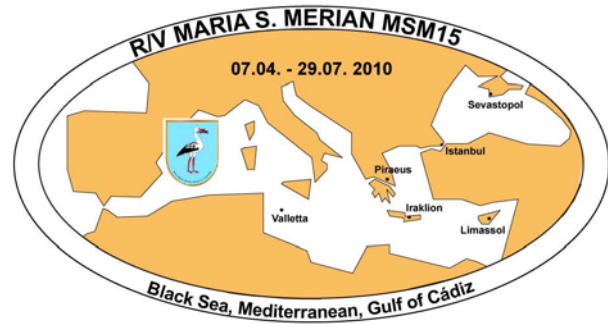


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**Short Cruise Report  
MERIAN MSM15-3  
“SACRE”  
Elefsina – Valletta  
05.06.2010 – 04.07.2010  
Chief Scientist: Katrin Huhn  
Captain: Ralph Schmidt**

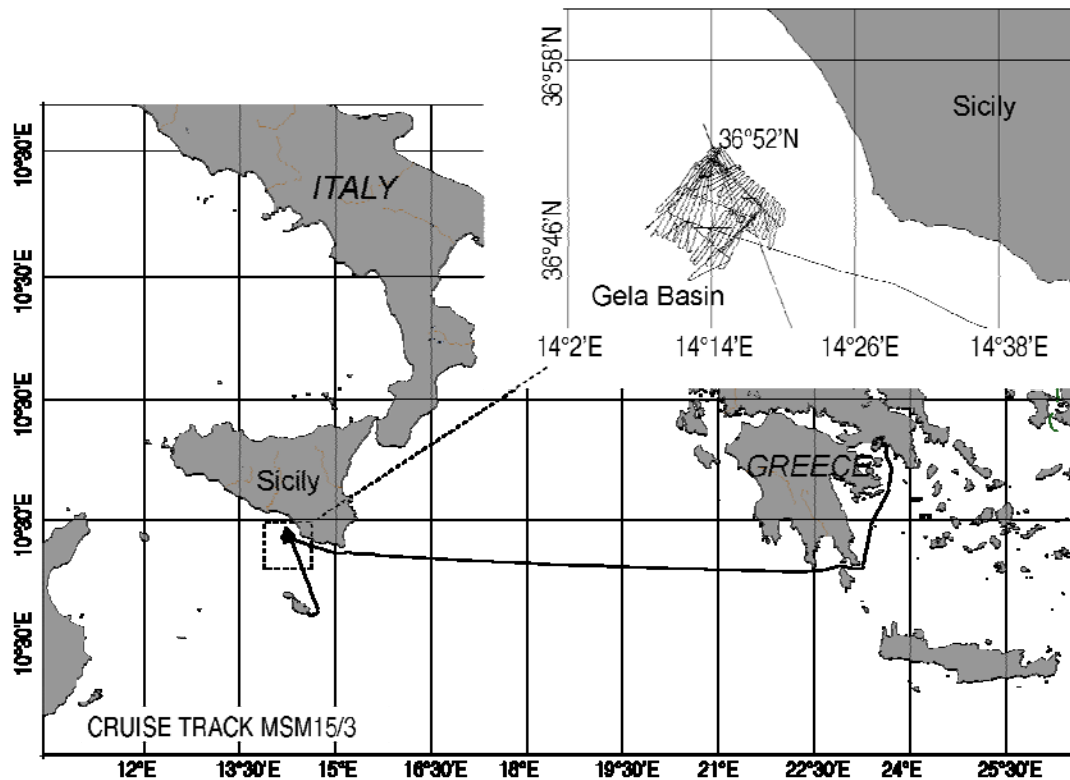


Fig. 1 Trackplot of MSM15-3

## **Objectives**

Submarine landslides occur at all sediment bearing margins worldwide. Although many studies have dealt with mapping and monitoring of submarine landslide as well as investigations of trigger mechanisms and sediment failure processes within the last decades, many open questions persist why a given slope fails catastrophically whereas another adjacent remains stable.

Hence, the main objective of the research expedition MSM15/3 was to drill two distinct landslides: the Twin slides, on the eastern slope of the Gela Basin offshore South Sicily (Italy) utilizing the new Bremer sea floor drill rig (MeBo) to get a better ground truthing of geophysical data and to collect samples for further sedimentological, geochemical and geotechnical analysis. Therefore, MeBo was deployed at three sites at the undisturbed slope apron and the depositional area of these landslide masses. Sediment cores from up to 55 meter below seafloor (mbsf) including the failure planes and stacked mass transport deposits in the proximal and distal areas respectively were drilled. Besides, 7 gravity cores with a total length of 35m were recovered and two CPT (Cone Penetration Test) profiles (in total: 12 deployments) were recorded along the headwall of the northern slide complex. In addition, a high resolution map of the entire slide complex was recorded utilizing the EM710 and Parasound.

Analysis of all data will enable an age dating and estimation of the recurrence rate of mid-sized slide events and a sediment physical characterization to gain a deeper insight into kinematics and physical processes during failure as well as to test a number of hypothesis regarding the trigger mechanisms, such as the weakness of clayey deposits, and/or pore pressure changes due to high accumulation rates.

## **Narrative**

The scientific crew of expedition MSM15/3 - 21 scientists and technicians from the MARUM and the universities of Bremen, Kiel (Germany) and Fribourg (Switzerland), boarded the R/V MARIA S. MERIAN in the port of Elefsina (Greece) on the 4<sup>th</sup> June 2010. Just during unpacking our containers, the work permit for Greek waters was initially recalled by the Greek Foreign Office and finally retracted on the 9<sup>th</sup> June based on several political reasons. As a consequence, Dr Efthymios Tripsanas (HCMR; Hellenic Center of Marine Research) – the Greek observer, disembarked and R/V MARIA S. MERIAN had to harbour in the port of Elefsina with the aim to leave Greek waters as soon as possible.

In the meanwhile, we developed a new scientific program to work in Italian waters south of Sicily. As the major aim of this expedition was to drill a transect through a distinct mid-sized slide complex from the undisturbed slope apron to the depositional area of slid landslide masses we designed a new work plan for the Twin slide complex south of Sicily. This slide complex has previously been identified on the basis of side-scan sonar, chirp and swath bathymetry data in water depth between 200 – 800m below sea level. Hence, excellent data regarding the slide geometries and local settings which are essential to deploy MeBo were already available and were immediately provided by colleagues from the University of Bologna. They also consented instantaneously to collaborate in a new joint project and to support the purpose of MSM15/3. Hence, we submitted a new work plan and application for work permit in Italian waters by the 9<sup>th</sup> June 2010. During the next two weeks, we acquainted ourselves with the new target area; we set up labs and instruments and several MeBo tests were carried out in the harbor basin of Elefsina. Finally, we received a

positive answer from the Italian Foreign Office in Rom on the morning of the 24<sup>th</sup> June and left the port of Elefsina instantaneously in the evening.

After arriving in the Gela Basin offshore Sicily on the 26<sup>th</sup> June, the first sound velocity profile was recorded (GeoB14401-1) to calibrate the EM710 before starting with the first Multibeam survey (GeoB14421). Simultaneously to this bathymetrical map, Parasound data were collected. Based on both datasets the first MeBo location (GeoB14401) was selected. As major aim of this cruise was to estimate the recurrence rate of mid-sized slide events in this region we drilled a distal part of the northern slide complex of the Twin slides. Drill depth was 20 mbsf (meters below sea floor). Core material consists mostly of homogenous dark greenish-gray nannofossil silty-clay (GeoB14401-3). During further hydro-acoustic surveys (GeoB14422; GeoB14423) the northern slide as well as the undisturbed slope area just above this headwall was mapped as a pres-side survey for the second MeBo drill site (GeoB14403). At this location MeBo was deployed on the 29<sup>th</sup> June. Drilling at this site has to be stopped at a depth of 19 mbsl (GeoB14403-2) and continued on the 30<sup>th</sup> June to a final depth of 54 mbsl. Subsequently, a sediment core of 54m length was drilled with a core recovery rate of 77.9% (GeoB14403-2+GeoB14403-8). Drilled sediments also consist mostly of a homogenous dark greenish-gray nannofossil silty-clay lithology. Between these MeBo deployments, a gravity core transect along the northern slide from the undisturbed slope in the vicinity of the headwall to the outer portion of the slid masses was recovered (GeoB14404-1; GeoB14405-1; GeoB14406-1). On the 1<sup>st</sup> June a second sound velocity profile was recorded (GeoB14403-10) to re-calibrate the EM710 for shallower water depth less than 300m before MeBo was deployed again at site GeoB14401 at the distal part of the northern slide. Here, the upper 15m were washed down and sediments were drilled from 15mbsl down to 36mbsl with a core recovery of 84,8%. Hence, at least the uppermost two stacked mass wasting deposits were drilled with the aim to drill as far back as possible in time to learn about recurrence rate. A third MeBo site (GeoB14414) along the undisturbed slope just above the headwall of the southern slide was initially mapped and afterwards drilled to a depth of 28.5 mbsl. Here, we drilled again through an undisturbed potential glide plane similar to GeoB14403. Therewith, we complete our transect through potential glide planes. In addition, the comparison of both sites along the undisturbed slope enable investigate of key of source material on slide kinematics. Finally, two gravity cores along the undisturbed slope between both MeBo locations and a Cone Penetration Test (CPT) transect perpendicular to the headwall of the northern slide as well as a sequence of terraces above this headwall was measured on the 3<sup>rd</sup> June.

### **Acknowledgements**

We thank Captain and crew of the MERIAN expedition MSM15/3 for their excellent support of our work at sea. Also, we thank the MeBo team for the excellent work essential for fulfilling the goals of the cruise. The MERIAN ship time for the SACRE expedition was provided by the Deutsche Forschungsgemeinschaft.

## List of participants

Name	Function	Institute
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3. Uwe Rosiak	MeBo	MARUM
4. Werner Schmidt	MeBo	MARUM
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6. Ralf Düsselmann	MeBo	MARUM
7. Markus Bergenthal	MeBo	MARUM
8. Thorsten Klein	MeBo	MARUM
9. Christian Seiter	MeBo	MARUM
10. Jesper Zedlitz	MeBo	Uni Kiel
11. Kai Kaszemeik	MeBo	MARUM
12. Volker Diekamp	Gravity core / Geolab	MARUM
13. Fei Ai	Geotechnic	MARUM
14. Christian Zöllner	CPT	MARUM
15. Gauvin Wiemer	Geotechnic	MARUM
16. Michael Strasser	Sedimentology	MARUM
17. Giordana Gennari	Sedimentology	Uni Fribourg
18. Christian d. S. Ferreira	Multibeam / PARASOUND	MARUM
19. Linda Wenk	Geochemistry	MARUM
20. S. Hammerschmidt	Geochemistry	Uni Bremen
21. Lutz Torbahn	Geophysics	MARUM

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## Scientific work /station work during MSM15/3:

MeBo cores:	3 cores (in total: 120m core length)
Gravity cores:	7 cores (in total: 35m core length)
Sound velocity profiles:	2 stations
Cone Penetration Tests (CPT):	12 deployments
Multibeam / Parasound mapping	

## Station list

Date	Station No.	GeoB No.	Gear	Time [UTC]		Position		Depth [m]
				Start	End	Lat	Lon	
26.06.2010	MSM15/604-1	GeoB14401-1	SVP-SONDE	11:14	11:44	36° 47,19' N	14° 11,95' E	631,1
26.06.2010	MSM15/605-1	GeoB14401-2	Gravity Core	12:30	13:14	36° 47,17' N	14° 11,91' E	633,4
26.06.2010	MSM15/606-1	GeoB14421	Multibeam + Parasound	14:34		36° 45,28' N	14° 12,25' E	718,5
26.06.2010					17:50	36° 45,98' N	14° 10,81' E	712,7
26.06.2010	MSM15/607-1	GeoB14401-3	MEBO	18:32		36° 47,20' N	14° 11,90' E	613,1
27.06.2010					14:45	36° 47,20' N	14° 11,92' E	606,6
27.06.2010	MSM15/608-1	GeoB14422	Multibeam + Parasound	15:57		36° 46,20' N	14° 10,31' E	713,8
27.06.2010					17:56	36° 46,39' N	14° 9,85' E	686
27.06.2010	MSM15/608-2	GeoB14402	CPT	18:36	18:59	36° 46,21' N	14° 8,94' E	729
27.06.2010	MSM15/608-1	GeoB14423	Multibeam + Parasound	19:17		36° 46,57' N	14° 9,33' E	684,3
28.06.2010					02:53	36° 50,57' N	14° 13,15' E	304,7
28.06.2010	MSM15/609-1	GeoB14403-1	Gravity Core	03:22	03:51	36° 51,41' N	14° 13,92' E	184,7
28.06.2010	MSM15/609-2	GeoB14403-2	MEBO	04:06		36° 51,44' N	14° 13,92' E	183
28.06.2010					21:07	36° 51,41' N	14° 13,89' E	182,8
28.06.2010	MSM15/610-1	GeoB14424	Multibeam + Parasound	21:35		36° 50,89' N	14° 12,49' E	276,5
29.06.2010					02:40	36° 46,55' N	14° 18,71' E	177,4
29.06.2010	MSM15/611-1	GeoB14404-1	Gravity Core	03:12	03:28	36° 48,00' N	14° 18,34' E	144,5
29.06.2010	MSM15/612-1	GeoB14403-7	MEBO	04:57		36° 51,41' N	14° 13,90' E	182
29.06.2010					10:45	36° 51,41' N	14° 13,90' E	182
29.06.2010	MSM15/613-1	GeoB14425	Multibeam + Parasound	11:14		36° 51,22' N	14° 13,77' E	0
29.06.2010					11:57	36° 48,47' N	14° 11,00' E	569
29.06.2010	MSM15/614-1	GeoB14405-1	Gravity Core	12:08	12:50	36° 48,38' N	14° 10,91' E	581
29.06.2010	MSM15/613-1	GeoB14426	Multibeam + Parasound	12:57		36° 48,32' N	14° 10,92' E	574,3
29.06.2010					13:36	36° 46,74' N	14° 8,49' E	678,5
29.06.2010	MSM15/615-1	GeoB14406-1	Gravity Core	13:53	14:33	36° 46,81' N	14° 8,65' E	670,3
29.06.2010	MSM15/616-1	GeoB14427	Multibeam + Parasound	15:36		36° 46,44' N	14° 18,68' E	185,8
30.06.2010					02:34	36° 50,29' N	14° 15,48' E	176,8
30.06.2010	MSM15/617-1	GeoB14403-8	MEBO	03:16		36° 51,41' N	14° 13,91' E	185,7
01.07.2010					12:53	36° 51,40' N	14° 13,90' E	182
01.07.2010	MSM15/618-2	GeoB14403-10	SVP-SONDE	14:08	14:20	36° 51,40' N	14° 13,90' E	182
01.07.2010	MSM15/619-1	GeoB14407	CPT	14:56	15:30	36° 50,90' N	14° 13,88' E	198,5
01.07.2010	MSM15/620-1	GeoB14408	CPT	15:52	16:34	36° 50,85' N	14° 13,80' E	200
01.07.2010	MSM15/621-1	GeoB14409	CPT	16:48	17:19	36° 50,78' N	14° 13,74' E	203
01.07.2010	MSM15/622-1	GeoB14410	CPT	17:40	18:11	36° 50,71' N	14° 13,68' E	210,5
01.07.2010	MSM15/623-1	GeoB14411	CPT	18:28	19:09	36° 50,63' N	14° 13,61' E	217,2
01.07.2010	MSM15/624-1	GeoB14428	Multibeam + Parasound	19:14		36° 50,48' N	14° 13,47' E	247,4
01.07.2010					19:19	36° 50,41' N	14° 13,45' E	289,3
01.07.2010	MSM15/625-1	GeoB14412	CPT	19:26	20:07	36° 50,41' N	14° 13,46' E	289,3
01.07.2010	MSM15/626-1	GeoB14413	CPT	20:29	21:05	36° 50,16' N	14° 13,01' E	377
01.07.2010	MSM15/624-1	GeoB14429	Multibeam + Parasound	21:19		36° 50,54' N	14° 13,49' E	246,5
01.07.2010					22:00	36° 47,92' N	14° 10,40' E	600,5
01.07.2010	MSM15/627-1	GeoB14401-5	MEBO	22:37		36° 47,19' N	14° 11,89' E	601,3

02.07.2010					12:33	36° 47,19' N	14° 11,89' E	601,2
02.07.2010	<b>MSM15/624-1</b>	<b>GeoB14430</b>	Multibeam + Parasound	12:40		36° 47,17' N	14° 11,89' E	601,2
02.07.2010					15:08	36° 47,60' N	14° 17,75' E	154,9
02.07.2010	<b>MSM15/628-1</b>	<b>GeoB14414-1</b>	MEBO	16:20		36° 48,13' N	14° 18,17' E	146
03.07.2010					05:10	36° 48,14' N	14° 18,18' E	145,2
03.07.2010	<b>MSM15/628-2</b>	<b>GeoB14414-2</b>	Gravity Core	05:28	05:46	36° 48,14' N	14° 18,18' E	145,2
03.07.2010	<b>MSM15/629-1</b>	<b>GeoB14415</b>	Gravity Core	06:33	07:08	36° 45,09' N	14° 14,86' E	619,2
03.07.2010	<b>MSM15/630-1</b>	<b>GeoB14416</b>	CPT	07:52	08:35	36° 47,80' N	14° 17,68' E	145,9
03.07.2010	<b>MSM15/631-1</b>	<b>GeoB14417</b>	CPT	08:51	09:27	36° 47,63' N	14° 17,59' E	158,7
03.07.2010	<b>MSM15/632-1</b>	<b>GeoB14418</b>	CPT	09:47	10:24	36° 47,43' N	14° 17,46' E	181,2
03.07.2010	<b>MSM15/633-1</b>	<b>GeoB14419</b>	CPT	10:43	11:17	36° 47,47' N	14° 17,30' E	188,7
03.07.2010	<b>MSM15/634-1</b>	<b>GeoB14420</b>	CPT	12:04	12:56	36° 49,17' N	14° 11,87' E	532,2
03.07.2010	<b>MSM15/635-1</b>	<b>GeoB14431</b>	Multibeam + Parasound	13:20		36° 49,73' N	14° 14,18' E	303,4
03.07.2010					17:44	36° 50,79' N	14° 14,31' E	184,2
03.07.2010	<b>MSM15/636-1</b>	<b>GeoB14432</b>	Multibeam + Parasound	18:42		36° 44,58' N	14° 13,05' E	696,5
03.07.2010					23:01	36° 47,13' N	14° 16,95' E	231,5

01.07.2010	<b>MSM15/627-1</b>	<b>GeoB14401-5</b>	MEBO	22:37		36° 47,19' N	14° 11,89' E	601,3
02.07.2010					12:33	36° 47,19' N	14° 11,89' E	601,2
02.07.2010	<b>MSM15/624-1</b>		Multibeam + Parasound	12:40		36° 47,17' N	14° 11,89' E	601,2
02.07.2010					15:08	36° 47,60' N	14° 17,75' E	154,9
02.07.2010	<b>MSM15/628-1</b>	<b>GeoB14414-1</b>	MEBO	16:20		36° 48,13' N	14° 18,17' E	146
03.07.2010					05:10	36° 48,14' N	14° 18,18' E	145,2
03.07.2010	<b>MSM15/628-2</b>	<b>GeoB14414-2</b>	Gravity Core	05:28	05:46	36° 48,14' N	14° 18,18' E	145,2
03.07.2010	<b>MSM15/629-1</b>	<b>GeoB14415</b>	Gravity Core	06:33	07:08	36° 45,09' N	14° 14,86' E	619,2
03.07.2010	<b>MSM15/630-1</b>	<b>GeoB14416</b>	CPT	07:52	08:35	36° 47,80' N	14° 17,68' E	145,9
03.07.2010	<b>MSM15/631-1</b>	<b>GeoB14417</b>	CPT	08:51	09:27	36° 47,63' N	14° 17,59' E	158,7
03.07.2010	<b>MSM15/632-1</b>	<b>GeoB14418</b>	CPT	09:47	10:24	36° 47,43' N	14° 17,46' E	181,2
03.07.2010	<b>MSM15/633-1</b>	<b>GeoB14419</b>	CPT	10:43	11:17	36° 47,47' N	14° 17,30' E	188,7
03.07.2010	<b>MSM15/634-1</b>	<b>GeoB14420</b>	CPT	12:04	12:56	36° 49,17' N	14° 11,87' E	532,2
03.07.2010	<b>MSM15/635-1</b>		Multibeam + Parasound	13:20		36° 49,73' N	14° 14,18' E	303,4
03.07.2010					17:44	36° 50,79' N	14° 14,31' E	184,2
03.07.2010	<b>MSM15/636-1</b>		Multibeam + Parasound	18:42		36° 44,58' N	14° 13,05' E	696,5
03.07.2010					23:01	36° 47,13' N	14° 16,95' E	231,5