ANTARES 1: Cruise Report.

1.0 Cruise Narrative

1.1 Highlights

Expedition Designation

ANTARES 1 Southern Ocean France-JGOFS

Ship

Navire Océanographique MARION DUFRESNE

Chief Scientist

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Ports of Call

S^{t} Denis to S^{t} Denis (Reunion Island, France)

Moored: Port aux Français, Kerguélen Island (April 6 1993)

and Crozet Island (March

Cruise Date

March 29 to May 18, 1993

Funding

Institut Français pour la Recherche et la Technologie Polaires: IFRTP/CNRS

1.2 Cruise Summary

Overview

This was the first cruise of the ANTARES Project leaded by

Pr. Paul Tréguer,
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This project is the French contribution to the Southern-JGOFS program. It is centered along the WOCE section by 58^{o}S in the Southern Indian Ocean. This project addresses the biogeochemical cycles of the upper ocean as well as the circulation inventory along this transect in order to determine the fraction of the primary production that is preserved in the sedimentary record. This project promotes a multi-disciplinary approach to the study of Global Ocean Flux. For further information please write to Paul Tréguer.

The present cruise focused primarily on the benthic environment. A total of 30 scientists were on board the Marion Dufresne for a period of 52 days. The biology, the chemistry and the sedimentology of surface sediments were investigated. This cruise also encompassed hydrographic stations related to the WOCE program.

Cruise Track

The cruise track is shown in Fig. 1 (POSt-N.ps) and the station locations are reported in the table ANTARES_01.SUM.

Sampling and Mooring Accomplished

During this cruise samples of water and sediments were collected. The sea water physical and chemical properties were probed using a Neil-Brown type Mark III B CTDOXY and a General Oceanics rosette equipped with 12 x 12 liters GO bottles. Water samples were analyzed during the cruise for salinity, using a Guildline Autosal salinometer, for oxygen, CTDOXY cross calibration, and nutrients: nitrate+nitrite and silicate. On board, water column dissolved aluminium analyses were performed at selected locations. Water samples were also collected and preserved for isotopic measurements (^{13}C and ^{18}O). The activity of microbial populations present in the water column was also investigated in order to assess mineralization rates and turn over rates. Large volume sampler (200 liters bottle) were collected for the characterization of the organic composition of the particulate matter. Plankton nets were also utilized to collect planktonic species leaving in the surface waters.

Sediments were collected for biological investigations, geochemical studies of inorganic and organic constituents, and microbiological rates determinations. Sediments were collected using three (3) different coring devices: 1) a multicorer (Barnett et al., 1975); 2) Boxcorers: type NIOZ or USNEL; and 3) piston corer. The piston cores were devoted to paleoceanographic studies of the phytoplanktonic assemblages in relation with the isotopic measurements of ^{13}C and ^{18}O in selected communities of foraminifera.

The objectives of the ANTARES 1 cruise encompassed also the mooring of sediment trap arrays. It was first envisioned to moore 4 lines but because of the weather conditions encountered, we were only able to moore one line in relatively difficult conditions.

Type and Number of Stations

During this cruise a total of 20 stations was occupied at which we have accomplished 142 operations encompassing CTD/rosette, large-volume sampling, and sediment coring.

1.3 List of Principal Investigators

The principal investigators related to the ANTARES 1 cruise are listed in Table 1.

TABLE 1. Principal Investigators related to the ANTARES 1 Cruise.

Name	Responsibility	Affiliation
P. Arrnaud	Sediment Biology	COM, Marseille, F
A. Dinet	Meiobenthos	Lab. ARAGO, Banuyls, F
M. Bianchi	Enzymatic Activity	Univ. Luminy, Marseille, F
D. Moriarty	Microbiology	CSIRO, Australia
J-C. Relexans/R. De Wit	Sediment Microbiology	LOB, Bordeaux, F.
Y. Park	CTD, S, O_2	MNHN, Paris, F
A. Saliot	Organic Geochemistry	LPCM, Paris, F
J. Morvan	Sediment Trap	ENSCR, Rennes, F
P. Tréguer	Nutrients	IEEM, Brest, F
A. Van Bennekom	Aluminium	NIOZ, Texel, NL
C. Rabouille	Interstitial Waters	CFR, Gif/Yvette, F
J-L. Reyss/S. Schmidt	Radionuclides	CFR, Gif/Yvette, F
J-L. Turon/J-J. Pichon	Paleoceanography	DOG, Bordeaux, F
C.Pierre/C. Vergnaux-Grazzini	Isotopes: ^{18}O, ^{13}C	LODYC, Paris, F
L. Labeyrie	Isotopes & Paleoceanogr.	CFR, Gif/Yvette, F
P. Van Cappellen	Biogenic Si Dissolution	Georgia Tech, Atlanta, USA

1.4 Preliminary Results

The ship departed from le Port de St Denis (Reunion Island) on March 29, 1993 and made two test stations on its way to the Kerguelen Island. The first station consisted in the testing of the oceanographic winch utilized during all coring and the second station was consecrated to test the CTD/rosette operation and also sampling deep water for conditioning the sediment trap collection bottles. The CTD was calibrated at IFREMER, Brest prior to the previous cruise of the Marion Dufresne (CIVA-WOCE, Chief Scientist: Dr. A. Poisson, LPCM, Paris, F) and after ANTARES 1 (July, 1993).

The water samples collected with the PVC bottles proved to be relatively free of contamination when proper care was taken for handling and cleaning the bottles. The determination of the enzymatic activity and dissolved aluminium are the most sensitive parameters that allowed to check contaminations.

Numerous analysis were performed on board. Among the most relevant for the WOCE community were the determination of the salinity and the oxygen following the Winkler method with the end point determined using starch. The determination of salinity was carried out in a constant temperature container (+/- 1^{o}C). The standard utilized was Batch P120 (April 6, 1992) with K_{15}= 0.99985. The nutrient analyses (nitrate+nitrite, and dissolved silicate) were performed on board using segmented flow colorimetry (Auto Analyzer II Technicon).

1.5 Problems

During this cruise most of the problems we have encountered were related to weather conditions. The original cruise plan requested for ship time during January, February, and March. Unfortunately the time period that was given to ANTARES 1 was too late in the season since it was centered on the Month of April and May. Just after departing from the Reunion Island we encountered some bad weather. After mooring at Kerguelen Island for a logistic rotation, we run into severe weather and had trouble mooring the sediment trap array in the vicinity of the Kerguelen Island on the ANTARFIX/KERFIX site. When we steamed southward we encountered after performing some piston coring very high seas. The bridge recorded waves as high as 20 meters. We had therefore to change the cruise plan since it was not anymore adapted to the weather conditions we were likely to encounter.

Although we had to modify our original plans, this cruise proved to be valuable in order to understand the benthic and hydrographic environment in the investigated region (see cruise track).