

1. Cruise information

Cruise name

MR09-01

Ship name

R/V Mirai

Title of cruise

Mirai MR09-01

Chief scientists

Leg 1: Akihiko Murata (RIGC/JAMSTEC)

Leg 2: Hiroshi Uchida (RIGC/JAMSTEC)

Leg 3: Ken-ichi Sasaki (RIGC/JAMSTEC)

Representative of science party

Akihiko Murata (RIGC/JAMSTEC)

Naomi Harada (RIGC/JAMSTEC)

Michio Aoyama (Meteorological Research Institute (MRI))

Kunio Yoneyama (RIGC/JAMSTEC)

Naoyuki Kurita (RIGC/JAMSTEC)

Osamu Tsukamoto (Okayama University)

Yoko Yokouchi (National Institute for Environmental Studies (NIES))

Nobuo Sugimoto (NIES)

Toshio Suga (RIGC/JAMSTEC)

Masao Nakanishi (Chiba University)

Takeshi Matsumoto (University of the Ryukyus)

Ken Furuya (University of Tokyo)

Naohiro Yoshida (Tokyo Institute of Technology)

Mitsuo Uematsu (Ocean Research Institute (ORI)/University of Tokyo)

Cruise period

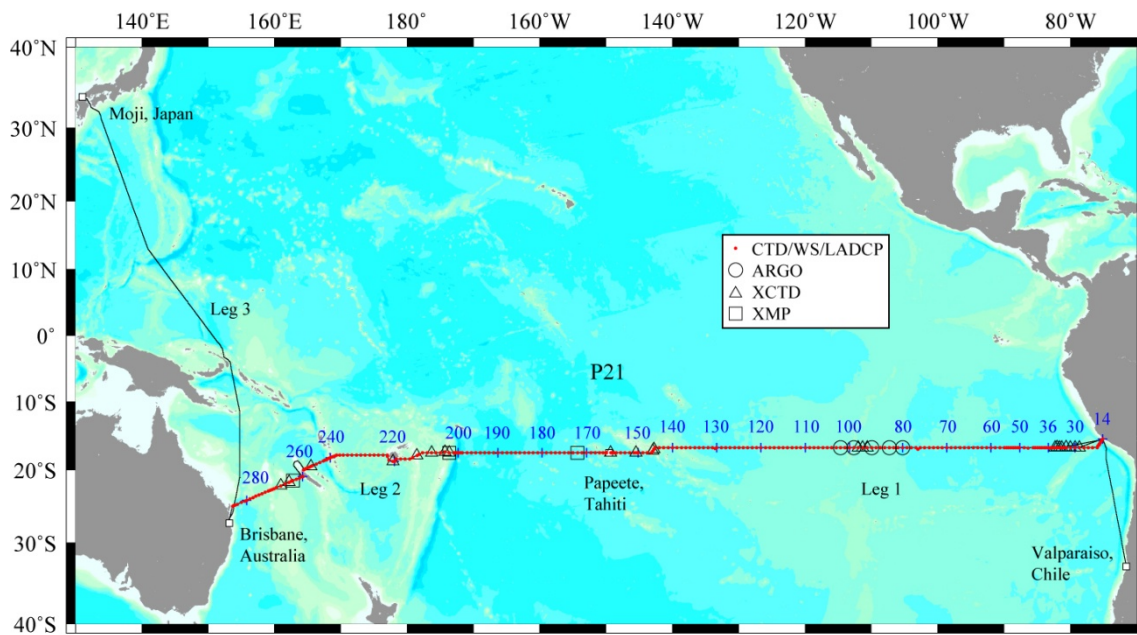
85 days from 10th April, 2009 through 3rd July, 2009

Port-of-call: Valparaiso, Chile; Papeete, Tahiti; Brisbane, Australia

Research area

Subtropical ocean in the South Pacific

Research map



2. Overview of observation

Purpose

It is well known that climate changes of a timescale more than a decade are influenced by changes of oceanic conditions. Among a lot of oceanic changes, we focus on transport and accumulation of anthropogenic CO₂ and heat in the ocean, both of which are important for global warming. Accordingly we are aimed at clarifying temporal changes of the transport and accumulation quantitatively. In doing so, we pay a special attention to water masses of the Southern Ocean's origin, which play an important role in transporting anthropogenic CO₂ and heat into the ocean's interior. This study is conducted under the frameworks of International Repeat Hydrography/Carbon and International Ocean Carbon Coordination.

In MR09-01, science parties, which had different objectives and listed in section 1, joined the cruise. Activities during the cruise and relevant research parties are introduced below briefly.

Outline

(1) CTD/LADCP/Water sampling (RIGC/JAMSTEC, MRI, University of Tokyo, Tokyo Institute of Technology)

Measurements of temperature, salinity, dissolved oxygen, current from the sea surface to the bottom using a CTD/O₂/LADCP system were made, together with water sampling at max. 36 layers in a water column with Niskin bottles of a volume of 12L. Salinity, dissolved oxygen, CO₂-system properties, CFCs, etc. were analyzed on board the ship.

(2) Underway measurements (RIGC/JAMSTEC, Okayama University)

Water temperature, salinity, atmospheric and surface seawater concentrations of CO₂, etc. were measured using equipments installed in the R/V Mirai.

(3) Current velocity measurements (RIGC/JAMSTEC)

Continuous measurements of vertical profiles of current direction and velocity were made along the cruise track.

(4) Measurements of turbulence mixing intensity by Expendable Microstructure Profile (XMP)

The measurement was conducted at 3 CTD stations of Stn. 172, 205 and 264.

(5) Atmospheric measurements (RIGC/JAMSTEC, Okayama University, NIES, ORI/University of Tokyo)

Measurements such as general meteorological elements, cloud base height by a ceilometers, turbulence fluxes by equipments installed in the foremast and the top deck were made continuously. Satellite images of clouds were also collected during the cruise. Furthermore, air sampling for volatile organic compounds, aerosols, etc. were made.

(6) Precipitation sampling (RIGC/JAMSTEC)

Precipitation for stable isotopes analyses was collected.

(7) Lidar observations (NIES)

Structure of atmospheric boundary layer, vertical distributions of aerosols, etc. were measured continuously with a lidar installed in a van.

(8) Deployment of Argo floats (RIGC)

Argo floats were deployed at the following 5 points.

(105°20.41′W, 16°45.21′S), (107°19.90′W, 16°44.51′S), (109°59.34′W, 16°45.05′S), (112°41.19′W, 16°44.99′S), (114°40.55′W, 16°45.33′S)

(9) Geophysical observations (Chiba University, University of the Ryukyus)

Sea bottom topography, gravity acceleration and 3-component magnetic field were measured continuously.

(10) Biogeochemical observations (University of Tokyo)

Phytoplanktonic community structure was surveyed by sampling planktons with a plankton net operated by hand.