

The ANTARES 1 Cruise Launched France Southern-JGOFS.

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France has launched its contribution to Southern-JGOFS with the ANTARES 1 cruise which took place last spring in the Southern Indian Ocean. The ANTARES 1 cruise was the first of a series of cruises of the ANTARES program that should bring scientists to the Southern Ocean in order to investigate major biogeochemical cycles with a particular emphasis on the cycle of biogenic silica. The ANTARES program is sponsored by the Institut Français pour la Recherche et la Technologie Polaire: IFRTP which is part of the CNRS (Centre National de la Recherche Scientifique). The primary goal of the ANTARES 1 cruise was to investigate the geochemical and biological processes in the benthic environments of the Seasonal Ice Zone (SIZ) and Permanent Open Ocean Zone (POOZ). During this expedition, it was also planned to 1) install sediment trap arrays, 2) characterize the physics and the chemistry of water masses along the 58°E WOCE section, and 3) collect piston cores to document the paleoceanographic record. Ship time was requested for early spring: February-March during the Austral summer.

A total of 30 scientists were on board the N.O. Marion Dufresne (TAAF), representing six different nationalities. Although all the cruise objectives were not achieved because of the mediocre weather conditions that we encountered, it has been a rather successful scientifically. During this cruise we have accomplished 184 operations and collected a wide variety of water column and sediment samples.

Sampling.

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

Water samples were analyzed on board for salinity, oxygen, nutrients: nitrate + nitrite and silicate, and dissolved aluminium. Water samples were collected and preserved for isotopic measurements of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$. The microbial activity in the water column

was determined on board in order to assess bacterial production, biomass, and turn over rates. Bottom waters were also sampled using the rosette for ^{226}Ra , ^{228}Ra , ^{228}Th , and ^{234}Th studies. Large volume samples (200 L inox bottle) were collected for the characterization of the organic fraction of the particulate matter. Surface plankton nets were also utilized to collect grazers and study their fecal pellets.

Sediments were collected for biological investigations, geochemical studies of inorganic and organic constituents, and microbiological determinations. Sediments were collected using three different coring devices: 1) a multicorer; 2) Boxcorers: one designed at NIOZ (Texel, NL) and the more conventional USNEL; and 3) Kullenberg piston corer. The piston cores were devoted to paleoceanographic studies of the phytoplanktonic assemblages in relation with the isotopic measurements of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ in selected communities of foraminifera.

The macrobenthos was studied using samples taken with the USNEL box core which were also subsampled for former analysis of the meiofauna. The multicorer was utilized in order to assess the vertical distribution of the species. The organic matter from algal origin was sampled by filtration at the top of some multicore and will be characterized for its pigment content. A study of the taxonomy of the planktonic species will also be performed.

Oxygen and resistivity micro-profiles were realized on the sediment cores retrieved with the multicorer. On the same cores the ETS was determined at specific depth. Pore waters were extracted by centrifugation and analyzed on board for dissolved silica, nitrate, dissolved aluminium, pH, and alkalinity. Sediments were collected for stable isotope ($\delta^{13}\text{C}$ and $\delta^{18}\text{O}$) and radiogenic isotope studies in order to determine bioturbation and sedimentation rates (^{234}Th on piston cores). Sediment samples were also preserved for lipids geochemistry. Kinetics studies were performed on board, at various temperatures, to determine the bulk sediment biogenic silica dissolution rate using flow through cells.

On board, the activity of sediment microbial populations was assessed via the measurement of the protease activity, the biomass production, the amino acid mineralization rate, and the ammonium oxidation rate. On shore, these studies will be completed by the determination of the bacterial biomass, the molecular identification of the various bacterial strains, and the characterization of sulfato reducing bacteria.

Cruising in the South: Some gory details.

The cruise departed from S^t Denis (Réunion Island) on March 29th 1993 and returned to S^t Denis May 18, 1993. It started at the beginning of the fall season in the southern hemisphere and was consequently relatively affected by bad weather conditions. Our first port of call was Port aux Français (Kerguelen Island) where we arrived April the 5th. After delivering supplies to the scientific base and a short visit of the facilities and the wildlife, we sailed on the evening for the ANTARFIX site where a sediment trap array was successfully deployed in poor weather, 3 days later.

Three piston cores were collected, South of Heard Island, on the Kerguelen plateau slope. At the bottom of the slope we were able to collect our first surface cores using the multicorer. Because we had to work almost constantly in seas ranging from 6 to 9, various systems were designed and tested in order to avoid the triggering of the box cores and the multicorer in the water column.

On the evening of April the 11th, by 59°S our southern progression was stopped by a violent storm. It became obvious, because we were too late in the season, that we would have major difficulties to follow through with our initial program. Since one of the major goal of this cruise was the deployment of sediment trap arrays it necessitated rather moderate weather conditions. More importantly all of our surface sediment sampling instruments were relatively sensitive to ship motions. Therefore, we decided to alter the original plans and concentrate our efforts on the POOZ.

In the POOZ we lost a complete sediment trap array: 2 acoustic release units, 2 sediment traps, 2 current meters, the flotation, and the head equipped with a gonio bearing, a flash light, and an ARGOS buoy. Although we were able to follow the drift of the mooring by satellite tracking, we were never able to bring it on the deck. The recovery had to be performed in rather poor weather and the line had to be cut because it was threatening to be caught in the propeller. No more mooring were attempted after this.

The cruise was then entirely devoted to sediment coring and water sampling along two transects located respectively by 58°E and 56°E. On April the 18th, during our weekly storm event, a container used for water filtrations was disemboweled by a wave. New laboratory facilities were assembled in order to accommodate the unfortunate users. The sampling program was then pursued without major problems until near the end of the cruise when the oceanographic winch COBRA, used for all the sediment coring, drop dead. The cable was slipping in the pulley!

On April the 29th, we called in at Crozet Island, where, on a beautiful day, we visited the scientific base and the island with its important penguin population. Operations were finished by May the 13th at 21h00 when we steamed towards the North. We had to wait the last three days of our trip before experiencing again nice weather and calm seas.

Cruise Information and Future Plans.

The cruise report and relative information about ANTARES 1 are available via anonymous ftp on: *darwin.cc.nd.edu*. In order to retrieve that information select the directory *pub/users/jfg*. The cruise report is primarily written in French with some sections in English and is available under the form of a MacIntoshTM Microsoft-WordTM format. A table summarizing the different operations and their locations is also available under the Microsoft-ExcelTM spreadsheet format. All these files are stored using the *.Hqx extension for binary transfer through the Internet. The directory also contains postscript files, displaying the cruise track, ASCII files, and a short summary of the cruise. If you experience any difficulty retrieving that information please send an e-mail to Jean-François Gailard for more complete instructions.

The first results of the ANTARES 1 cruise will be discussed at a workshop that will be held in Brest (Brittany, France), in the new Headquarters of the IFRTP, on December the 16 and 17, 1993. That workshop will gather the cruise participants, some representative of the executive committee of France-JGOFS, and anyone interested in the ANTARES program. The next cruise for ANTARES is scheduled for the next Austral summer: January-February on board the Marion-Dufresne.

ANTARES 1, Scientific Party.

Arnaud, P.; Benzohra, M.; Bianchi M.; Bouvier, T.; Carrion J.; De Witt, R., Feliatra, Gailard J-F.; Gamberoni L.; Hammoud, C.; Laureillard, J.; Moriarty, D.; Morvan, J.; Park, Y.; Pichon J-J.; Pierre, C.; Rabouille C.; Relexans J-C.; Riaux-Gobin C.; Roudier J-P.; Schmidt, S.; Stora, G.; Talbot, V.; Tréguer P.; Turon, J-L.; Van Beusekom, J.; Van Cappellen, P.; Vautravers, M.; Vincendeau, M-A.; Virvaux, E.