CRUISE REPORT

SHIP UTIL_ATION DATA

UNOLS Rev. 83

SHIP NAME R/V Robert Conrad	OPERATING INST. Columbia University	
CRUISE (LEG) NO. RC 2909	DATES 9/15/88-10/14/88	
AREA OF OPERATIONS: Central Atlantic 24-29°N 43-47°W	PORT CALLS: PLACE / DATES	
	Cape Verdes (Mindelo, Sao Vincente Is.)	9/12-15
DAYS AT SEA / DAYS IN PORT	Azores (Punta Delgada)	10/14-17

PARTICIPATING PERSONNEL

CODE	NAME	TITLE	AFFILIATION
1.	J.-C. Sempere	Dr.	University of Washington
2.	H. Schouten	Dr.	WHOI
3.	J. Miller	--	URI
4.	R. Edwards	--	URI

(over)

Use Reverse If Additional Space Required.

WAS RESEARCH CONDUCTED IN FOREIGN WATERS? No COUNTRY: _____

PRIMARY PROJECTS (those which govern the principal operations, area and movements of the ship)

PROJECT TITLE AND PRINCIPAL INVESTIGATOR	SPONSORING ACTIVITY	GRANT OR CONTRACT NUMBER	PARTICIPATING PERSONNEL (AS CODED ABOVE)
A seabeam investigation of the Mid-Atlantic Ridge (24-30°N) P.I.'s: Jean-Christopher Sempere (UW) G. Michael Purdy (WHOI)	NSF	OCE-8722980 (UW)	see above
DISCIPLINE: marine geology & geophysics			

ANCILLARY PROJECTS (which are accomplished on a not-to-interfere basis and contribute to the overall effectiveness of the cruise)

PROJECT TITLE AND PRINCIPAL INVESTIGATOR	SPONSORING ACTIVITY	GRANT OR CONTRACT NUMBER	PARTICIPATING PERSONNEL (AS CODED ABOVE)

SIGNATURE _____ DATE 10/28/88

CHIEF SCIENTIST

TOTAL SCIENTISTS 2 TOTAL TECHNICIANS 4

TOTAL GRAD STUDENTS 4 TOTAL STUDENTS/OBSERVERS 1

ATTACH PAGE SIZE CRUISE TRACK

COST ALLOCATION DATA

DAYS CHARGED	AGENCY OR ACTIVITY CHARGED	GRANT OR CONTRACT NO
33	NSF	OCE 8611640S

SIGNATURE _____ DATE 2/17/89

Participating Personnel (cont'd):

5.	R. Bartholomew	--	Lamont
6.	D. MacDonald	--	Lamont/TAMU
7.	J. Palmer	--	UW
8.	M. Montfort	--	UW
9.	C. Wolfe	--	WHOI
10.	G. Christeson	--	WHOI
11.	B. Trams	--	UW

RC 2909
CRUISE REPORT

A Sea Beam survey of the Mid-Atlantic Ridge between the Kane and Atlantis Fracture Zones (Part 1)

Chief Scientists

Jean-Christophe Sempere
School of Oceanography WB-10
University of Washington
Seattle, WA 98195

and

Hans Schouten
Department of Geology and Geophysics
Woods Hole Oceanographic Institution
Woods Hole, MA 02543

1. Field Program

1.1. Logistics

We departed Mindelo (Cape Verde Islands) on September 15 at 1100 (local). Underway geophysical data acquisition (Sea Beam and magnetics) began on the following day outside the 200 mile limit. The transit to our survey area was in two parts. The first part involved steaming toward the Kane fracture zone at about 41°W. During the second part, we followed the Kane Fracture Zone to its western intersection with the Mid-Atlantic Ridge at about 24°00'N/46°20'W. We added coverage to the existing RC 2511 Sea Beam coverage. We reached our survey area 5 days after departing the Cape Verde Islands. Our survey consisted of 25-30 nm long profiles oriented perpendicular to the spreading center (100°) and spaced 1.4-1.8 nm, depending on water depth (Figures 1, 2). We obtained in this way full Sea Beam coverage of the rift valley for a total length of approximately 500 km of the Mid-Atlantic Ridge. Coverage outside of the rift valley is of the order of 50-70 %. Magnetic data was collected at all times during the survey. We ended the survey on October 9 at 2000 Z at about 27°50'N/44°00'W. Our transit to the Azores was in three parts. First, we followed the Mid-Atlantic Ridge along a track about 10 miles away of the axis of spreading. This line will serve as a tie-line for the second leg of this field program. Then we followed the axis of the Atlantis F. Z. as a first step in the survey of this offset. Finally we steamed straight towards the Azores. The leg ended in Punta Delgada (Azores) on October 14 at about 1500 (local). Geophysical data acquisition stopped within 200 miles of the Azores as requested by Capt. Peterlin. 19.5 days were spent on site, the rest in transit.

1.2. Personnel

Dr. Jean-Christophe Sempere	Co-chief Scientist	U of Washington
Dr. Hans Schouten	Co-chief Scientist	WHOI
Mrs. J. Miller	Sea Beam Tech.	URI
Mr. R. Edwards	Sea Beam Tech.	URI
Mr. R. Bartholomew	Programmer	L-DGO
Mr. D. MacDonald	Science Officer	L-DGO/TAMU
Mr. J. Palmer	Watchstander	U of Washington
Ms. M. Montfort	Watchstander	U of Washington
Mr. B. Trams	Watchstander	U of Washington
Ms. C. Wolfe	Watchstander	WHOI
Ms. G. Christeson	Watchstander	WHOI

2. Scientific Objectives And Results

2.1. Scientific Objectives

The principal scientific objective of this cruise was to determine the segmentation of the Mid-Atlantic Ridge (MAR). In contrast to the East Pacific Rise, where the segmentation of the spreading center has been demonstrated by a combination of morphologic, geophysical and geochemical studies, the segmentation of the MAR has only been postulated from surface magnetic field data and the extremely limited multibeam bathymetry coverage available. In order to gain a good understanding of accretionary processes at a slow spreading center, it is necessary to obtain complete bathymetric coverage of a large section of the Mid-Atlantic Ridge. Such a careful study allows one to understand the variations in volcanic and tectonic activity along the spreading center, the nature of small axial discontinuities that offset the spreading center and the timing, variability, nature and spacing of upper mantle melting events that lead to the segmentation of the MAR. Some of the questions which we proposed to answer include: What is the morphologic nature of the segmentation of the MAR? What is the nature of the variations in volcanic and tectonic activity along the spreading center? What are the true spacings and natures of the spreading center discontinuities which are encountered along the MAR?

This program was initially planned as a SeaMARC II investigation of the Mid-Atlantic Ridge. However, the very poor performance of the side-scan sonar and bathymetric system SeaMARC II during RC 2908 warranted a last minute change of plans. The decision was made to use the Sea Beam multibeam echo-sounder as our primary investigative tool instead of SeaMARC II. Given the great difference in areal coverage that these two systems can obtain, this change required us to significantly revise our scientific objectives. Considering these revised scientific objectives, our cruise was successful, but we fell considerably short of our intial objectives. However, RC 2909 is the first of two Sea Beam surveys of the Mid-Atlantic Ridge. During the second leg, we will

attempt to finish the work started during RC 2909. The two surveys combined will not allow us to obtain the coverage we initially planned with SeaMARC II.

2.2. Preliminary Results

The Mid-Atlantic Ridge between 24°N and 27°50'N consists of a series of spreading segments separated by transform zones. There are no well developed transform faults in the 500 km section on the spreading center we surveyed. Each of the segments appears to be of the order of 20-35 km long. The zone of most recent volcanism within each of these segments seems to correspond, in most cases, with elongated volcanic ridges on which are superposed more circular volcanoes. A large number of old circular and split volcanoes can be recognized off-axis. Evidence for the splitting of central volcanoes in the rift valley was found in several places. The larger of the transform zones mapped are similar to other short-offset fracture zones along the Mid-Atlantic Ridge. However most of the discontinuities that offset individual spreading segments are not associated with the morphotectonic characteristics of transform offsets along the Mid-Atlantic Ridge.

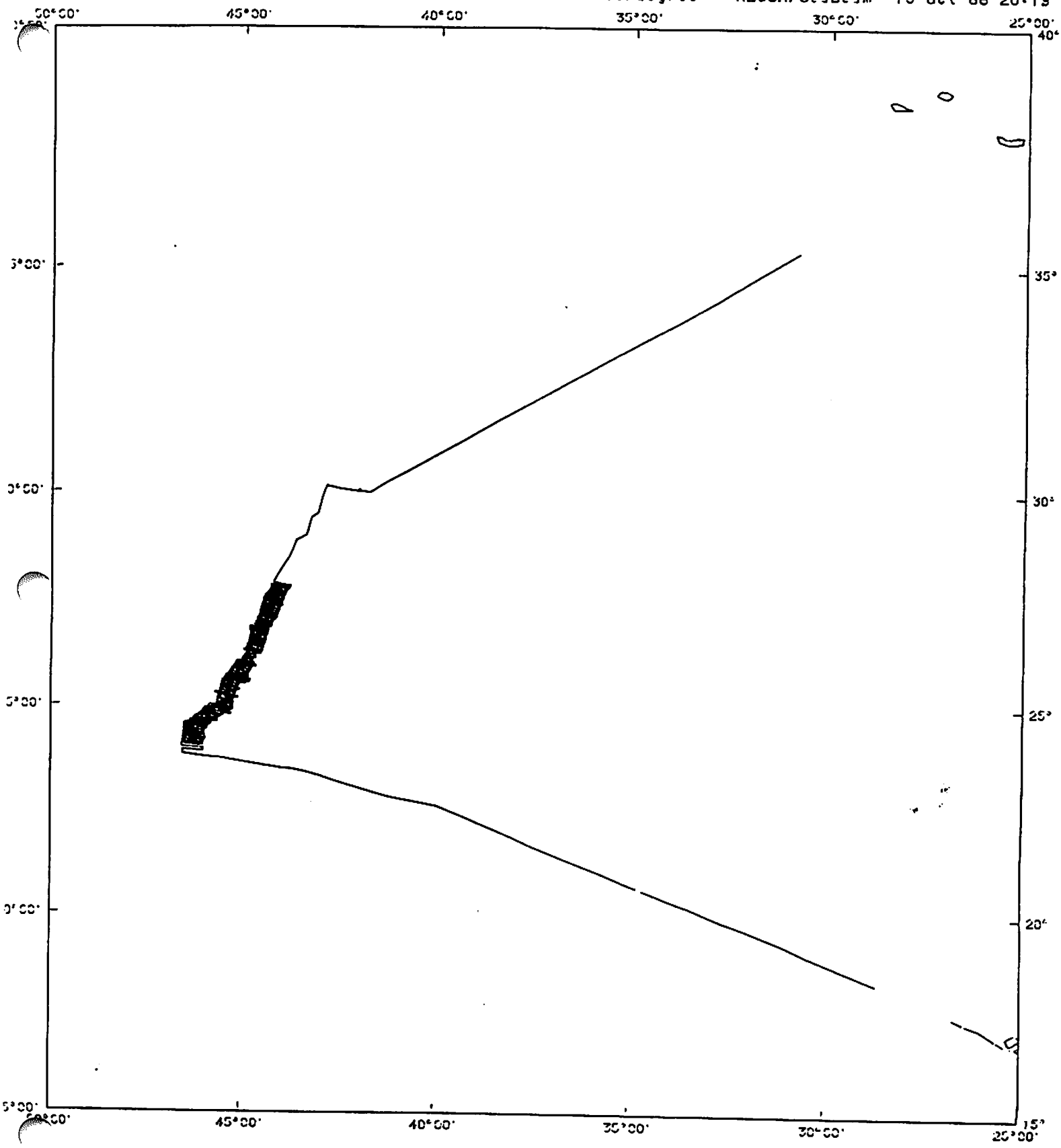
The surface magnetic field along the spreading center reflects the segmentation of the spreading center, although a proper analysis of the data is required before strong conclusions can be inferred. The presence of large magnetic anomalies at certain locations along the spreading center may be indicative of the presence of highly magnetized bodies in the subsurface, which may be the result of enrichment in iron of the basalts, and of the presence of bodies with a low magnetization, possibly due to hydrothermal alteration.

3. Technical support

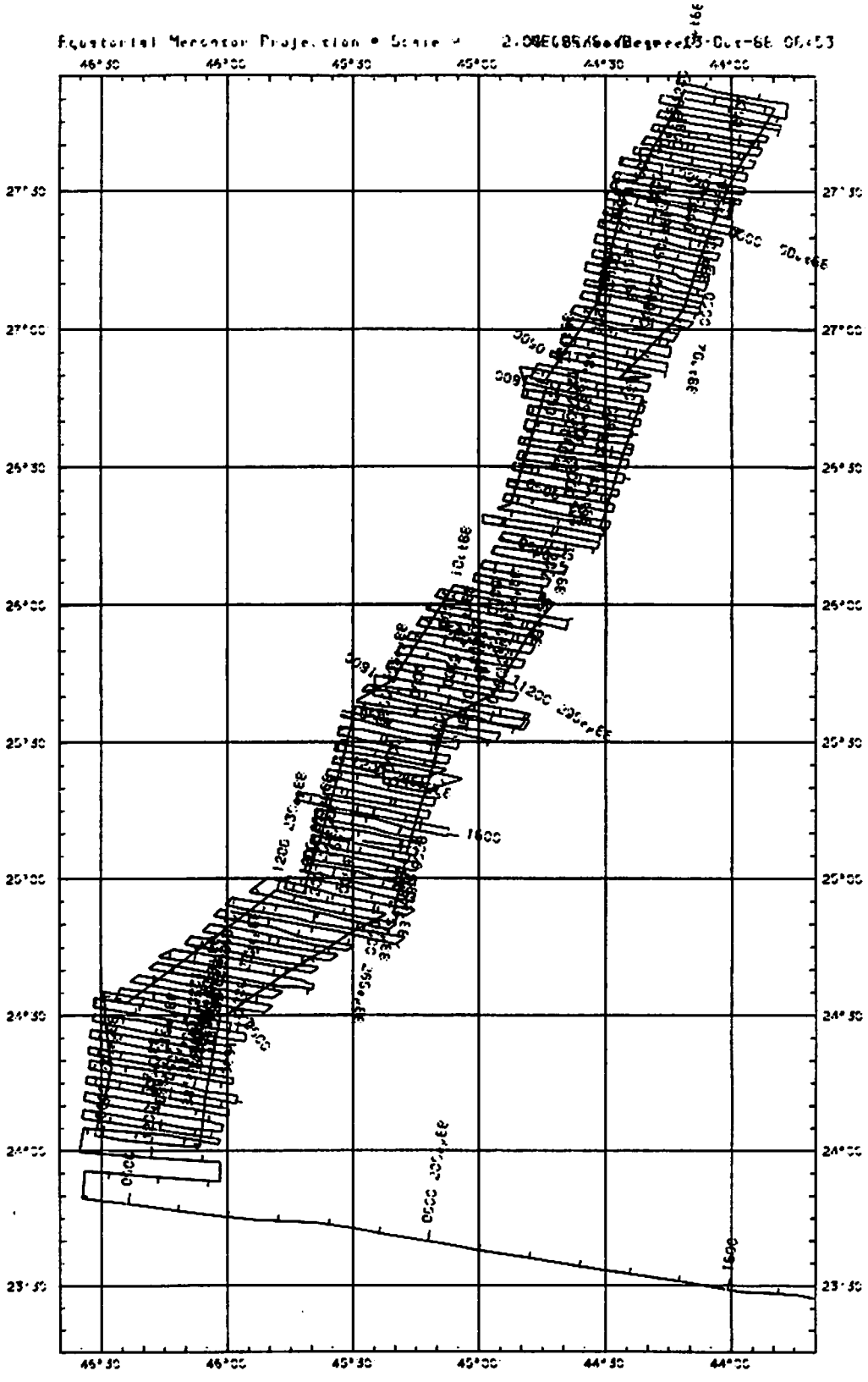
A large part of the success we had in meeting our revised scientific objectives is the direct result of the excellence of the technical support we found on the R/V Conrad. The shipboard programmer, R. Bartholomew, was outstanding. His friendly cooperation and his superb programming skills were much appreciated. The cooperation of the Science Officer, D. MacDonald, was equally appreciated. Finally, the Sea Beam group, which consisted of J. Miller and R. Edwards, was outstanding. Not only did they manage to keep Sea Beam working with practically no interruption, but they were able to produce a final set of maps by the end of the leg which, given the magnitude of the coverage we obtained, was no easy task. The wholehearted, thoroughly professional cooperation of all these individuals deserves great praises.

4. Ship support

We are much indebted to Capt. Peterlin, the officers and crew of the R/V Conrad for helping to make this trip so successful. We greatly appreciated the concern that Capt. Peterlin and the crew expressed in helping us to acquire the best possible coverage, thereby ensuring the success of this trip. It was a true pleasure to sail and work under these conditions.



RC2909 MID-ATLANTIC RIDGE SURVEY SEPTEMBER 15 - OCTOBER 14, 1988



RC2909 SURVEY CRUISE TRACK

Figure 2