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HYDROGRAPHIC STATION DATA OBTAINED IN THE EAST CHINA SEA,
AUGUST, 1981

by

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TECHNICAL REPORT

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Abstract

A hydrographic survey was made on August 1-16, 1981 on the People's Republic of China R/V Shijian to measure the regional hydrographic structure in the East China Sea near the mouth of the Chang Jiang (Yangtze) River. The objectives of the hydrographic program were to document the spatial structure of the Chang Jiang discharge over the continental shelf and characterize the river's influence on the shelf water masses during a period of maximum river discharge. A summary of the hydrographic observations made during Cruise ECS81-1 on the R/V Shijian is presented in graphic form.

1. Introduction

The Chang Jiang (Yangtze River) is the third largest river in the world in terms of water discharge, and the maximum discharge on average occurs in July and August. In June, 1980, the first field experiment of a cooperative research program took place in the East China Sea involving U.S. and Chinese scientists from many institutions including specialists in marine geology, biological oceanography, marine geochemistry, and physical oceanography. The overall objective of this joint U.S. - P.R.C. program is to develop an understanding of the discharge of fresh water and sediment from the Yangtze River, and to determine its influence on the East China Sea sedimentary regimes. As part of this program, a hydrographic component was designed to measure the spatial and temporal structure of the Yangtze River plume from the mouth of the estuary out onto the shelf and characterize the influence of this plume on the shelf water masses. In 1981, the second field experiment involved two Chinese research ships, the R/V Shijian, which worked over the shelf adjacent to the Yangtze River mouth, and the R/V Shugang No. 6, a smaller coastal vessel which worked within the mouth of the Yangtze estuary. We present here in graphical form a preliminary analysis of the hydrographic observations made in the East China Sea on the R/V Shijian during the August 1-16, 1981 survey.

2. Instrumentation

A. CTD

A Neil Brown Instrument System Model MK3 CTD fish (No. 038-D) was used as the primary profiling instrument aboard the R/V Shijian. The instru-

ment provided continuous sampling of temperature, conductivity, pressure, dissolved oxygen, and light transmission. Salinity and density were subsequently derived from the measured variables. Conductivity is measured with a miniature four electrode ceramic cell. Temperature is sensed from the combined outputs of a high speed (30 millisecond) thermistor and a platinum resistance thermometer. Pressure is sensed by a strain gauge pressure transducer. Dissolved oxygen is measured by a Beckman polarographic partial pressure oxygen-sensor.

B. Transmissometer

A Sea Tech beam transmissometer (25 cm pathlength) was attached to the CTD underwater unit and light transmission was recorded continuously during each CTD cast. The light source is a Light Emitting Diode (LED) with a wavelength of 660 nm. The instrument design has been field-tested in Oregon and Peru (Bartz, Zaneveld and Pak, 1978) with satisfactory results and used here without additional calibration.

C. Calibration Samples

Water samples were not collected for salinity calibration since a salinometer was not available on the R/V Shijian. Suspended sediment samples were obtained by Chinese scientists, and these samples were used for comparison with the light transmission data.

D. Navigation

The R/V Shijian relied primarily on the local Chinese Loran-A navigation system to position the ship at each station. The estimated accuracy of the station locations was ± 4 km.

3. Data Acquisition and Analysis

An HP85 desktop computer was integrated with the Neil Brown CTD deck unit as the primary data acquisition system. The acquisition program was initially written by Frank Sommer of the University of Alaska, Fairbanks, and slightly modified for this application. Temperature, conductivity, pressure, dissolved oxygen, and the original light transmission data, were also recorded continuously in FM format using an analog cassette recorder as a backup for the HP85 system at each station. The Neil Brown digital data stream was subsampled by the HP85 every 0.4 seconds giving a typical pressure interval of 15 cm between data records. Vertical profiles produced immediately after each cast in engineering units enable the user to qualitatively assess the data quality of each station. The raw data in engineering units were then averaged over 2 meter depth intervals, recorded on the HP85 tape cassette, and subsequently used with analysis software to compute other derived variables and make edited data plots.

4. Error Analysis

The USGS Neil Brown CTD fish (No. 038-D) was calibrated by Neil Brown Instrument Systems prior to the cruise and recalibrated after the cruise by Karl Schleicher at the WHOI calibration facility. At Station P8156 near the end of the survey, an incorrect bottom depth from the bridge resulted in the CTD fish hitting bottom. Subsequent recovery showed fine sediment in the conductivity cell and thermistor. The sensors were cleaned with a mild acidic solution and the remaining stations were completed without problems. Thus we feel that the data accuracy was within the manufac-

turer's specifications of

Pressure	:	± 0.5 db
Temperature	:	$\pm 0.005^{\circ}\text{C}$
Conductivity	:	± 0.005 mmho
Dissolved Oxygen	:	± 2 nA

prior to Station P8156 (corresponding to 95 of the CTD stations made on the cruise). After Station P8156, the calibration is assumed to have changed due to contamination of the conductivity cell with mud. Post-cruise calibration at WHOI showed the following offsets between the measured and true temperature and conductivity.

	Offset	
	<u>True - Instrument</u>	<u>Standard Deviation</u>
Temperature :	- .012 $^{\circ}\text{C}$	.001 $^{\circ}\text{C}$
Conductivity :	+ .022 mmho	.005 mmho

We assume that this small shift in the CTD calibration occurred after Station P8156, however, this change is small compared to the mode of presentation of the survey results. The CTD fish sensors were then recleaned at WHOI and the instrument recalibrated. The calibrations after the second cleaning were:

	<u>Offset</u>	<u>Standard Deviation</u>
Temperature :	- .010 $^{\circ}\text{C}$	.001 $^{\circ}\text{C}$
Conductivity :	+ .010 mmho	.003 mmho

Since these calibration offsets were small compared to the local variability in the hydrographic structure in the East China Sea, no correction was made to the data.

5. Hydrographic Data Presentation

The hydrographic data taken on the survey are presented here in three different formats - vertical and horizontal sections, and T/S diagrams. The horizontal and vertical cross-sections are drawn with contour intervals of 1°C , $1^{\circ}/\text{‰}$, $1 \sigma_t$, 1 mg/L O_2 , and every 10 percent light transmission. T/S diagrams are also presented for each vertical section as well as a composite of all stations. The T/S diagrams are plotted from the raw CTD data whereas the vertical and horizontal cross-sections are drawn from the 2 m averaged data. The horizontal plan view sections are presented for the survey at standard depths of 2 m, 6 m, 10 m, 20 m, 30 m, 40 m.

6. Acknowledgements

Cruise ECS 81-1 of the R/V Shijian was supported jointly by the People's Republic of China, National Bureau of Oceanography and the National Atmospheric and Oceanic Administration under Cooperative Agreement No. NA81AA-H-00008. The authors were also supported under NSF Grant No. OCE 80-14941. Dr. George Keller was the Chief Scientist on the multi-disciplinary cruise which involved current meter mooring deployment and recovery, seafloor sampling and coring, and the hydrographic program. The work was a cooperative effort between scientists from the People's Republic of China and the United States. The helpfulness of the officers and crew of the R/V Shijian contributed significantly to the success of the cruise. We are especially

indebted to Brad Butman of the USGS who loaned the CTD profiling system and Dan Schaff of Neil Brown Instrument Systems who assisted in making the hydrographic survey a success.

7. Reference

Bartz, R. J., R. V. Zaneveld and H. Pak, A transmissometer for profiling and moored observations in water. SPIE, Volume 160, Ocean Optics V, 1978, p. 102-108.

Figure 1: Hydrographic Station Locations

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16

Figure 17: T/S Diagram for All Stations

Figure 18

Figure 19

STATION # MAX DEPTH (M)

1	P8106	12
2	P8105	25
3	P8104	23
4	P8103	18
5	P8102	12
6	P8101	12

Figure 20

Figure 21

Figure 22

STATION # MAX DEPTH (M)

G8128 7

P8101 12

P8154 20

P8153 42

P8152 47

P8126 48

1

2

3

4

5

6

Figure 23

Figure 24

Figure 25

Figure 26

STATION # MAX DEPTH (M)

1	P8106	12
2	P8107	28
3	P8108	33
4	P8109	36
5	P8110	49
6	P8111	69

Figure 27

Figure 28

Figure 29

Figure 30

STATION # MAX DEPTH (M)

1	P8104	23
2	P8112	28
3	P8113	32
4	P8114	43
5	P8115	35
6	P8116	50
7	P8118	85

SALINITY

Figure 31

Figure 32

Figure 33

Figure 34

STATION # MAX DEPTH (M)

1	P8154	20
2	P8119	46
3	P8120	34
4	P8121	43
5	P8122	35
6	P8123	44
7	P8124	70

SALINITY

Figure 35

Figure 36

Figure 37

Figure 38

STATION # MAX DEPTH (M)

1	P8126	48
2	P8127	43
3	P8128	49
4	P8129	44
5	C8138	65
6	P8132	82

Figure 39

Figure 40

Figure 41

Figure 42

STATION # MAX DEPTH (M)

1	P8133	56
2	P8134	46
3	P8135	53
4	P8136	54
5	P8155	71

SALINITY

Figure 43

Figure 44

Figure 45

Figure 46

STATION # MAX DEPTH (M)

1	P8106	12
2	P8105	25
3	P8112	28
4	P8119	46
5	P8126	48
6	P8133	56
7	P8140	53

SALINITY

Figure 47

Figure 48

Figure 49

Figure 50

1	P8107	28
2	P8113	32
3	P8120	34
4	P8127	43
5	P8134	46
6	P8141	58
7	P8147	66

SALINITY

Figure 51

Figure 52

Figure 53

Figure 54

STATION # MAX DEPTH (M)

1	P8108	33
2	P8114	43
3	P8121	43
4	P8128	49
5	P8135	53
6	P8142	59

SALINITY

Figure 55

Figure 56

Figure 57

Figure 58

STATION #	MAX DEPTH (M)
1 P8109	36
2 P8115	35
3 P8122	35
4 P8129	44
5 P8136	54
6 P8143	60

SALINITY

Figure 59

Figure 60

Figure 61

Figure 62

STATION # MAX DEPTH (M)

1	G8135	61
2	P8110	49
3	P8116	50
4	P8123	44
5	P8156	61
6	G8132	68

SALINITY

Figure 63

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