

WHP Ref. No.: PR24/PR25/PR22/PR26
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A. Cruise Narrative

A.1 Highlights

A.1.a WOCE designation PR24,PR25,PR22,PR26

A.1.b EXPCODE 76XB09/1

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A.1.d Ship R/V Xiang Yang Hong No. 5

A.1.e Ports of call

A.1.f Cruise dates 16 November 1991 to 11 December 1991

A.2 Cruise Summary Information

A.2.a Geographic boundaries

A.2.b Stations occupied

A.2.c Floats and drifters deployed

A.2.d Moorings deployed or recovered

A.3 List of Principal Investigators

A.4 Scientific Programme and Methods

To support world Ocean Circulation Experiment (WOCE) program, scientists and technicians of State Oceanic Administration from South China Sea Branch of SOA (Guangzhou), First Institute of Oceanography (Qingdao), Second Institute of Oceanography (Hangzhou), Third Institute of Oceanography (Xiamen), National Marine environment Forecasting Centre (Beijing), National Marine Data and Information Service (Tianjin), National Centre of Ocean Standard & metrology (Tianjin) conducted hydrographic observations aboard R/V Xiang Yang Hong No. 5 in the western tropical Pacific Ocean. The objective of this component of the WOCE program was to document the water mass property distributions of the western tropical Pacific Ocean and describe the oceanic velocity field. The cruise summarized here were conducted from 16th November 1991 to 11th December 1991. Conductivity-Temperature-Depth-Oxygen (CTD/02) data were collected at the hydrographic stations to the depths limited by either the CTD cable length or echo sounder problems. The cruise reoccupied some of the same stations as they were conducted during the 8 cruises of the PRC/US TOGA program in a period from December 1985 to July 1990 in order to provide temporal information. Summarized listings of CTD/02 data together with selected physical properties of sea water

for the cruise are provided here, as well as a description of the hardware used and an explanation of the data reduction techniques employed.

Introduction

The WOCE committee of the People's Republic of China (PRC) were established in 1990. Director Yan Hongmo of State Oceanic Administration (SOA) of PRC is the chairman of the committee. SOA called at some oceanographic scientists to select the area in the western tropical Pacific Ocean as the field of investigation for Chinese WOCE. It results in the first cruise of the Chinese WOCE, which might be considered a component of the international WOCE program.

The first cruise of the Chinese WOCE took place on 16th November 1991 to 11th December 1991; A major focus of the cruise has been the boundary area of the western tropical Pacific Ocean. In the area there are Mindanao Current, Papua New Guinea Coastal Undercurrent, Indonesia/Pacific throughflow and the other equatorial currents. The results from the cruise are summarized here. The objectives of the hydrographic program are to document the thermohaline and water mass property distributions in the western Pacific Ocean, to resolve the geostrophic transport field of the various currents of the region, and to characterize any interannual variations. The cruise track and the station positions for the cruise were chosen in an effort to resolve the major boundary currents and equatorial currents mentioned above, and to provide data for intercomparison with the previous PRC/US TOGA cruises. The reoccupation of some of the same stations as they were occupied during PRC/US TOGA cruises is important for studying time variability and also facilitate calibration of the sensors by exploiting the stability of the deep water property. The cruise were carried out aboard the R/V Xinag Yang Hong No. 5 operated by SOA. Scientific and technical personnel staffing the cruise were a combination of the SOA scientific units (Table).

Instrumentation

Two EG&G/Neil Brown Instrument Systems (NBIS) MK IIIb CTDs were used as the primary profiling instruments aboard the cruise. The instruments (serial numbers 1104 (CTD 11), and 2233 (CTD 13)) sampled temperature, conductivity, pressure and dissolved oxygen. A detailed description of the instrument can be found in the report by Brown and Morrison (1978)- A 12-position General Oceanics rosette fitted with 1.7 liter Niskin bottles was used to collect water samples for subsequent analysis aboard the vessel. Digital CTD data were acquired with a NBIS 1150 deck unit. These raw data were achieved with a PC based system (using the EG&G Marine Instruments Oceansoft CTD acquisition software) for real time display and subsequent data processing. Water samples from the rosette sampler were analyzed for salinity and dissolved oxygen content. Salinity samples were analyzed on a Chinese salinometer (serial number 0088091 (SYC2-1A type)) supplied by First Institute of Oceanography (Qingdao). Dissolved oxygen samples were analyzed using a modified Winkler method, all of the titration equipment was supplied by the South Branch of SOA (located at Guangzhou), and all of the samplers were processed on board.

Data Collection

Totally six sections, with stations positioned to optimize the resolution of transport in the strong current regions near the equator and the coasts, were occupied during the cruise. They are the 18 20 N section from the Phillipine coast to 130 E, the 130 E section

from 18 20 N to 8 N, the 8 N section from the Phillipine coast to 141.5 E, the 141.5 E section from 8 N to the Pupua New Guinea coast, the equatorial section from the 141.5 E to 128 E. and the Pacific/Indonesia throughflow section from the west end of Papua New Guinea to the southeast corner of the Mindanao Island. During the cruise, the station depth for CTD casts was limited by problems of the board echo sounder. The CTD casting depth was determined from the navigating charts if the bottom depth at the stations was greater than 1000 m. The CTD was casted to as deep as the bottom depth was if the station depth was less than 1000 m. Xiang yang Hong No. 5 is a vessel with a limited ability to maneuver on the wire, thus, strong wind or currents often results in large wire angles, limiting casting depths.

The data return for the cruise was excellent, except few stations were not completed due to adverse weather conditions effected by typhoon.

Data Calibration and Reduction

Conductivity, temperature and pressure sensors of the CTD instruments were calibrated at National Centre of Ocean Standard & Metrology (Tianjin) prior to and following the cruise. The detailed calibration ability can be found in Millard et al. (1990).

CTD sensor calibrations applied at sea for data workup and instrument quality control were typically the pre-cruise laboratory calibrations for conductivity, temperature and pressure. No electronic adjustments were made to the sensor interface boards during the laboratory calibrations. Instead, temperature, pressure and conductivity corrections, determined by polynomial least-square fits to the laboratory calibration data were applied to the data, thus the performance history of each sensor was maintained. Temperature calibrations consisted of a linear or quadratic fit to seven temperature points in reference to a platinum thermometer standard. Pressure calibrations were done using dead-weight tester at 1000 psi intervals for increasing and decreasing pressure. Temperature and pressure calibrations were used to scale the data profiles as well as the CTD components of rosette sample data files. Conductivity calibrations were done in reference to Chinese standard sea water, supplied by First Institute of Oceanography (Qingdao). The procedure and method of the CTD calibration and data processing are advised on with R. C. Millard, WHOI USA. Specific information on actual calibrations for each sensor for the cruise can be found in Yang(1993). CTD/O₂oxygen sensor calibration coefficients were derived from comparison to in situ water sample oxygen data within various station groupings (Owens and Millard, 1985). CTD conductivity sensor calibrations for the cruise were determined by considering the relationship of precruise laboratory calibrations to in situ rosette water sample data (Millard, 1982) and very stable water potential temperature/salinity profiles of the western tropical Pacific Ocean.

A.5 Major Problems and Goals not Achieved

A.6 Other Incidents of Note

A.7 List of Cruise Participants