

THERA 2006

Cruise Plan

HCMR R/V AEGAEO**GENERAL INFORMATION****Project title:** Thera 2006**Cruise Dates:** 26 April – 8 May 2006**Operating Area:** In and around the caldera of Thera volcano, Aegean Sea**Total Sea Days:** 13**Administrative Contact Information:**Haraldur Sigurdsson
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1. Cruise overview

1.1. Other points of contact

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1.2. Participating institutions

University of Rhode Island (URI)
Hellenic Centre for Marine Research (HCMR)
National Science Foundation (NSF)
Institute of Geology and Mineral Exploration (IGME)
Institute for Exploration (IFE)
NOAA Office of Ocean Exploration (NOAA/OE)

1.3. Vessel identification

- Call sign: SXYY

1.4. Permits and certification

US Department of State authorization is not required because a Greek research vessel will be used for this project.

1.5. Scientific objectives and data to be collected

I. Distribution of Minoan volcanic deposits on the seafloor around Santorini

A. Date/Sample types: seismic profiles, sediment cores, side-scan sonar, ROV exploration/samples

B. Interpretation/Analysis: processing of seismic profiles and side-scan sonar records with identification of major sedimentary units and tectonic features. Geochemical analysis (electron microprobe) of sedimentary layers for identification of eruptive sources. Correlation of seismic stratigraphic units from proximal to distal environments. Reconstruct the deposition of pyroclastic material in the marine environment as a result of the Minoan eruption. Evaluate potential volumes of Minoan pyroclastic material on the seafloor.

II. Structural evolution of the Santorini caldera and sector collapse

A. Date/Sample types: seismic profiles, side-scan sonar, ROV exploration/samples

B. Interpretation/Analysis: processing of seismic profiles and side-scan sonar records with identification of major fault structures and sedimentary infillings. Try to clarify the nature of caldera formation during the Minoan eruption and the configuration of the island prior to the event.

III. Processes of submarine volcanoclastic sedimentation in adjacent ocean basins

A. Date/Sample types: seismic profiles, side-scan sonar, sediment cores

B. Interpretation/Analysis: Seismic unit identification and correlation, description of sediment types (granulometric analysis, petrographic analysis, geochemical analysis), and transport process evaluation (coring, side-scan). Develop a facies model for volcanoclastic sedimentation surrounding an active caldera-forming volcanic complex in a subduction zone environment.

IV. Exploration of hydrothermal areas in the Santorini caldera

A. Date/Sample types: side-scan sonar, sediment cores, ROV exploration/samples

B. Interpretation/Analysis: Thermistor data from ROV, ROV images, and geochemical (XRF, ICPMS) analysis of sediment cores and ROV samples. Identify any polymetallic mineral deposits actively forming with the Santorini caldera.

V. Exploration of the Kolumbo submarine volcano

A. Date/Sample types: seismic profiles, side-scan sonar, ROV exploration/samples

B. Interpretation/Analysis: processing of seismic profiles and side-scan sonar to infer the structure and surface morphology of Kolumbo volcano. Geochemical and petrologic analysis of samples to gain an understanding of the 1649-1650 eruption and fragmentation mechanisms. Granulometric and petrographic analysis of core and ROV samples to infer submarine depositional processes during the 1649-1650 eruption. Search for evidence of hydrothermal mineralization in the caldera or on the flanks of Kolumbo.

1.6. Itinerary

25-26 April	Mobilize in Piraeus, Greece
26 April-8 May	Geophysics and coring in and around Thera
8 May	Demobilize in Piraeus, Greece

2. Vehicles and equipment

2.1. Equipment and capabilities provided by ship

- SeaBeam multibeam systems
 - SeaBeam 1180
 - Frequency: 180 kHz
 - Max depth: 600 m
 - Swath: 700-970 m (function of depth)
 - SeaBeam 2120
 - Frequency: 20 kHz
 - Max depth: full ocean
 - Swath: 6-11 km (function of depth)
- GeoAcoustics side-scan sonar
 - Frequency: dual 100/400 kHz
 - Max operating depth: 600 m
- 3.5kHz sub-bottom profiler
- 1-40in (BOLT) airgun system and 2-hydrophone array
- ACHILLES Comex remotely operated vehicle
- Gravity core samplers, up to 5m in length

2.2. Equipment and capabilities provided by scientists

- PC laptop with Triton sonar acquisition and processing software
- Other personal laptops for data processing

3. Operations

3.1. Cruise plan

Date	Activity
26 April	Transit Piraeus to Thera (depart at noon)
27 April	Distal airgun seismic survey
28 April	Distal airgun seismic survey
29 April	Distal airgun seismic survey
30 April	Proximal airgun seismic survey
1 May	Proximal airgun seismic survey Possible personnel transfer at Thera
2 May	Proximal airgun seismic survey
3 May	Gravity coring outside and within caldera
4 May	Gravity coring outside and within caldera
5 May	Side scan within caldera
6 May	ROV at Kolumbo/Christiana
7 May	ROV Kolumbo
8 May	Transit Thera to Piraeus (arrive in evening)

Daily operations will be dependent on technician availability and schedule. It is possible that geophysical survey will be undertaken at night and ROV and/or coring operations will be conducted during the day. Below are the cumulative times for all operations.

- Transit: 142 nm each way, ~12-14 hours total
- Airgun (see below for waypoints)
 - Distal lines: ~211 nm, approximately 3 days
 - Proximal lines: ~80 nm, approximately 3.3 days
- Side scan inside caldera: ~50 nm, approximately 1 day
- ROV: 2 days at Kolumbo, possibly Christiana
- Coring: 2 days

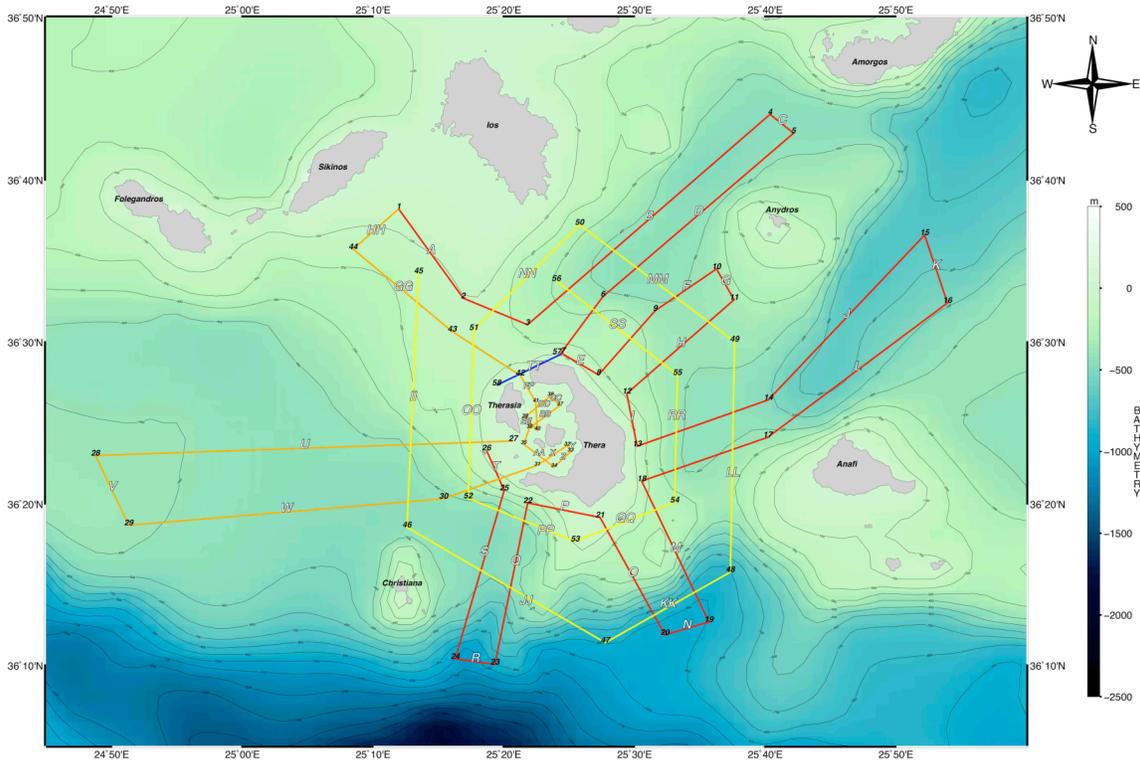


Figure 1 Distal and proximal airgun tracklines

Table 1 Airgun tracklines and waypoints

Line #	Waypoint	Latitude	Longitude	Comments
A	1	36.63681	25.19969	
	2	36.54506	25.28211	
B	3	36.51769	25.36406	Near N coast
C	4	36.73392	25.67328	Anydros Basin
D	5	36.71458	25.70325	
	6	36.54667	25.46011	Kolumbo
E	7	36.48872	25.40664	Coast
F	8	36.46619	25.45458	Coast
	9	36.53219	25.52675	Kolumbo
G	10	36.57511	25.60486	
H	11	36.54344	25.62744	
I	12	36.44689	25.49053	Coast
J	13	36.39269	25.50372	Coast
	14	36.44044	25.67117	
K	15	36.60997	25.87031	
L	16	36.54022	25.89944	
	17	36.40183	25.67042	Anafi
M	18	36.35675	25.50961	Coast
N	19	36.21136	25.59522	
O	20	36.19797	25.53919	

P	21	36.31919	25.45647	Coast
Q	22	36.33422	25.36422	Coast
R	23	36.16739	25.32244	
S	24	36.17328	25.27181	Christiana
T	25	36.34711	25.33425	Aspronisi
	26	36.38842	25.31169	End
U	27	36.39806	25.34572	Palea Kameni
V	28	36.38306	24.81303	Christiana Basin
W	29	36.31117	24.85550	
	30	36.33853	25.25689	
X	31	36.37286	25.37633	Kokkinopetra
Y	32	36.39325	25.41439	C. Alai
Z	33	36.38733	25.41969	Athinios
AA	34	36.37125	25.39767	Balos
BB	35	36.39486	25.35906	Cape Tripiti
	36	36.41147	25.36644	Therasia
CC	37	36.43456	25.40517	Skaros
DD	38	36.44475	25.39319	Peristeria Bay
EE	39	36.42222	25.36047	Cape Simandiri
FF	40	36.40933	25.37642	Nea Kameni
	41	36.43831	25.37450	Millo Bay
GG	42	36.46567	25.35458	Oia
	43	36.51072	25.26803	Ios Ridge
HH	44	36.59550	25.14158	Sikinos - To Point 1 - End
II	45	36.57081	25.22486	
JJ	46	36.30900	25.21017	Christina Basin
KK	47	36.18992	25.46317	
LL	48	36.26289	25.62269	Anafi Ridge
MM	49	36.50053	25.62800	Santorini-Amorgos Ridge
NN	50	36.62069	25.43033	Ios
OO	51	36.51233	25.29536	Ios Ridge
PP	52	36.33906	25.28825	Christina Basin
QQ	53	36.29453	25.42478	Gavrilos
RR	54	36.33478	25.55156	
SS	55	36.46619	25.55525	
	56	36.56278	25.40083	End
TT	57	36.48767	25.40731	
	58	36.45547	25.32456	Cape Riva

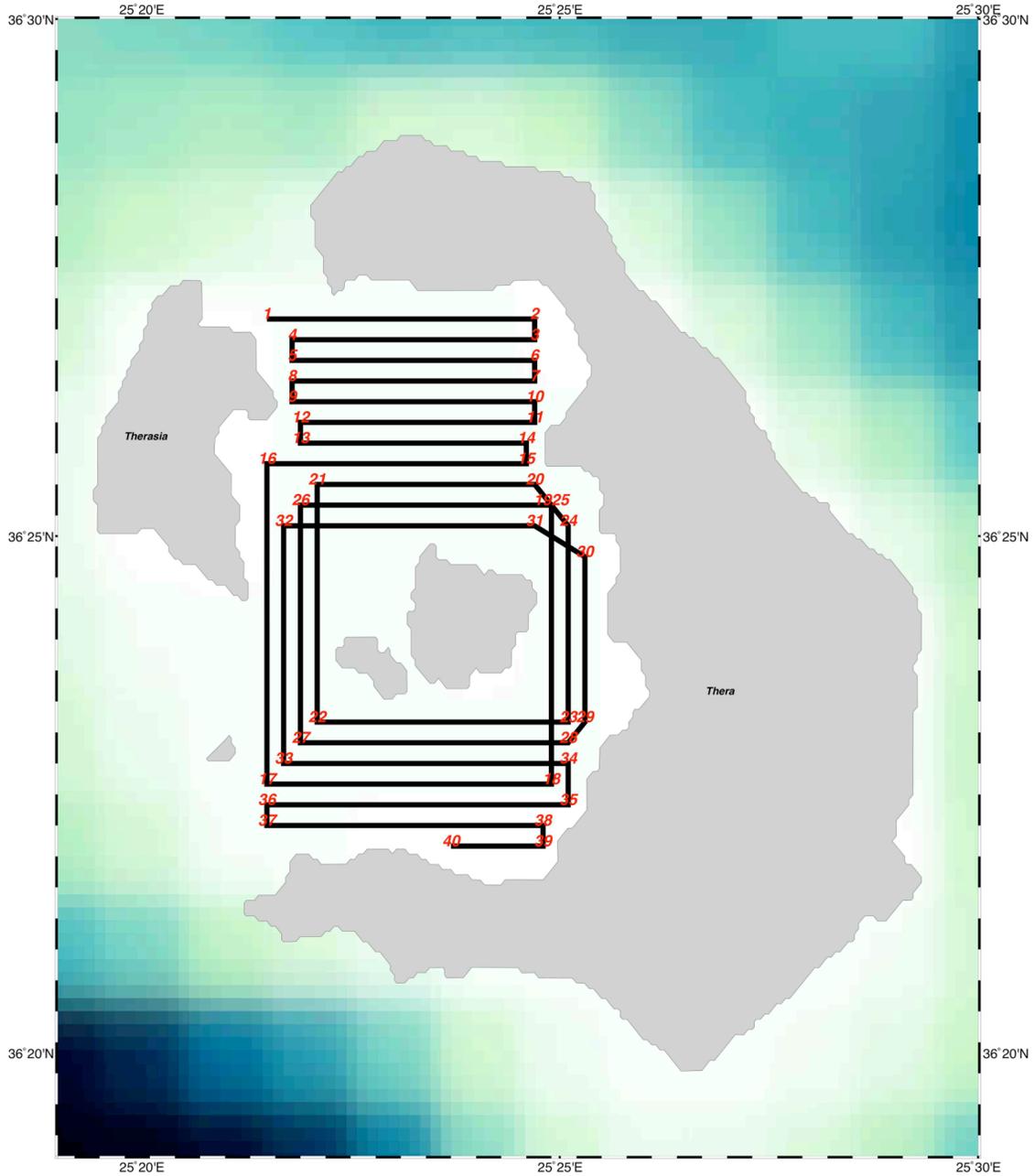


Figure 2 Side scan tracklines inside caldera

Table 2 Waypoints for side scan survey inside Thera caldera

Waypoint	Latitude (N)	Longitude (E)
1	36.4517	25.3583
2	36.4517	25.4117
3	36.4483	25.4117
4	36.4483	25.3633
5	36.4450	25.3633
6	36.4450	25.4117

7	36.4417	25.4117
8	36.4417	25.3633
9	36.4383	25.3633
10	36.4383	25.4117
11	36.4350	25.4117
12	36.4350	25.3650
13	36.4317	25.3650
14	36.4317	25.4100
15	36.4283	25.4100
16	36.4283	25.3583
17	36.3767	25.3583
18	36.3767	25.4150
19	36.4217	25.4150
20	36.4250	25.4117
21	36.4250	25.3683
22	36.3867	25.3683
23	36.3867	25.4183
24	36.4183	25.4183
25	36.4217	25.4150
26	36.4217	25.3650
27	36.3833	25.3650
28	36.3833	25.4183
29	36.3867	25.4217
30	36.4133	25.4217
31	36.4183	25.4117
32	36.4183	25.3617
33	36.3800	25.3617
34	36.3800	25.4183
35	36.3733	25.4183
36	36.3733	25.3583
37	36.3700	25.3583
38	36.3700	25.4133
39	36.3667	25.4133
40	36.3667	25.3950

3.2. Personnel

Last	First	Role	Affiliation
Alexandri	Matina	Co-Chief Scientist	HCMR
Ballas	Dionysis	Electrical engineer/ Seabed mapping	HCMR
Carey	Steve	Marine geologist	URI
Croff	Katherine	Graduate student	URI
Fero	Julie	Graduate student	URI
Ioakim	Chrysanthi	Sedimentologist	IGME
Kratzmann	David	Graduate student	URI
Likousis	Vasilis	Sedimentologist	HCMR
Misaridis	Thanassis	Electrical and computer engineer/Seabed mapping	HCMR
Nomikou	Evi	Geologist/Seabed mapping	HCMR
Pampidis	Giannis	Technician/Seismic acquisition units	HCMR
Perissoratis	Constantine	Marine geologist	IGME
Prokopis		Air-gun technician	HCMR
Rousakis	Grigoris	Sedimentologist	HCMR
Sigurdsson	Haraldur	Co-Chief Scientist	URI
Vougioukalakis	Georges	Sedimentologist	IGME

3.3. Organizational structure

- Chief scientists: Haraldur Sigurdsson and Matina Alexandri
- The chief of operations and watches, roles and responsibilities of the science party will be decided on board the ship.

4. Education and outreach

- Website located on URI/GSO server. URL to be announced.
- Daily logs will be updated on the website.

5. Underway, station and small boat operations

5.1. Underway operations

Underway operations will include the collection of sub-bottom seismic data, multibeam bathymetry, and side-scan sonar data. Multibeam data will be collected at anytime when other operations are not being conducted.

5.2. Station operations

Station operations will include ROV operations and geological bottom sampling. ROV diving and bottom sampling locations will be determined at sea after the processing of seismic, multibeam and side scan data, and will be determined by the Co-Chief Scientists.

5.3. Applicable restrictions

Both station and underway operations must take the effects of wind and seas into consideration. This consideration is especially critical during the launch and recovery of vehicles. The AEGAEO will need to display Restricted Maneuverability lights/insignia as appropriate.

6. Disposition of data

6.1. Data and samples

- The Co-Chief Scientists are responsible for the disposition of data.
- Each PI will receive copies of all shipboard, multibeam and side scan, and other acoustic data acquired during the cruise.
- Samples and cores will be shared between URI and HCMR.

6.2. Records and reports

The Co-Chief Scientists will submit a preliminary upon completion of the cruise, and a full cruise report within 90 days of the completion of the project.

7. Communications

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