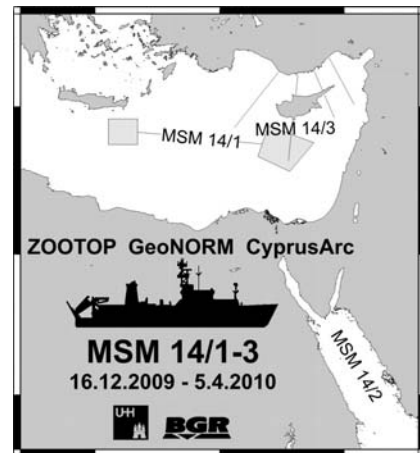


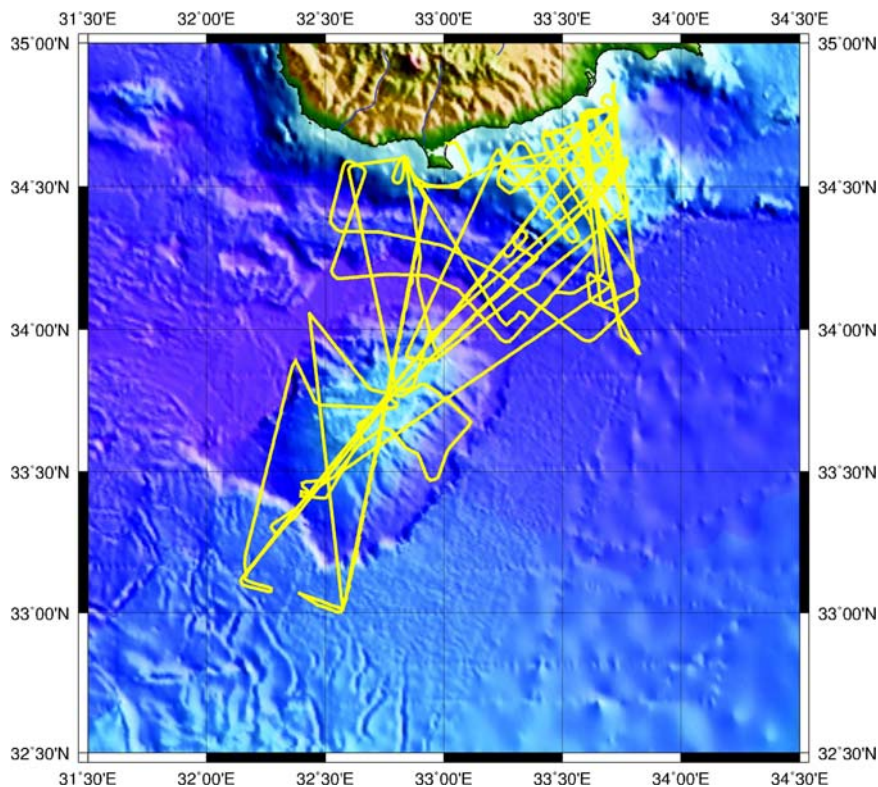
Christian Hübscher
Institute for Geophysics
University of Hamburg
Bundesstrasse 55
20146 Hamburg / Germany

Tel. +49 40 42838 5184
Fax. +49 40 42838 5441

Email: Christian.huebscher@zmaw.de



Short Cruise Report
RV MARIA S. MERIAN Cruise MSM14/3
Limassol (Cyprus) to Limassol (Cyprus)
12 March – 5 April 2010
Chief Scientist: Christian Hübscher
Captain: Friedhelm von Staa



Cruise track MSM14/3

Objectives

To understand how the continents evolved and how, and where, they hide our resources or cause catastrophic events, we must learn the lessons of plate tectonics from active examples. Most of the Earth's solid surface dynamics occurs at plate boundaries, as manifest spectacularly in earthquakes and volcanoes, less spectacularly, but equally importantly, in sedimentary basins and mountain ranges. In the eastern Mediterranean, the Cyprus arc has been the location of subduction of the oceanic edge of the African plate below the Aegean/Anatolian microplate, which itself is squeezed between the larger African and Eurasian plates. But now microcontinental blocks on the oceanic edge of the African plate are beginning to collide with the Aegean/Anatolian microplate, the Cyprus arc is in transition from subduction to continental collision. The working program was designed to unravel the impact of the incipient continent-continent collision on the deep crustal structure, on the Pliocene-Quaternary sediment succession and on the morphostructure of the seabed in the entire study area. In order to image the deep crustal structure we chose a multi-scale approach including wide angle seismic reflections and refractions seismics, gravity, magnetics as well as magnetotelluric data along four profiles. The uppermost few kilometres of the crust were investigated by means of multichannel seismics, gravity, magnetics, sediment subbottom profiling and multibeam surveying.

Narrative

RV Maria S. Merian left Limassol harbor in the evening of the 12th of March. About 2 hours later and after leaving the 3 nm zone collections of gravity and hydroacoustic data started. Shortly afterwards the reflection seismic equipment and the magnetometer were deployed. The first three multi-parameter profiles covered the southern Cyprus continental slope, the Cyprus trench, the northern part of the Eratosthenes Seamount (ESM) and Hecataeus Rise (HR). These seismic data provided a first insight into the upper 1000 m of these dominant features. The data elucidate mass-wasting on the southern continental slope of Cyprus, compressional salt tectonics between Cyprus and ESM, growth strata in the Cyprus Trench and tectonic faulting.

On Sunday, 14th of March, all towed equipment was retrieved and the preparations for the deployment of 37 ocean-bottom-seismometers (OBS) and 12 magnetotelluric stations (MT) started with testing the releaser systems in water depth of 1000 m. All these instruments were deployed along two profiles until 15th of March. The northern seamount and adjacent trenches has been investigated by three more profiles during a 24 hour survey. On March 16 we started with the deployment of the 98-Liter airgun cluster and started with shooting along the first two wide angle reflection / refraction seismic profiles (WARRPs). As usually along all profiling measurements, gravity, magnetic, sediment subbottom profiler and multi-beam data were collected along the profiles. Directly after the successful end of the shooting the OBS were collected until March 22nd.

The following 24 hours we spend with geophysical profiling between ESM and HR, getting first ideas about the intricate tectonic history of ESM. In order to investigate the deep interior of the HR we deployed 15 OBS along a ca. 100 km long WARRP. We directly started to shoot with the 98 liter cluster along this line. Subsequently the OBS were recovered. On March 25 we had a closer look on the flanks of the ESM which reveals several canyons overprinted by tectonic processes and a circular

depression. The deployment of the OBS along the final WARRP was done on the 26th and 27th of March. Before this line was measured we spent 24 more hours with geophysical profiling and a test of the controlled source magnetotelluric system. Shooting along the last WARRP was successfully finished on March 23rd and the recovery of the OBS and the magnetotelluric stations was done on April 1st. The next two days we surveyed mainly the HR, before we released two remaining OBS south-east of Cyprus. During the final 24 hours of the cruise we completed the multi-beam map of the HR. Our cruise ended in Limassol harbour on April 5th in the morning.

Acknowledgements

We would like to thank Captain Friedhelm von Staa, his officers and the crew of R/V Maria S. Merian who contributed with their competent and professional support significantly to the success of the cruise. The cooperativeness, efficiency and problem management aboard was outstanding. Further we would like to thank Mr. Wolfgang Mahrle from Germany's Foreign Office, Mr. Ralf Teepe from the Embassy of the Federal Republic of Germany Nicosia and their colleagues for their extensive support in all diplomatic issues.

The ship time of R/V Maria S. Merian and financial support was provided by the Deutsche Forschungsgemeinschaft (DFG).

Scientists

PD Dr. Christian Hübscher	Fahrtleiter / <i>Chief Scientist</i>	IfG-HH
Dr. Ali Dehghani	Geophysics	IfG-HH
Prof. Dr. Jeremy Hall	Geophysics	MUN
Prof. Dr. Keith Louden	Geophysics	DAL
Nikolaos Markou	Observer	MCIT
Sven Winter	Technician/Geophysics	IfG-HH
Joachim Bülow	Engineer/Electronics	IfG-HH
Benjamin Schwarz	Geophysics	IfG-HH
Carina Juretzek	Geophysics	IfG-HH
Frederike v. Schlippe	Geophysics	IfG-HH
Illona Ott	Geophysics	IfG-HH
Benedikt Weiss	Geophysics	IfG-HH
Marcel Ruhnau	Geophysics	IfG-HH
Hanna Blanck	Geophysics	IfG-HH
Jonas Wagner	Geophysics	IfG-HH
Robert Pfau	Geophysics	IfG-HH
Garland Darrell Moulard	Engineer	MUN
Robert Joseph Iulucci	Geophysics	DAL
Matthias Delescluse	Geophysics	DAL
Graham Bruce Standen	Geophysic	GC
Dr. Sebastian Hölz	Geophysics	IfM-GEOMAR
Martin Wollatz-Vogt	Engineer	IfM-GEOMAR

DAL

Department of Oceanography
Dalhousie University
Halifax, Nova Scotia
Canada B3H 4J1
www.phys.ocean.dal.ca

IfM-GEOMAR

Leibniz-Institute of Marine Sciences
Wischhofstrasse 1-3,
D-24148 Kiel, Germany
www.ifm-geomar.de

GC

Geoforce Consultants Ltd.
P.O. Box 696
Dartmouth, Nova Scotia / Canada B2Y
3Y9

MCIT

Ministry of Commerce, Industry and
Tourism
<http://www.mcit.gov.cy>

IfG-HH

Institute for Geophysics
University of Hamburg
Bundesstrasse 55
20146 Hamburg, Germany
www.geophysics.zmaw.de

MUN

Department of Earth Sciences
Memorial University of Newfoundland
300 Prince Philip Drive
St. John's, NL, Canada A1B 3X5
www.mun.ca/earthsciences

MSM14/3 Multi-parameter geophysical profiles (multichannel seismics, gravity, magnetics, sediment subbottom profiling, Multibeam). Profiles 07, 08, 13 and 27 are wide angle reflection & refraction profiles (WARRPs).

Source	Profile	Start				Ende				Length[km]
		Date	UTC	Latitude	Longitude	Date	UTC	Lat	Lon	
GI-Gun	01	13.03.2010	00:36:15	34°33,092'	32°35,963'	13.03.2010	09:51:43	33°48,180'	32°47,614'	91
GI-Gun	02	13.03.2010	11:03:34	33°49,07'	32°52,66'	13.03.2010	12:50:50	33°57,69'	32°55,71'	18
GI-Gun	03	13.03.2010	13:03:28	33°58,587'	32°56,360'	13.03.2010	23:37:40	34°33,39'	33°44,20'	98
GI-Gun	04	15.03.2010	19:36:00	34°44,17'	33°34,78'	16.03.2010	03:13:50	34°6,295'	33°39,544'	78
GI-Gun	05	16.03.2010	03:48:00	34°6,013'	33°42,162'	16.03.2010	04:43:09	34°8,317'	33°48,067'	17
GI-Gun	06	16.03.2010	05:23:00	34°11,291'	33°48,734'	16.03.2010	12:27:00	34°41,322'	33°26,583'	65
Bolt	07	16.03.2010	18:30:52	34°45,776'	33°43,183'	18.03.2010	06:41:00	33°7,506'	32°9,054'	234
Bolt	08	18.03.2010	21:46:59	33°41,628'	32°41,422'	19.03.2010	12:50:27	34°33,356'	33°45,455'	139
GI-Gun	10	22.03.2010	12:22:00	34°39,530'	33°44,333'	23.03.2010	00:33:00	34°54,744'	32°50,516'	137
GI-Gun	11	23.03.2010	00:56:00	33°53,838'	32°52,388'	23.03.2010	01:36:00	33°53,490'	32°56,700'	10
GI-Gun	12	23.03.2010	01:57:00	33°54,093'	32°58,668'	23.03.2010	11:20:00	34°25,284'	33°45,859'	93
Bolt	13	23.03.2010	22:20:46	33°59,862'	33°44,544'	24.03.2010	09:42:22	34°44,638'	33°34,672'	91
GI-Gun	14	25.03.2010	16:50:15	33°25,608'	32°31,115'	25.03.2010	20:07:00	33°39,120'	32°44,676'	34
GI-Gun	15	25.03.2010	20:28:00	33°38,699'	32°50,681'	25.03.2010	22:59:00	33°28,177'	32°56,580'	25
GI-Gun	16	25.03.2010	23:17:00	33°28,606'	32°58,383'	26.03.2010	01:42:00	33°39,905'	33°06,542'	28
GI-Gun	17	26.03.2010	01:59:00	33°41,150'	33°06,240'	26.03.2010	04:10:26	33°48,431'	32°54,884'	33
GI-Gun	18	26.03.2010	05:13:42	33°45,867'	32°48,938'	26.03.2010	10:15:00	34°02,276'	32°27,020'	47
GI-Gun	19	27.03.2010	07:01:00	34°37,502'	33°14,258'	27.03.2010	11:08:00	34°18,925'	33°31,480'	52
GI-Gun	20	27.03.2010	11:48:23	34°20,331'	33°33,634'	27.03.2010	15:14:00	34°38,860'	33°20,687'	38
GI-Gun	21	27.03.2010	15:19:00	34°38,613'	33°20,843'	27.03.2010	21:51:09	34°44,998'	33°37,467'	39
GI-Gun	22	27.03.2010	22:00:21	34°44,270'	33°38,273'	28.03.2010	01:28:00	34°24,559'	33°46,013'	69

GI-Gun	23	28.03.2010	02:26:00	34°25,93'	33°41,83'	28.03.2010	05:36:00	34°41,844'	33°29,335'	41
GI-Gun	24	28.03.2010	06:09:00	34°40,83'	33°25,69'	28.03.2010	09:44:00	34°22,246'	33°37,252'	40
GI-Gun	25	28.03.2010	10:44:00	34°16,585'	33°37,353'	28.03.2010	12:54:00	34°07,01'	33°27,23'	37
Bolt	27	28.03.2010	22:58:59	34°35,151'	32°50,375'	29.03.2010	23:19:00	33°00,821'	32°34,411'	180
GI-Gun	28	01.04.2010	13:14:16	34°49,299'	33°42,938'	01.04.2010	20:20:09	34°6,949'	33°48,904'	85
GI-Gun	29	01.04.2010	20:42:00	34°5,082'	33°47,479'	01.04.2010	22:32:02	33°57,762'	33°37,840'	25
GI-Gun	30	01.04.2010	22:59:11	33°57,895'	33°34,954'	02.04.2010	08:30:22	34°20,593'	32°33,808'	112
GI-Gun	31	02.04.2010	09:02:41	34°22,866'	32°33,808'	02.04.2010	11:04:26	34°34,867'	32°34,280'	23
GI-Gun	32	02.04.2010	12:04:39	34°32,619'	32°40,017'	02.04.2010	15:36:44	34°12,548'	32°31,666'	56
GI-Gun	33	02.04.2010	16:05:24	34°10,647'	32°33,533'	02.04.2010	22:42:16	33°57,676'	33°14,625'	77
GI-Gun	34	02.04.2010	23:05:23	33°57,765'	33°17,093'	03.04.2010	01:15:25	34°7,529'	33°27,791'	31
GI-Gun	35	03.04.2010	01:53:06	34°7,534'	33°32,145'	03.04.2010	03:01:05	34°10,804'	33°39,292'	16
GI-Gun	36	03.04.2010	03:18:47	34°12,253'	33°40,290'	03.04.2010	08:45:25	34°44,756'	33°35,618'	77
GI-Gun	37	03.04.2010	10:15:13	34°43,754'	33°41,744'	03.04.2010	12:57:38	34°33,865'	33°26,123'	55
GI-Gun	38	03.04.2010	15:14:43	34°34,202'	33°15,707'	03.04.2010	19:01:04	34°34,568'	33°43,128'	48
GI-Gun	39	03.04.2010	19:36:12	34°36,609'	33°42,824'	03.04.2010	22:41:18	34°23,626'	33°26,200'	35

Deployment and recovery coordinates of Ocean Bottom Seismometers (OBS)

		<u>WARRP 07</u>											
Nr.	OBS	Deployment				Recovery				Depth [m]	Offset		
		Lat [°]	Lat [']	Lon [°]	Lon [']	Lat [°]	Lat [']	Lon [°]	Lon [']		min [m]	max [m]	
1	GSC A	34	43,29	33	40,73	34	43,26	33	40,762	798	-228707	5726	
2	GSC C	34	39,68	33	37,42	34	39,611	33	37,411	783	-22034	14093	
3	GSC D	34	36,30	33	33,93					784	-205138	29295	
4	GSC E	34	33,30	33	31,14	34	33,35	33	31,092	747	-198878	35555	
5	GSC F	34	30,69	33	28,53	34	30,71	33	28,554	718	-190182	4425	
6	GSC H	34	27,01	33	24,99	34	27,02	33	24,984	856	-184034	50399	
7	GSC J	34	24,40	33	22,50	34	24,43	33	22,511	964	-184,034	50,399	
8	OBH Krieg	34	19,50	33	18,19	34	19,57	33	18,34	2015	-61440	170240	
9	OBS DUFF	34	15,61	33	14,03	34	15,64	33	14,395	2023	-71201	160382	
10	OBH Binky	34	11,71	33	10,35	34	11,70	33	10,3	2082	-80308	151378	
11	OBS JEVER	34	7,38	33	6,06	34	7,40	33	6	2585	-90713	140873	
12	OBS ESPECIAL	34	3,29	33	2,06	34	3,21	33	2,203	2507	-100474	131218	
13	OBS Becks	33	58,99	32	58,02	33	58,96	32	58,027	1877	-110496	121194	
14	OBS GANTER	33	54,78	32	53,94	33	54,57	32	53,878	1575	-120493	111198	
15	GSC K	33	50,18	32	49,50	33	50,19	32	49,43	1020	-102967	13147	
16	GSC L	33	41,47	32	41,28	33	41,52	32	41,244	820	-82481	151957	
17	GSC N	33	37,35	32	37,41	33	37,38	32	37,398	808	-72801	161638	
18	GSC P	33	31,57	32	31,82	33	31,63	32	31,846	1184	-59067	175377	
19	DAL A	33	25,27	32	25,80	33	25,11	32	26	1723	-44161	190292	
20	DAL B	33	19,05	32	19,82	33	18,89	32	20,023	1594	2949	-29414	
21	DAL C	33	13,41	32	14,70	33	13,23	32	14,92	1580	1821	-16339	

		<u>WARRP 08</u>											
Nr.	OBS	Deployment				Recovery				Depth [m]	Offset		
		Lat [°]	Lat [']	Lon [°]	Lon [']	Lat [°]	Lat [']	Lon [°]	Lon [']		min [m]	max [m]	
23	OBS Rothaus	33	45,90	32	46,75					903	-131138	12014	
24	OBH Pest	33	51,69	32	54,25	32	54,13	33	51,742	1174	-114579	28574	
25	OBS Astra	33	55,42	32	58,58	33	55,43	32	58,474	1590	-104693	38459	
26	OBH Hunger	34	0,02	33	4,27	34	0,03	33	4,305	2309	-91975	51177	
27	OBS Carlsberg	34	3,79	33	8,85	34	3,59	33	8,961	2523	-81676	61476	
28	OBS Polar	34	7,50	33	13,55	34	7,36	33	13,964	2185	-72009	71148	
29	OBH TOD	34	11,638	33	18,618	34	11,84	33	18,966	2110	-59788	83364	
30	OBS Karlsquell	34	15,392	33	23,317	34	15,68	33	23,585	1802	-49437	93715	
31	DAL E	34	19,110	33	28,032	34	19,31	33	28,335	1132	-102439	37593	
32	DAL F	34	22,092	33	31,728	34	22,18	33	31,867	1112	-110344	29688	
33	DAL G	34	26,190	33	36,678					273			
34	DAL H	34	28,308	33	39,138					419			
35	DAL I	34	30,012	33	41,430	34	29,75	33	41,341	557	-131194	8834	
36	DAL K	34	31,902	33	43,740	34	31,96	33	43,652	863	-136162	3867	
37	DAL N	34	33,396	33	45,498	34	33,46	33	45,367	988	-140023	-29	

		<u>WARRP 13</u>											
Nr.	OBS	Deployment				Recovery				Depth [m]	Offset		
		Lat [°]	Lat [']	Lon [°]	Lon [']	Lat [°]	Lat [']	Lon [°]	Lon [']		min [m]	max [m]	
1	DAL-E	34	42,996	33	34,974	34	42,95	33	34,964	551	-3268	87166	
2	DAL-F	34	40,206	33	35,567	34	40,14	33	35,551	653	-8448	81993	

3 DAL-I	34	37,404	33	36,222	34	37,33	33	36,095	819	-13722	76719
4 DAL-K	34	34,620	33	36,876	34	34,60	33	36,838	798	-19317	71131
5 DAL-N	34	31,716	33	37,488	34	31,71	33	37,541	685	-24407	66045
6 OBS Rothaus	34	28,902	33	38,094	34	28,93	33	38,234	360	-46516	25270
7 OBS GANTER	34	26,538	33	38,856	34	26,20	33	39,012	278	-42622	29164
8 OBS Becks	34	23,256	33	39,420	34	23,37	33	39,609	664	-37449	34302
9 OBS Keo/Carlsberg	34	20,421	33	40,020	34	20,60	33	40,285	1054	-32934	38818
10 OBS Polar	34	17,610	33	40,620	34	17,78	33	40,831	1891	-28445	43307
11 GSC-A	34	14,808	33	41,202	34	14,96	33	41,442	1919	-56175	34359
12 GSC-C	34	11,913	33	41,904	34	12,03	33	41,994	1872	-61628	28926
13 GSC-E	34	9,126	33	42,498	34	9,27	33	42,647	2138	-66643	23918
14 GSC-F	34	6,318	33	43,134	34	6,41	33	43,291	2153	-72139	18521
15 GSC-H	34	3,420	33	43,734	34	3,52	33	43,938	2176	-77558	13234

WARRP 27

Nr.	OBS	Deployment				Recovery				Depth [m]	Offset	
		Lat [°]	Lat [°]	Lon [°]	Lon [°]	Lat [°]	Lat [°]	Lon [°]	Lon [°]		min [m]	max [m]
1	GSC A	33	0,745	32	34,400	33	0,74	32	34,400	1423	-222	178309
2	GSC C	33	3,280	32	35,241	33	3,28	32	35,241	1444	-5083	173494
3	GSC E	33	5,770	32	35,838	33	5,77	32	35,838	1431	-9778	168803
4	GSC F	33	9,585	32	36,644	33	9,59	32	36,644	1434	-16919	161661
5	GSC H	33	13,506	32	37,748	33	13,51	32	37,748	2051	-24363	15426
6	GSC J	33	15,795	32	38,253	33	15,80	32	38,253	1981	-28663	149967
7	OBH Binky	33	17,918	32	38,736	33	17,952	32	38,800	1856	-122461	27793
8	OBS JEVER	33	20,480	32	39,351	33	20,562	32	39,363	1774	-118314	31850
9	OBS Polar	33	23,486	32	40,126	33	23,622	32	40,099	1634	-113436	36763
10	OBS GANTER	33	26,390	32	40,835	33	28,987	32	41,722	1430	-108740	41487
11	OBS Carlsberg/Keo	33	29,003	32	41,433	33	29,076	32	41,442	1356	-104524	45723
12	OBH Krieg	33	32,073	32	42,230	33	32,133	32	42,264	1195	-99550	50742
13	OBS Astra	33	34,688	32	42,924	33	34,747	32	43,012	832	-95323	55018
14	GSC K	33	36,784	32	43,424	33	36,78	32	43,424	840	-68263	110558
15	GSC L	33	39,815	32	44,140	33	39,81	32	44,140	945 no	data	
16	GSC N	33	42,614	32	44,742	33	42,61	32	44,742	931	-79224	99652
17	GSC P	33	45,709	32	45,555	33	45,71	32	45,555	916	-85079	93855
18	DAL A	33	48,184	32	46,121	33	48,18	32	46,121	953	-89735	89233
19	DAL B	33	50,954	32	46,812	33	50,95	32	46,812	1115	-94963	8406
20	DAL C	33	54,262	32	47,609	33	54,26	32	47,609	1658	-101198	77894
21	OBS Becks	33	56,285	32	48,103	33	56,278	32	48,069	1768	-60708	90083
22	OBS Rothaus	33	59,218	32	48,929	33	59,21	32	48,929	1899	-56041	94907
23	OBH Pest	34	2,782	32	49,588	34	2,864	32	49,727	2509	-50433	100699
24	OBS Karlsquell	34	4,876	32	50,213	34	4,885	32	50,422	2508	-47141	104049
25	OBS DUFF	34	7,894	32	50,816	34	7,925	32	50,961	2642	-41423	108882
26	OBH TOD	34	10,676	32	51,501	34	10,647	32	51,855	2664	-41423	108882
27	OBH Hunger	34	13,189	32	52,101	34	13,234	32	52,165	2699	-30155	117583
28	OBS ESPECIAL	34	16,284	32	52,802	34	16,281	32	52,857	2209	-23670	122472
29	DAL D	34	19,074	32	53,541	34	19,07	32	53,541	2115	-147946	32477
30	DAL E	34	22,383	32	54,362	34	22,38	32	54,362	1994	-154189	26794
31	DAL F	34	24,803	32	54,826	34	24,80	32	54,826	2045	-158726	22777
32	DAL I	34	27,294	32	55,440	34	27,29	32	55,440	1977	-163411	18943
33	DAL K	34	31,939	32	52,477	34	31,94	32	52,477	160	-171013	9243
34	DAL N	34	35,294	32	50,340	34	35,29	32	50,340	118	-176503	4146