivity and oxygen was used. Ten Niskin bottles were available. Water samples for oxygen and salinity were taken after each cast. These samples were analyzed on board and the resulting data will be used for the insitu calibration of the conductivity and oxygen sensors.

The LADCP is a RDI Broadband 150 kHz ADCP.

## **2.2 XBT**

The Mark 12 system was used to achieve a higher resolution of the temperature field.

## **2.3 Vessel-mounted ADCP**

The data from two vessel-mounted ADCPs were recorded throughout the survey. The used instruments are a RDI Broadband Ocean Surveyor 300 kHz ADCP and a RDI Narrowband 150 kHz ADCP. Combining the data from the two ADCPs will result in velocity profiles over the upper nearly 400 m with a higher resolution in the upper 100m.

## 2.4 PALACE float deployments

The five PALACE floats were deployed after passing a self-test. They launch positions were chosen to best supplement the existing array of profiling floats.

## 2.5 Drifter deployments

The six surface drifters were deployed into gaps of the global drifter array.

## 2.6 Underway measurements

Underway measurements included thermosalinograph (TSG) data and the various variables of the Oceanus's IMET system (surface temperature, conductivity, oxygen, meteorological parameters, GPS, ship speed, heading and bathymetry).

## 3 Preliminary analysis

Preliminary data products generated on the R/V Oceanus are presented. The hydrographic sections show the major water masses (Figs. 2, 3, 5-7, 9-11, 13-15, 17) and the flow field from the ADCPs (Figs. 4, 5, 8, 9, 12, 13, 16, 17).

The water masses in the upper 1500 m of the tropical Atlantic are the Tropical Surface Water (TSW), the Subtropical Underwater (STUW), the Central Water (CW), and the Antarctic Intermediate Water (AAIW). One major goal of this cruise is to improve the understanding of the spreading of the STUW. This water is characterized by a salinity maximum in the upper 150m of the water column. The maximum is strongest near the equator (Fig. 18). It is weakening towards the north before it strengthens again. Between about 2°N and 5°N the salinity maximum shows only small changes of its strength. The sections at the four longitudes indicate an increase of the salinity in the STUW near the equator. The maximum salinity north of 5°N does not change as much as the maximum salinity near the equator between 35°W and 41°W. From 41°W to 44°W this maximum strengthens as much as the maximum south of 3°N.

Between 500 and 1000 m the AAIW is found. It is characterized by a low salinity, which increases slightly towards the north (Figs. 2, 6, 10, 14). Salinity values below 34.6 reach north beyond 6°W at all longitudes except 44°W. At 44°W the 34.6 isohaline terminates at 6°N.

The strongest oxygen signal is the broad minimum centered near 500m at the upper boundary of the AAIW (Figs. 3, 7, 11, 15). The lowest values are observed near the northern end of the section. The oxygen concentration in this minimum layer increases from east to west.

The temperature sections at 38°W and 44°W show a deepening of the 13°C to 5°C isotherms and a shoaling of the thermocline at 3°N and 4°N, respectively (Figs. 6 and 14). Similar patterns are also found in other sections: Between 38°W and 35°W (Fig. 5). At 41°W (Fig. 10). Between 38°W to 41°W (Fig. 9).

The ADCP and LADCP sections show the alternating zonal currents characteristic for the tropical Atlantic (Fig. 4, 5, 8, 9, 12, 13, 16). The velocity maximum of the Equatorial Undercurrent (EUC) coincides with the salinity maximum of the STUW. This highest salinity STUW is flowing east (Fig. 18). The STUW with the lowest salinity and also the more saline STUW to the North are flowing west in the northern branch of the South equatorial current.

## 4 Acknowledgements

We want to thank the officers and crew of the R/V Oceanus as well as the personnel at WHOI. Their expertise and high motivation were important for the successful completion of our work program. The excellent work of the WHOI technician, the AOML personnel and the Brazilian scientist made it possible to obtain a high quality data set. The help and instructions from employees in Miami before and during the cruise are much appreciated. The cruise was sponsored by AOML.

## 5 Appendix

Table 1: CTD stations

<i>Station</i>	<i>Date</i>	<i>Time(UTC)</i>	<i>Latitude</i>	<i>Longitude</i>	<i>Max Pres.</i>	<i>Comment</i>
1	6-Mar-2001	16:43	1.2133°S	35.9648°W	100	test
2	7-Mar-2001	00:34	0.6667°S	34.9988°W	1500	No primary cond. (up-cast)
3	7-Mar-2001	03:35	0.4990°S	34.9977°W	1500	No primary cond.
4	7-Mar-2001	06:33	0.3333°S	35.0000°W	1500	
5	7-Mar-2001	09:01	0.1658°S	35.0002°W	1500	
6	7-Mar-2001	11:33	0.0002°S	35.0005°W	1500	
7	7-Mar-2001	14:16	0.1687°N	34.9992°W	1500	
9	7-Mar-2001	18:33	0.6637°N	35.0020°W	1500	
10	7-Mar-2001	21:14	0.8338°N	34.9997°W	1500	
11	7-Mar-2001	23:20	0.9817°N	34.9978°W	1500	
12	8-Mar-2001	01:43	1.1665°N	34.9997°W	1500	
13	8-Mar-2001	04:03	1.3322°N	34.9997°W	1500	
14	8-Mar-2001	06:30	1.4995°N	34.9998°W	1500	
15	8-Mar-2001	08:45	1.6663°N	35.0005°W	1500	
16	8-Mar-2001	10:57	1.8315°N	35.0000°W	1500	
17	8-Mar-2001	13:19	1.9985°N	35.0003°W	1500	
18	8-Mar-2001	15:44	2.1657°N	35.0000°W	1500	
19	8-Mar-2001	18:03	2.3330°N	35.0000°W	1500	
20	8-Mar-2001	20:30	2.4997°N	35.0003°W	1500	
21	8-Mar-2001	22:39	2.6668°N	35.0002°W	1500	
22	9-Mar-2001	00:53	2.8333°N	35.0012°W	1500	
23	9-Mar-2001	03:04	2.9990°N	35.0002°W	1500	
24	9-Mar-2001	05:15	3.1655°N	35.0002°W	1500	
25	9-Mar-2001	07:24	3.3315°N	35.0000°W	1500	
26	9-Mar-2001	09:32	3.5003°N	34.9992°W	1500	
27	9-Mar-2001	11:59	3.6743°N	35.0092°W	1500	
28	9-Mar-2001	14:23	3.8318°N	35.0000°W	1500	
29	9-Mar-2001	16:32	3.9980°N	35.0012°W	1500	
30	9-Mar-2001	19:37	4.3275°N	34.9990°W	1500	
31	9-Mar-2001	22:49	4.6670°N	35.0000°W	1500	
32	10-Mar-2001	01:58	4.9955°N	35.0000°W	1500	
33	10-Mar-2001	05:05	5.3335°N	34.9997°W	1500	
34	10-Mar-2001	08:13	5.6660°N	34.9998°W	1500	
35	10-Mar-2001	11:31	5.9998°N	35.0000°W	1500	
36	10-Mar-2001	14:59	6.3323°N	34.9998°W	1500	
37	10-Mar-2001	18:10	6.6657°N	34.9998°W	1500	
38	10-Mar-2001	21:32	6.9997°N	34.9997°W	1500	
39	12-Mar-2001	13:48	0.0000°N	37.9987°W	1500	
40	12-Mar-2001	16:08	0.1652°N	38.0000°W	1500	
41	12-Mar-2001	18:27	0.3277°N	38.0003°W	1500	
42	12-Mar-2001	20:54	0.4992°N	37.9995°W	1500	
43	12-Mar-2001	23:10	0.6648°N	37.9997°W	1500	
44	13-Mar-2001	01:23	0.8315°N	38.0000°W	1500	
45	13-Mar-2001	03:37	0.9993°N	37.9993°W	1500	
46	13-Mar-2001	05:52	1.1660°N	37.9985°W	1500	

47	13-Mar-2001	08:25	1.3318°N	37.9997°W	1500
48	13-Mar-2001	10:41	1.4992°N	37.9998°W	1500
49	13-Mar-2001	12:47	1.6662°N	37.9998°W	1500
50	13-Mar-2001	14:51	1.8317°N	37.9998°W	1500
51	13-Mar-2001	16:56	1.9988°N	37.9998°W	1500
52	13-Mar-2001	19:19	2.1652°N	38.0000°W	1500
53	13-Mar-2001	21:32	2.3323°N	38.0002°W	1500
54	13-Mar-2001	23:55	2.4990°N	38.0002°W	1500
55	14-Mar-2001	02:02	2.6662°N	38.0008°W	1500
56	14-Mar-2001	04:18	2.8332°N	38.0010°W	1500
57	14-Mar-2001	06:30	2.9993°N	37.9985°W	1500
58	14-Mar-2001	08:53	3.1660°N	37.9998°W	1500
59	14-Mar-2001	10:59	3.3320°N	37.9998°W	1500
60	14-Mar-2001	13:10	3.4992°N	37.9998°W	1500
61	14-Mar-2001	15:22	3.6660°N	38.0007°W	1500
62	14-Mar-2001	17:37	3.8305°N	38.0000°W	1500
63	14-Mar-2001	19:56	3.9990°N	38.0007°W	1500
64	14-Mar-2001	23:14	4.3313°N	38.0003°W	1500
65	15-Mar-2001	02:14	4.6615°N	37.9998°W	1500
66	15-Mar-2001	05:32	4.9995°N	37.9997°W	1500
67	15-Mar-2001	08:36	5.3322°N	38.0000°W	1500
68	15-Mar-2001	11:50	5.6655°N	37.9992°W	1500
69	15-Mar-2001	14:55	5.9947°N	37.9997°W	1500
70	15-Mar-2001	18:20	6.3332°N	38.0007°W	1500
71	16-Mar-2001	22:23	1.9990°N	41.0002°W	1500
72	17-Mar-2001	01:36	2.3322°N	41.0000°W	1500
73	17-Mar-2001	05:00	2.6635°N	40.9997°W	1500
74	17-Mar-2001	08:11	2.9990°N	40.9997°W	1500
75	17-Mar-2001	11:13	3.3322°N	40.9993°W	1500
76	17-Mar-2001	14:19	3.6653°N	41.0003°W	1500
77	17-Mar-2001	17:28	3.9983°N	41.0003°W	1500
78	17-Mar-2001	20:46	4.3330°N	41.0003°W	1500
79	17-Mar-2001	23:46	4.6670°N	41.0003°W	1500
80	18-Mar-2001	02:42	4.9982°N	41.0002°W	1500
81	18-Mar-2001	05:54	5.3318°N	41.0005°W	1500
82	18-Mar-2001	09:08	5.6647°N	41.0003°W	1500
83	18-Mar-2001	12:06	5.9992°N	40.9992°W	1500
84	18-Mar-2001	15:09	6.3330°N	40.9995°W	1500
85	19-Mar-2001	20:06	2.0045°N	43.9973°W	1500
86	19-Mar-2001	23:12	2.3333°N	43.9998°W	1500
87	20-Mar-2001	02:10	2.6653°N	43.9995°W	1500
88	20-Mar-2001	05:18	2.9990°N	43.9992°W	1500
89	20-Mar-2001	08:27	3.3327°N	43.9980°W	1500
90	20-Mar-2001	11:53	3.6665°N	43.9997°W	1500
91	20-Mar-2001	14:50	3.9972°N	44.0002°W	1500
92	20-Mar-2001	17:50	4.3320°N	43.9978°W	1500
93	20-Mar-2001	20:51	4.6660°N	44.0003°W	1500
94	21-Mar-2001	00:07	4.9998°N	44.0002°W	1500
95	21-Mar-2001	03:14	5.3313°N	44.0002°W	1500
96	21-Mar-2001	06:34	5.6650°N	43.9995°W	1500
97	21-Mar-2001	09:49	6.0002°N	43.9995°W	1500
98	21-Mar-2001	12:57	6.3327°N	43.9993°W	1500
99	21-Mar-2001	16:09	6.6645°N	43.9998°W	1500

Table 2: Mark 12 XBT deployments

<b>XBT</b>	<b>Date</b>	<b>Time(UTC)</b>	<b>Latitude</b>	<b>Longitude</b>	<b>comment</b>
2	10-Mar-2001	14:03	6.1819°N	35.0065°W	
4	10-Mar-2001	21:24	6.9862°N	35.0005°W	
5	10-Mar-2001	23:07	6.9794°N	35.0145°W	
6	11-Mar-2001	01:06	6.6153°N	35.1710°W	
7	11-Mar-2001	03:19	6.2302°N	35.3365°W	
8	11-Mar-2001	05:29	5.8438°N	35.5015°W	
9	11-Mar-2001	07:32	5.4715°N	35.6613°W	
10	11-Mar-2001	09:39	5.0858°N	35.8263°W	
11	11-Mar-2001	11:48	4.6995°N	35.9921°W	
12	11-Mar-2001	13:57	4.3190°N	36.1549°W	
14	11-Mar-2001	16:07	3.9215°N	36.3262°W	
15	11-Mar-2001	18:8	3.5409°N	36.4881°W	
17	11-Mar-2001	22:21	2.7787°N	36.8140°W	
18	12-Mar-2001	00:20	2.4017°N	36.9750°W	
19	12-Mar-2001	02:33	2.0077°N	37.1360°W	
20	12-Mar-2001	04:38	1.6300°N	37.3038°W	
21	12-Mar-2001	06:45	1.2515°N	37.4660°W	
22	12-Mar-2001	08:50	0.8707°N	37.6285°W	
23	12-Mar-2001	10:58	0.4838°N	37.7938°W	
24	12-Mar-2001	13:41	0.0034°N	37.9976°W	
25	12-Mar-2001	15:11	0.0010°N	38.0015°W	
27	15-Mar-2001	18:16	6.3303°N	38.0000°W	
28	15-Mar-2001	19:36	6.3466°N	38.0074°W	
29	15-Mar-2001	21:56	5.9693°N	38.2684°W	
30	16-Mar-2001	00:10	5.6110°N	38.5160°W	
31	16-Mar-2001	02:29	5.2337°N	38.7753°W	
32	16-Mar-2001	04:44	4.8700°N	39.0267°W	
33	16-Mar-2001	06:57	4.5067°N	39.2760°W	
34	16-Mar-2001	09:16	4.1294°N	39.5360°W	
35	16-Mar-2001	11:25	3.7718°N	39.7823°W	
36	16-Mar-2001	13:42	3.3969°N	40.0400°W	
37	16-Mar-2001	16:01	3.0168°N	40.3015°W	
38	16-Mar-2001	18:12	2.6681°N	40.5409°W	
39	16-Mar-2001	20:29	2.2990°N	40.7946°W	
40	16-Mar-2001	22:17	2.0046°N	40.9974°W	
41	16-Mar-2001	23:38	1.9972°N	41.0063°W	
42	18-Mar-2001	15:01	6.3149°N	41.0002°W	
43	18-Mar-2001	16:22	6.3513°N	41.0025°W	
44	18-Mar-2001	18:51	5.9661°N	41.2717°W	
45	18-Mar-2001	21:01	5.6190°N	41.5110°W	
46	18-Mar-2001	23:26	5.2367°N	41.7746°W	
47	19-Mar-2001	01:44	4.8682°N	42.0295°W	
48	19-Mar-2001	04:00	4.5047°N	42.2780°W	
50	19-Mar-2001	06:17	4.1366°N	42.5319°W	
51	19-Mar-2001	08:33	3.7738°N	42.7818°W	
52	19-Mar-2001	10:54	3.4038°N	43.0359°W	
53	19-Mar-2001	13:16	3.0352°N	43.2888°W	
54	19-Mar-2001	15:42	2.6694°N	43.5405°W	
55	19-Mar-2001	18:07	2.3021°N	43.7931°W	>250 bad

56	19-Mar-2001	18:11	2.2913°N	43.8006°W
57	19-Mar-2001	19:59	2.0183°N	43.9879°W
58	19-Mar-2001	21:24	2.0047°N	43.9921°W
59	21-Mar-2001	17:32	6.6954°N	43.9982°W
60	21-Mar-2001	19:46	6.8399°N	44.3777°W
61	21-Mar-2001	22:12	7.0180°N	44.8106°W
62	21-Mar-2001	23:53	7.1412°N	45.1105°W
63	22-Mar-2001	01:16	7.2423°N	45.3529°W
64	22-Mar-2001	03:06	7.3728°N	45.6748°W
65	22-Mar-2001	04:57	7.5065°N	45.9990°W
66	22-Mar-2001	07:05	7.6580°N	46.3681°W
67	22-Mar-2001	09:00	7.7906°N	46.6937°W
68	22-Mar-2001	10:51	7.9216°N	47.0108°W
69	22-Mar-2001	12:48	8.0615°N	47.3524°W
70	22-Mar-2001	15:03	8.2139°N	47.7282°W
71	22-Mar-2001	16:40	8.3274°N	48.0087°W
72	22-Mar-2001	18:31	8.4623°N	48.3384°W
73	22-Mar-2001	20:23	8.5993°N	48.6727°W
74	22-Mar-2001	22:15	8.7366°N	49.0093°W
75	23-Mar-2001	00:01	8.8688°N	49.3317°W
76	23-Mar-2001	01:51	9.0051°N	49.6641°W
77	23-Mar-2001	03:48	9.1510°N	50.0265°W
78	23-Mar-2001	06:06	9.3237°N	50.4455°W
79	23-Mar-2001	07:22	9.4193°N	50.6797°W
80	23-Mar-2001	09:14	9.5518°N	51.0003°W
81	23-Mar-2001	11:26	9.7095°N	51.3804°W
82	23-Mar-2001	13:18	9.8403°N	51.7011°W
83	23-Mar-2001	15:02	9.9596°N	51.9940°W
84	23-Mar-2001	17:03	10.0963°N	52.3300°W
85	23-Mar-2001	19:04	10.2325°N	52.6651°W
86	23-Mar-2001	21:13	10.3839°N	53.0373°W
87	23-Mar-2001	23:01	10.5100°N	53.3488°W
88	23-Mar-2001	23:04	10.5132°N	53.3573°W
89	24-Mar-2001	00:51	10.6392°N	53.6666°W
90	24-Mar-2001	02:40	10.7753°N	54.0015°W
91	24-Mar-2001	04:47	10.9633°N	54.3917°W
92	24-Mar-2001	06:15	11.0731°N	54.6639°W
93	24-Mar-2001	07:59	11.2027°N	54.9880°W
94	24-Mar-2001	10:11	11.3479°N	55.3312°W

Table 3: PALACE floats deployed

<i>SOLO S/N</i>	<i>Date</i>	<i>Time (UTC)</i>	<i>Latitude</i>	<i>Longitude</i>	<i>at CTD</i>
1152	7-Mar-2001	13:16	0°0.295'S	35°0.458'W	6
1141	10-Mar-2001	22:55	6°59.560'N	35°0.700'W	38
1131	21-Mar-2001	11:02	6°01.070'N	43°59.610'W	97
1156	23-Mar-2001	09:17	9°33.1142'N	51°0.0234'W	-
1173	24-Mar-2001	08:05	11°12.634'N	54°59.896'W	-



Table 4: Drifters deployed

<i>ARGOS id</i>	<i>Date</i>	<i>Time (UTC)</i>	<i>Latitude</i>	<i>Longitude</i>	<i>at CTD</i>
29219	7-Mar-2001	13:16	0°0.295'S	35°0.458'W	6
29157	10-Mar-2001	0:20	4°41.775'N	35°0.142'W	31
29217	10-Mar-2001	23:00	6°59.500'N	35°0.700'W	38
29218	16-Mar-2001	23:46	2°00.500'N	41°00.300'W	71
29156	18-Mar-2001	16:30	6°20.369'N	41°00.777'W	84
29158	19-Mar-2001	17:30	6°41.600'N	43°59.700'W	99