

## 1. Objective

It is well known that the oceans play a central role in determining global climate. However heat and material transports in the ocean and their temporal changes have not yet been sufficiently quantified. Therefore, global climate change is not understood satisfactorily. The purposes of this research are to evaluate heat and material transports such as carbon, nutrients, etc. in the Pacific and to detect their long term changes and basin-scale biogeochemical changes since the 1990s. This cruise is a reoccupation of the hydrographic section called 'WHP-P14', which was observed by an ocean science group of USA (United States of America) in 1993 as a part of WOCE (World Ocean Circulation Experiment). The data-set is included in the data base of CLIVAR (Climate Variability and Predictability) and Carbon Hydrographic Data Office (<http://whpo.ucsd.edu/>). We will compare physical and chemical properties along section WHP-P14 with those obtained in 1993 to detect and evaluate long term changes of the marine environment in the Pacific. The western stations of the hydrographic section called 'WHP-P01', which were not occupied in MR07-04 due to a trouble of ship's propellers, were also observed.

Reoccupations of the WOCE hydrographic sections are now in progress by international cooperation in ocean science community, named 'International Repeat Hydrography and Carbon Project', within the framework of CLIVAR, which is as part of WCRP (World Climate Research Programme) and IOCCP (International Ocean Carbon Coordination Project). Our research is planned as a contribution to this international projects supported by WMO (The World Meteorological Organization), ICSU (The International Council for Science)/SCOR (The Scientific Committee on Oceanic Research) and UNESCO (The United Nations Educational, Scientific and Cultural Organization)/IOC (The Intergovernmental Oceanographic Commission), and the results and data will be published by 2009 for worldwide use.

The other purposes of this cruise are as follows:

1. to observe surface meteorological and hydrological parameters as a basic data of meteorology and oceanography such as studies on flux exchange, air-sea interaction and so on,
2. to observe sea bottom topography, gravity and magnetic fields along the cruise track to understand the dynamics of ocean plate and accompanying geophysical activities,
3. to observe bio-geochemical parameters to study material (carbon, nitrate, etc) cycle in the ocean,
4. to observe green house gasses in the atmosphere and the ocean to study their cycle from bio-geochemical aspect.

Participants are from;

- Global Ocean Development (Technicians)
- The University of Tokyo
- University of Washington
- University of Tsukuba
- Marine Works Japan (Technicians)
- Meteorological Research Institute
- National Institute for Environmental Studies
- Okayama University
- University of the Ryukyus

## 2. Cruise

Cruise Code : MR07-06  
GHPO Section designation : P14N, P14C, P01W  
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Ship : R/V MIRAI  
Ports of Call : Sekinehama – Hachinohe – Majuro – Auckland  
Cruise Date : October 8, 2007 – December 26, 2007

## 3. Cruise Track

Cruise Track and station locations are shown in Fig.1.

## 4. Observations

### 4.1 Number of Stations

A total of 143 stations for Leg.1 and 129 stations for Leg.2 were occupied using a Sea Bird Electronics 36 bottle carousel equipped with 12 liter Niskin X water sample bottles, a SBE911plus equipped with SBE35 deep ocean standards thermometer, SBE43 oxygen sensor, AANDERAA "optode" oxygen sensor and Benthos Inc. Altimeter and RDI Monitor ADCP.

### 4.2 Sampling and measurements

1. Measurements of temperature, salinity, oxygen, current profile, fluorescence using CTD/O<sub>2</sub> with LADCP.
2. Water sampling and analysis of salinity, oxygen, nutrients, CFC11,12, 113, total alkalinity, DIC, and pH.
3. Water sampling of POC, <sup>14</sup>C, <sup>13</sup>C, <sup>137</sup>Cs, Pu, Noble gases, stable isotopes of O<sub>2</sub>.
4. Water sampling for a biological study.
5. Underway measurements and sampling for pCO<sub>2</sub>, temperature, salinity, nutrients, surface current, bathymetry and meteorological parameters.
6. Air sampling for volatile organic matters.

### 4.3 Floats, Drifters, Drifter

A total of 14 Argo floats were deployed.

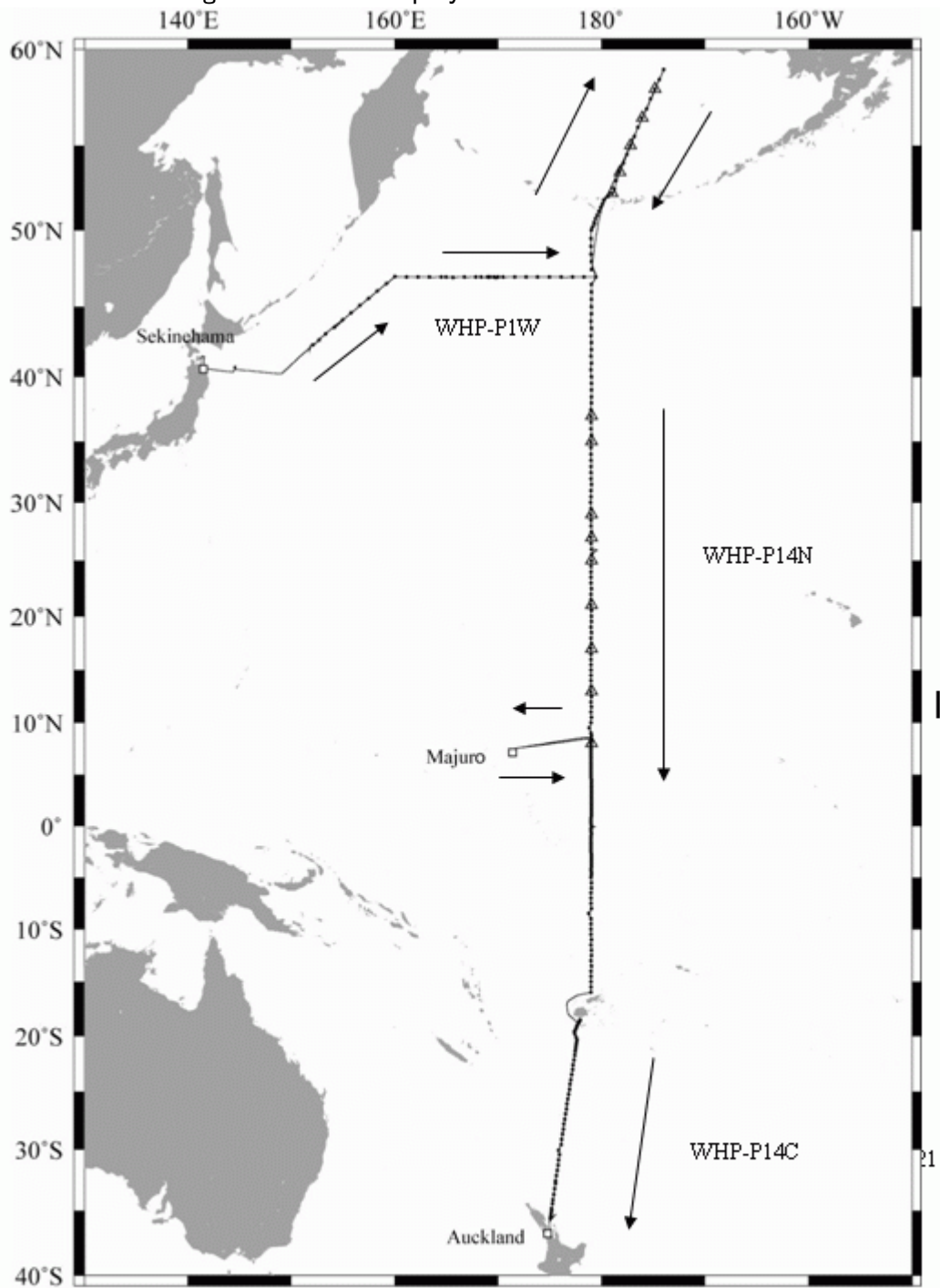


Fig.1. Cruise track and hydrographic stations. Solid circle (●) represents CTD station and triangle (△) shows a position where ARGO floats were deployed.