





### 3. Some Features of the PWBC

#### 3.1. The Kuroshio at its origin

The Kuroshio is defined differently by different oceanographers (Kishindo, 1931; Sverdrup et al., 1942; Wyrtki, 1961; Nitani, 1972). Nitani (1972) stated that the current from just north of the place where the North Equatorial Current is separated into two branches offshore east of the Philippines to the east of Japan where the current veers away from land can be called the Kuroshio in a broad sense. At least, the beginning of the Kuroshio is in the region off the east coast of Luzon.

In order to detect the Kuroshio three sections east of northern Luzon and Taiwan were designed (Fig. 1). However, the latitude of the section east of the north end of Luzon for 1986 is half degree different (more) than 1987 and 1988. A summary can be made about the Kuroshio as follows from the inversion-calculated results.

##### a) Volume transport of the Kuroshio in its origin area

October 1986. The strength of the Kuroshio can be examined by westward volume transport through the meridional section east of Luzon Strait (approximately  $122^{\circ}20'E$ ) and northward through the zonal sections ( $18^{\circ}30'N$  and  $22^{\circ}10'N$ ). It is seen from Fig. 2 that the main flows are concentrated in the upper 600m layer. A very narrow northward flow between st. 7 and 9 is more than  $19.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  in transport (Fig. 2a). There are two westward flows between st. 9 and 11 (east of Taiwan) with  $11.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  in transport and between st. 12 and 14 (north of Luzon) with  $19.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  (Fig. 2b). A narrow eastward flow of  $3.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  in transport gets through the meridional section (Fig. 2b). So if we use the northwestward flow from st. 7 and 14 to indicate the Kuroshio, the transport is about  $46.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  without the leakage in between st. 14 and Luzon coast (they are about 46 km apart. The velocity near st. 14 is more than  $30 \text{ cm} \cdot \text{s}^{-1}$ . Suppose the average velocity in the upper 600 m is  $18 \text{ cm} \cdot \text{s}^{-1}$  southeast of st. 14, then the transport leaked is about  $6.10^6 \text{ m}^3 \cdot \text{s}^{-1}$ . Therefore, the volume transport of the Kuroshio east of Luzon and Taiwan is about  $52.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  which is about 1.5 times of the normal transport (Hu, 1989). This can be circumstantially verified by the  $\sigma_t = 26$  topography (Fig. 5a).

October 1987. Through  $122^{\circ}40'E$  section (Fig. 3a) gets a westward flow between st. 18 and 21 with a volume transport of  $18.10^6 \text{ m}^3 \cdot \text{s}^{-1}$ , and eastward flow with  $18.7.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  in transport including a narrow eastward flow between st. 17 and 18 with  $1.5 \times 10^6 \text{ m}^3 \cdot \text{s}^{-1}$ . Through  $18^{\circ}N$  section (Fig. 3b) take place a northward flow between st. 17 and 14 (transport is about  $15.10^6 \text{ m}^3 \cdot \text{s}^{-1}$ ), and two bands of southward flow offshore with transport of  $19.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  between st. 14 and 13 and  $5.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  between st. 9 and 8 in the upper layer. In consideration of the fact that st. 17 is about 50 km away from land, northwestward leakage between st. 17 and Luzon might be about  $5.10^6 \text{ m}^3 \cdot \text{s}^{-1}$ . And then the transport of the Kuroshio is only about  $20.10^6 \text{ m}^3 \cdot \text{s}^{-1}$ , which is only half of the normal (Hu, 1989). Obviously, the Kuroshio is weaker during this time. A great deal of water getting through the section of  $132^{\circ}E$  (Fig. 3d-st. 5 to 1) turns right to the north in the place east of st. 1. This also can be verified by the  $\sigma_t = 26$  topography (Fig. 5b).

October 1988. An obvious westward flow through the  $122^{\circ}40'E$  section (Fig. 4a) is between st. 10 and 15 mainly in the upper 600 m layer with a volume transport of about  $30.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  and a return (eastward) flow in the upper 300 m layer exists between st. 8 and 10 with  $7.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  in transport. The section along  $18^{\circ}N$  (Fig. 4b) shows a strong  $28.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  in transport and wide (about 300 km in width) northward flow, in the upper 600 m layer between st. 15 and 18 and a return flow, which is 300 km wide and with volume transport of  $10.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  in the upper 500 m layer in between st. 18 and 21. This year the volume transport of the Kuroshio here is about  $33.10^6 \text{ m}^3 \cdot \text{s}^{-1}$  with the same estimate as above since the distance between st. 15 and Luzon is about 33 km. This tendency can be verified from figure 5c.

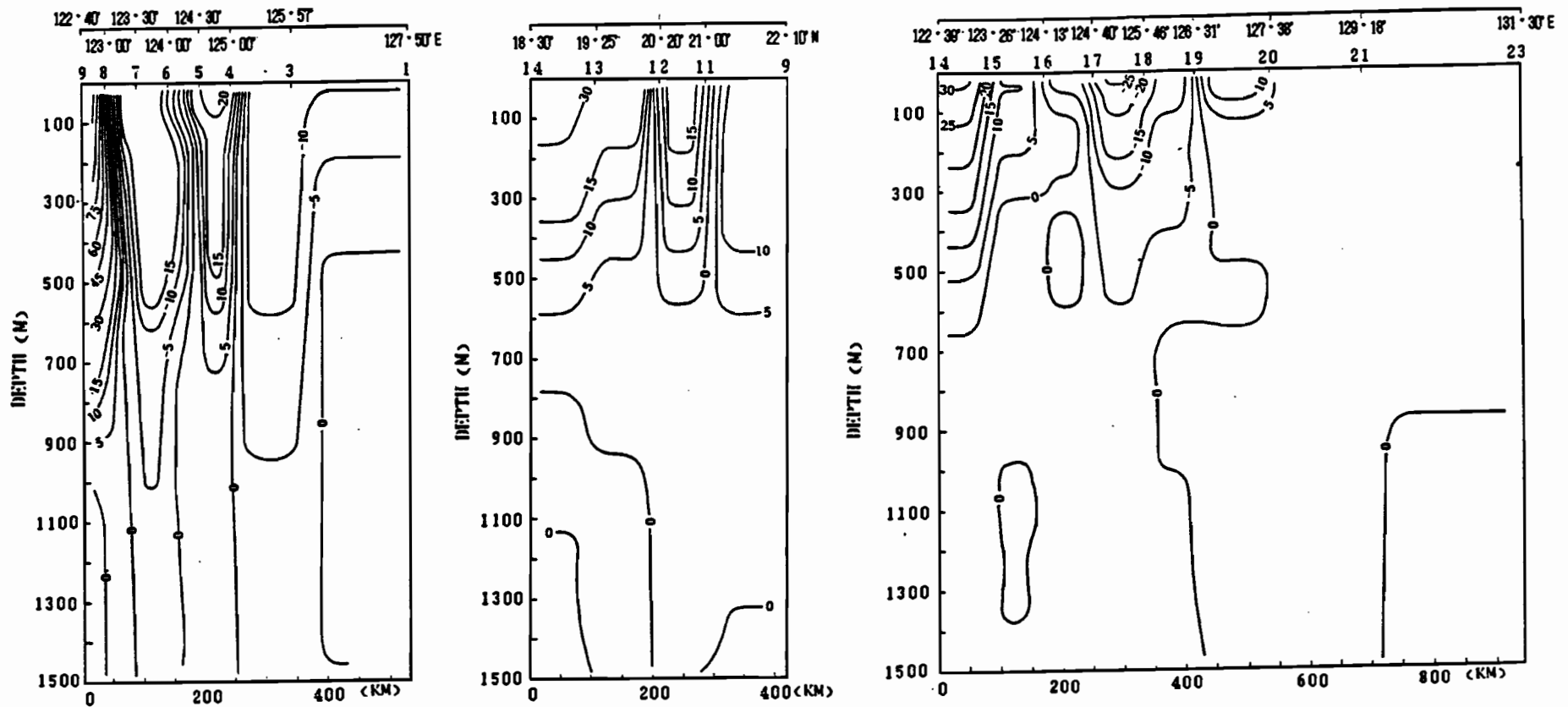


FIG.2. Velocity distribution in October 1986 along 22°10'N (left), 122°20'E (middle), and 18°30'N (right). Positive (negative) flow into (out of) the paper.











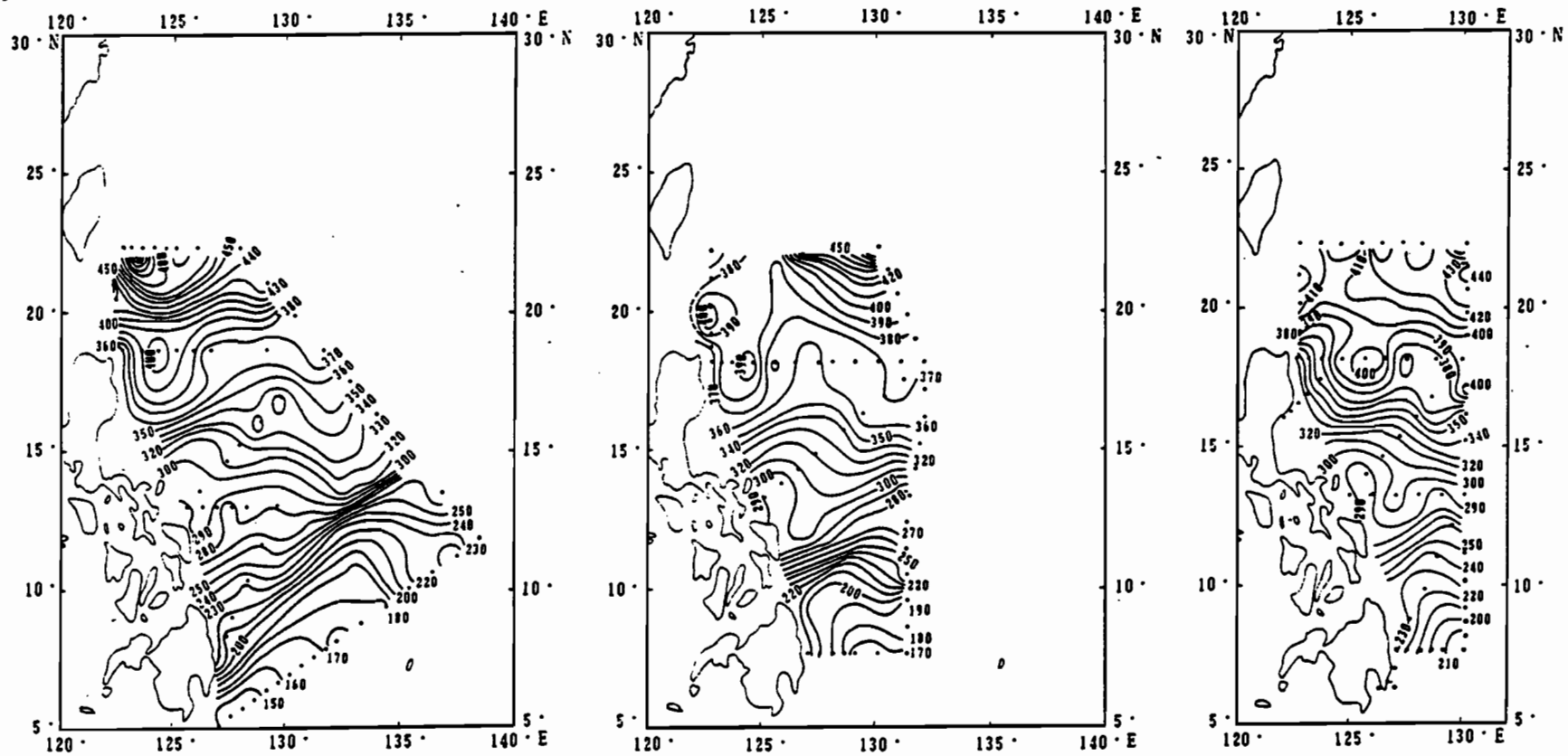


FIG.5. Sigma-t topography in October 1986 (left), October 1987 (middle), and October 1988 (right).







WESTERN PACIFIC INTERNATIONAL MEETING  
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PROCEEDINGS

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## TABLE OF CONTENTS

<b>ABSTRACT</b> .....	i
<b>RESUME</b> .....	iii
<b>ACKNOWLEDGMENTS</b> .....	vi
<b>INTRODUCTION</b>	
<b>1. Motivation</b> .....	1
<b>2. Structure</b> .....	2
<b>LIST OF PARTICIPANTS</b> .....	5
<b>AGENDA</b> .....	7
<b>WORKSHOP REPORT</b>	
<b>1. Introduction</b> .....	19
<b>2. Working group discussions, recommendations, and plans</b> .....	20
a. Air-Sea Fluxes and Boundary Layer Processes .....	20
b. Regional Scale Atmospheric Circulation and Waves .....	24
c. Regional Scale Oceanic Circulation and Waves .....	30
<b>3. Related programs</b> .....	35
a. NASA Ocean Processes and Satellite Missions .....	35
b. Tropical Rainfall Measuring Mission .....	37
c. Typhoon Motion Program .....	39
d. World Ocean Circulation Experiment .....	39
<b>4. Presentations on related technology</b> .....	40
<b>5. National reports</b> .....	40
<b>6. Meeting of the International Ad Hoc Committee on TOGA COARE</b> .....	40
<b>APPENDIX: WORKSHOP RELATED PAPERS</b>	
<b>Robert A. Weller and David S. Hosom: Improved Meteorological     Measurements from Buoys and Ships for the World Ocean     Circulation Experiment</b> .....	45
<b>Peter H. Hildebrand: Flux Measurement using Aircraft     and Radars</b> .....	57
<b>Walter F. Dabberdt, Hale Cole, K. Gage, W. Ecklund and W.L. Smith:     Determination of Boundary-Layer Fluxes with an Integrated     Sounding System</b> .....	81

**MEETING COLLECTED PAPERS**

RESEARCH IN LINGUISTICS AND LITERATURE OF THE AMERICAN INDIAN

[REDACTED]

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<b>John S. Godfrey, K. Ridgway, Gary Meyers, and Rick Bailey:</b> Sea Level and Thermal Response to the 1986-87 ENSO Event in the Far Western Pacific .....	291
<b>Joël Picaut, Bruno Camusat, Thierry Delcroix, Michael J. McPhaden, and Antonio J. Busalacchi:</b> Surface Equatorial Flow Anomalies in the Pacific Ocean during the 1986-87 ENSO using GEOSAT Altimeter Data .....	301

#### THEORETICAL AND MODELING STUDIES OF ENSO AND RELATED PROCESSES

<b>Julian P. McCreary, Jr.:</b> An Overview of Coupled Ocean-Atmosphere Models of El Niño and the Southern Oscillation .....	313
<b>Kensuke Takeuchi:</b> On Warm Rossby Waves and their Relations to ENSO Events .....	329
<b>Yves du Penhoat, and Mark A. Cane:</b> Effect of Low Latitude Western Boundary Gaps on the Reflection of Equatorial Motions .....	335
<b>Harley Hurlburt, John Kindle, E. Joseph Metzger, and Alan Wallcraft:</b> Results from a Global Ocean Model in the Western Tropical Pacific .....	343
<b>John C. Kindle, Harley E. Hurlburt, and E. Joseph Metzger:</b> On the Seasonal and Interannual Variability of the Pacific to Indian Ocean Throughflow .....	355
<b>Antonio J. Busalacchi, Michael J. McPhaden, Joël Picaut, and Scott Springer:</b> Uncertainties in Tropical Pacific Ocean Simulations: The Seasonal and Interannual Sea Level Response to Three Analyses of the Surface Wind Field .....	367
<b>Stephen E. Zebiak:</b> Intraseasonal Variability - A Critical Component of ENSO ? .....	379
<b>Atimasa Sumi:</b> Behavior of Convective Activity over the "Iovian-type"	

<b>Aqua-Planet Experiments .....</b>	389
<b>Ka-Ming Lau:</b> Dynamics of Multi-Scale Interactions Relevant to ENSO .....	397
<b>Pecheng C. Chu and Roland W. Garwood, Jr.:</b> Hydrological Effects on the Air-Ocean Coupled System .....	407
<b>Sam F. Jacobellis, and Richard C.J. Somerville:</b> A one Dimensional Coupled Air-Sea Model for Diagnostic Studies during TOGA-COARE .....	419
<b>John J. Clarke:</b> On the Reflection and Transmission of Low Frequency	



## MOMENTUM, HEAT, AND MOISTURE FLUXES BETWEEN ATMOSPHERE AND OCEAN

<b>W. Timothy Liu: An Overview of Bulk Parametrization and Remote Sensing of Latent Heat Flux in the Tropical Ocean</b> .....	513
<b>E. Frank Bradley, Peter A. Coppin, and John S. Godfrey: Measurements of Heat and Moisture Fluxes from the Western Tropical Pacific Ocean</b> .....	523
<b>Richard W. Reynolds, and Ants Leetmaa: Evaluation of NMC's Operational Surface Fluxes in the Tropical Pacific</b> .....	535
<b>Stanley P. Hayes, Michael J. McPhaden, John M. Wallace, and Joël Picaut: The Influence of Sea-Surface Temperature on Surface Wind in the Equatorial Pacific Ocean</b> .....	543
<b>T.D. Keenan, and Richard E. Carbone: A Preliminary Morphology of Precipitation Systems In Tropical Northern Australia</b> .....	549
<b>Phillip A. Arkin: Estimation of Large-Scale Oceanic Rainfall for TOGA</b> .....	561
<b>Catherine Gautier, and Robert Frouin: Surface Radiation Processes in the Tropical Pacific</b> .....	571
<b>Thierry Delcroix, and Christian Henin: Mechanisms of Subsurface Thermal Structure and Sea Surface Thermo-Haline Variabilities in the South Western Tropical Pacific during 1979-85 - A Preliminary Report</b> .....	581
<b>Greg. J. Holland, T.D. Keenan, and M.I. Manton: Observations from the</b>	

<b>Maritime Continent : Darwin, Australia</b> .....	591
<b>Roger Lukas: Observations of Air-Sea Interactions in the Western Pacific Warm Pool during WEPOCS</b> .....	599
<b>M. Nunez, and K. Michael: Satellite Derivation of Ocean-Atmosphere Heat Fluxes in a Tropical Environment</b> .....	611

## EMPIRICAL STUDIES OF ENSO AND SHORT-TERM CLIMATE VARIABILITY

<b>Klaus M. Weickmann: Convection and Circulation Anomalies over the Oceanic Warm Pool during 1981-1982</b> .....	623
<b>Claire Perigaud: Instability Waves in the Tropical Pacific Observed with GEOSAT</b> .....	637

**Chung-Hsiung Sui, and Ka-Ming Lau: Multi-Scale Processes in the  
Equatorial Western Pacific ..... 747**

