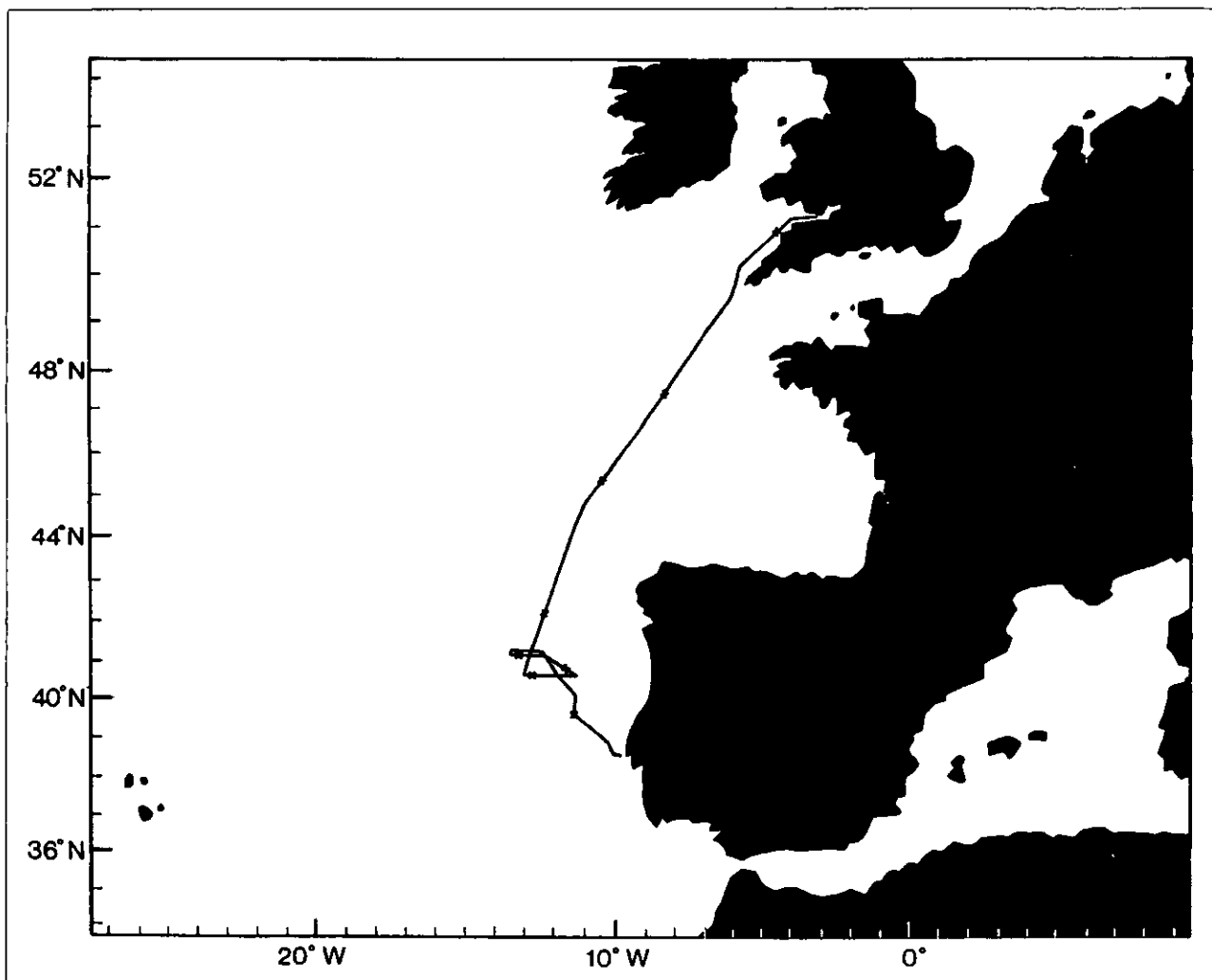


RRS *Charles Darwin* Cruise 64A

11 Dec - 19 Dec 1991

TOBI trials/survey line over the Iberia Abyssal Plain

Cruise Report No 233 1992



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RRS *CHARLES DARWIN* CRUISE 64A
11 DEC-19 DEC 1991

TOBI trials/survey line over the Iberia Abyssal Plain

Principal Scientist
N W Millard

1992

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ABSTRACT The main objective of the cruise was to undertake a short TOBI survey along a line from 40°41'N, 13°00'W to 40°41'N, 11°35'W over the Iberia Abyssal Plain ocean/continent transition (OCT). Data from the magnetometer of the deep-tow vehicle should provide a better position of the OCT than that obtained from multichannel seismic survey and surface magnetic measurements. Additionally, engineering trials on a newly modified winch and instrument trials on TOBI were carried out.	
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SCIENTIFIC PERSONNEL

MILLARD, Nick (PSO)	IOSDL
ANDERSON, Howard	RVS
DAVIS, Mike	RVS
FERN, Adrian	RVS
FLEWELLEN, Chris	IOSDL
LYONS, Kirsty	Student, Oxford
MILES, Peter	IOSDL
PAULSON, Chris	RVS
RHYMER, Chris	RVS
ROUSE, Ian	IOSDL
WILLET, Aldrey	Student, Oxford
WOODLEY, Colin	RVS

SHIPS PERSONNEL

ACTON, P	Second Steward
BAKER, J	Radio Officer
BRIDGE, A	Motorman
CAREN, J	Seaman
CLARKE, J	Chief Officer
DRAYTON, M	Seaman
GORDAN, T	Steward
HARRISON, M	Seaman
HIBSON, H	Seaman
HILLBERG, J	Steward
HOLT, J	Third Engineer
JENKINS, G	Seaman
LOVELL, V	Electrician
MACDERMOTT, P	Master
MOSS, S	Second Engineer
NEWTON, P	Second Officer
PETERS, K	Cook Steward
ROOK, G	CPO (Deck)
ROWLANDS, D	Chief Engineer
WARNER, R	Third Officer
WELCEF, G	Ships Cook

ITINERARY

Depart Barry 1800 11th December 1991.

Arrive Lisbon 1530 19th December 1991.

CRUISE OBJECTIVES

This cruise was the result of an application for opportunistic shiptime to undertake a short (circa 48 hours) TOBI transect of the Iberia Abyssal Plain ocean/continent transition (OCT). An earlier attempt during April 1991 had been unsuccessful owing to poor weather. The main objective was therefore to complete a TOBI line from 40 41N, 13 00W to 40 41N, 11 35W. Additionally, engineering trials on the winch and instrument trials on TOBI were to be carried out.

NARRATIVE

The ship sailed from Barry one tide later than planned at 1800 on Wednesday 11th. December (Julian day 345). Good weather throughout the cruise more than compensated for this lost time. After rounding Lands End a course was set in the direction of the TOBI line and for deep water (>4500 metres) required to allow trials on the winch containing the conducting TOBI tow cable to begin. On the morning of day 347 the ship was slowed to 4-5 knts and the streaming of 9000 metres of conducting cable commenced at 0530. The operation was completed by 1600 and the ship continued to the site chosen for the first TOBI trial, at which the ship arrived at 2100/347.

TOBI was launched at 2230/347 in 2300 metres of water over the Charcot Seamounts and was back inboard by 0600/348. The ship proceeded on to a point 4 miles west of the TOBI line to allow a lead in for the start of the survey. The vehicle was launched at 1000/349 and continued the survey until 0730/351 when hauling commenced, bringing TOBI inboard by 1100. For the duration of this survey the proton magnetometer was streamed, buoyed up for the slow towing speed by lengths of closed-cell pipe lagging strapped along its cable. While TOBI was being reconfigured for its second instrumentation trial 20 hours were available for a magnetometer/gravity meter survey some 30 miles north of the TOBI the line.

The third TOBI launch was at 1700/352 after tensioning the top 1000 metres of wire on the coring winch and was recovered at 0035/353. A course was set for Lisbon, the pilot was onboard at 1400/353 and the ship was alongside in Lisbon by 1530.

NWM

SCIENTIFIC RATIONALE

A rifted non-volcanic continental margin exists west of Iberia. The location of the OCT has already been identified approximately from seismic velocity measurements, surface magnetometer and seismic reflection profiles. These results have been published (Whitmarsh et al, 1990) and form the basis of a successful proposal No. 365 for an Ocean Drilling Programme leg on this margin. The acquisition of multichannel seismic data through collaboration with European colleagues during recent cruises together with the planned TOBI line provide badly needed geophysical data to support the ODP drill locations.

The use of a deep-towed magnetometer was anticipated to enhance the resolution of magnetic measurements. This would refine modelling and provide unique information to estimate the nature of the rocks of the OCT itself. The proposed track was to follow an existing multichannel seismic reflection profile so that the depth of the basement was known. The minimum requirement was to survey on a straight line from the flanks of the J magnetic anomaly on unequivocal ocean crust eastwards to the first tilted continental fault block.

The minimum requirement for the line was exceeded with the traverse being extended to 11° 08'W. Time was not available to either repeat the line while towing TOBI at a shallower depth or to run a second line parallel to and 6km. south of the first. However on completion of the primary objectives some 20 hours were available for scientific use while the scatterometer was prepared for a final TOBI deployment prior to docking in Lisbon. In this amount of time it was decided to run two parallel proton magnetometer and gravity lines E-W across the north end of the J anomaly where the contours of this feature appeared to close on previous compilations and data coverage was less extensive.

Gravity data was collected throughout the cruise. Two shipboard gravity meters were in operation - the second being test calibrated prior to reinstallation on RRS *Discovery*. The gravity meters were tied in to base stations at Barry and Lisbon.

WINCH

One of the drums on the main ships winch had been fitted with new shells and scrolling gears to enable the 17.4mm. conducting cable to used. The winding on of the wire was carried out in Barry before departure but it was not clear how satisfactorily the conversion had been achieved as it was not possible to apply sufficient back-tension to obtain a proper lay of the wire.

In order to rewind the wire to the required working tension, on reaching the required deep water (4500 metres), the ship was slowed to 4-5 knts. and the wire was carefully streamed, with 200 kg. of chain attached to the end, until only half the last wrap remained on the drum. On several occasions problems were encountered with the wire biting into lower layers but eventually sufficient was paid out. Unfortunately the wire-out counter was found to be unreliable during the recovery of the wire (not returning to zero at the end) but if the reading on the way out was to be believed then there is 9100 metres on the drum. The wire laid nicely on the winch during the recovery. The offending counter was repaired.

TOBI

During recent months many of the electronic cards have been modified and updated to incorporate a three wire data bus, controlled by a micro-controller which communicates with the ship via a new MODEM. Additionally, a third pressure housing containing the transmission and communications electronics for the scatterometer, which is currently under development, has been fitted to the vehicle. An important aspect of this cruise was to carry out proving trials on these modifications.

To minimise launch and recovery times a site over the Charcot Seamounts, where the water is only 2300 metres deep, was chosen for the first trial. This test was to try the MODEM link between the vehicle and ship, to prove the new and modified electronic cards and to make sure that the extra data on the towing cable would in no way degrade existing data channels. The MODEM link worked, although only at a reduced baud rate, and we were able to select various options in the vehicle through this link to the micro-controller. There was however, a certain amount of break through into the other data but, if the MODEM was not used, the performance of TOBI was unaffected by the modifications. Having established a working system it was decided to run the proposed TOBI line before the scatterometer trials. This line went without hitch. The sidescan data was uninteresting with the highlight being the discovery of two wrecks on an otherwise almost featureless sea floor. The magnetic data, which was of prime importance, proved, after post-cruise processing, to be of good quality and was successful in the objective of fixing more closely the position of the OCT.

For the second instrumentation trial the scatterometer electronics were installed into the third pressure housing. This test was to establish an RS232 link between the new micro-controller in TOBI and the one to be used to control the scatterometer. If this was successful then various combinations of the 32 power amplifiers required to steer the scatterometer acoustic beam would be selected to transmit into a dummy load. The link between the micro-controllers performed satisfactorily, however, as more power amplifiers were selected the power surges during transmission broke the MODEM link with the ship. It was also noticed that the scatterometer frequency broke through onto the other TOBI data. Although these problems require better filtering, the results were generally encouraging.

SUMMARY

The objectives of the cruise, namely to test the modified winch, to test the modified TOBI system and to carry out a TOBI survey across the OCT were all achieved. The data obtained during the survey proved to be useful in identifying the transition position. Results from winch and TOBI trials were totally satisfactory from both a developmental view and for providing the knowledge that the TOBI system was in good operational condition for the CD65 cruise beginning during the following month.

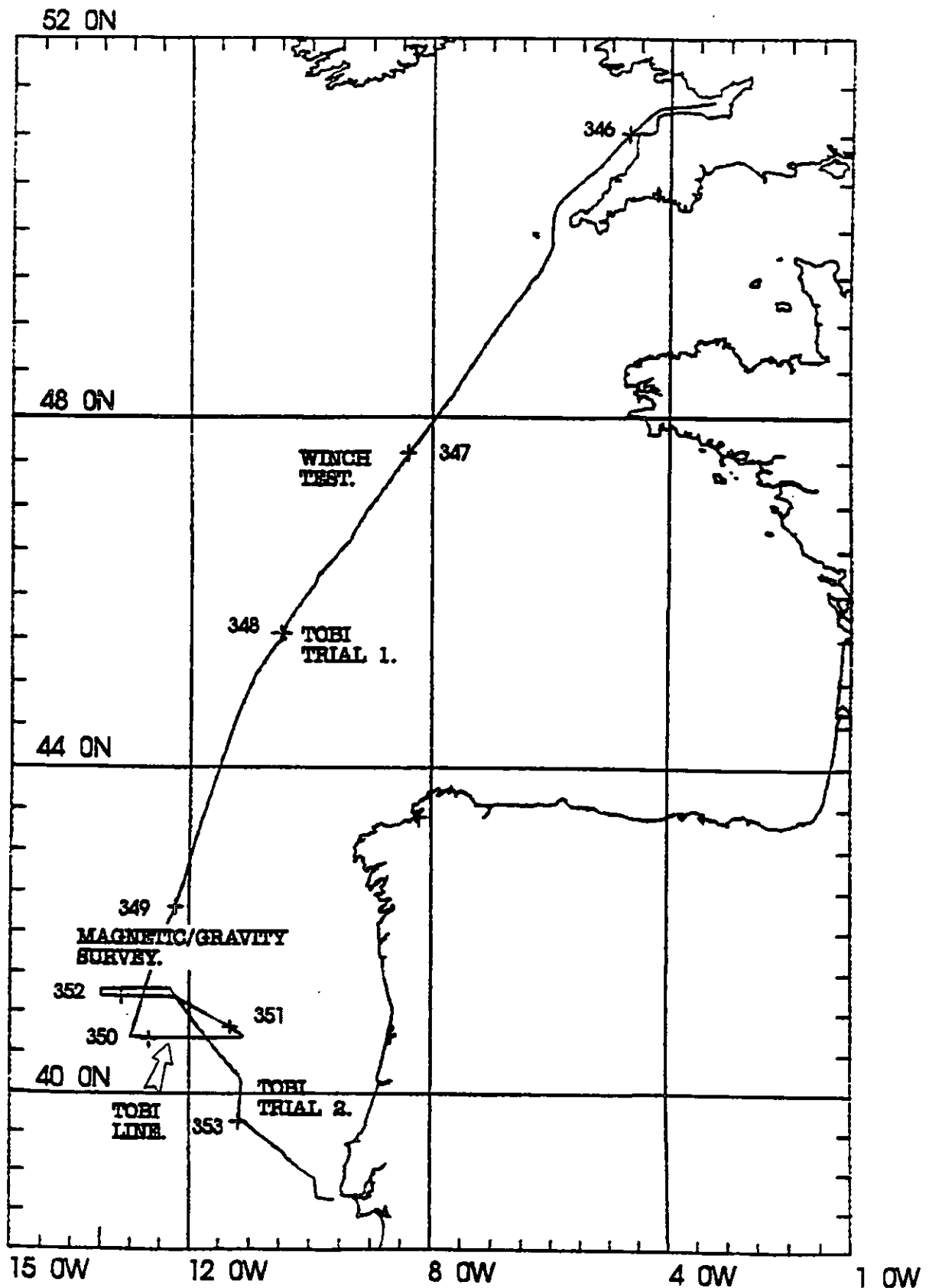


Figure 1. RRS *Charles Darwin* Cruise 64A, 11-19 Dec 1991. Track chart. Day numbers show positions at 0000 hrs.