MR99-K06 Cruise Summary

1. Introduction

The purpose of this cruise is to observe physical oceanographic conditions in the western tropical Pacific Ocean to achieve a better understanding of air-sea interaction affecting on the ENSO (El Nino/Southern Oscillation) phenomena and its related climate change. The surface layer in the western tropical Pacific Ocean is characterized by high sea surface temperature which plays major role in driving global atmospheric circulation. Especially, El Nino occurs when warm water migrates eastward, and causes short term climate changes in the world dramatically. For example, the western Pacific area has very few rainfall when the "El Nino" occurred, as in 1997-98. This atmospheric and oceanic systems is so complicated, and we still do not have enough knowledge about it. This climate system have the long time scale. To investigate the mechanism, we need precise and detailed data for the long period continuously. Therefore, ocean and atmosphere observing mooring array is effective to obtain such data set. The major mission of this cruise is to deploy TRITON buoys developed at JAMSTEC for the long term measurements of ocean and atmosphere in the western tropical Pacific Ocean. We have successfully deployed during this R/V Mirai cruise, although we must have recovered one TRITON buoy because of unexpected. It is the first step to establish long-term measurements for the TRITON program.

The other purposes of this cruise are,

1. CO2 measurements in the boundary layer by Meteorological Research Institute of Japan,
2. Lidar back scatter measurements of lower atmosphere by National Institute of Environment of Japan, Tohoku Institute of Technology and CRI and
3. Cloud and rainfall measurement by Doppler radar for comparison with TRMM satellite by Meteorological Institute of Japan.

These measurements are also made successfully during this cruise.

2.Summary

2.1 Ship

R/V Mirai
Captain Takaaki Hashimoto
Total 35 crew members

2.2 Cruise code

MR99-K06

2.3 Project name

Tropical Ocean Climate Study

2.4 Undertaking institution

Japan Marine Science and Technology Center (JAMSTEC)
2-15, Natsushima, Yokosuka, 237, Japan

2.5 Chief scientist

Kentaro Ando (JAMSTEC)

2.6 Period

October 13 , 1999 – November 20, 1999

2.7 Ports of call

Sekinehama, Japan	(October 13, 1999)
Hachinohe, Japan	(October 14, 1999)
Guam, USA	(October 19–20, 1999)
Guam, USA	(November 19, 1999)

2.8 Research participants

Total 21 scientists and technical stuff participated from 8 different institutions, universities and companies.

2.9 Observation summary

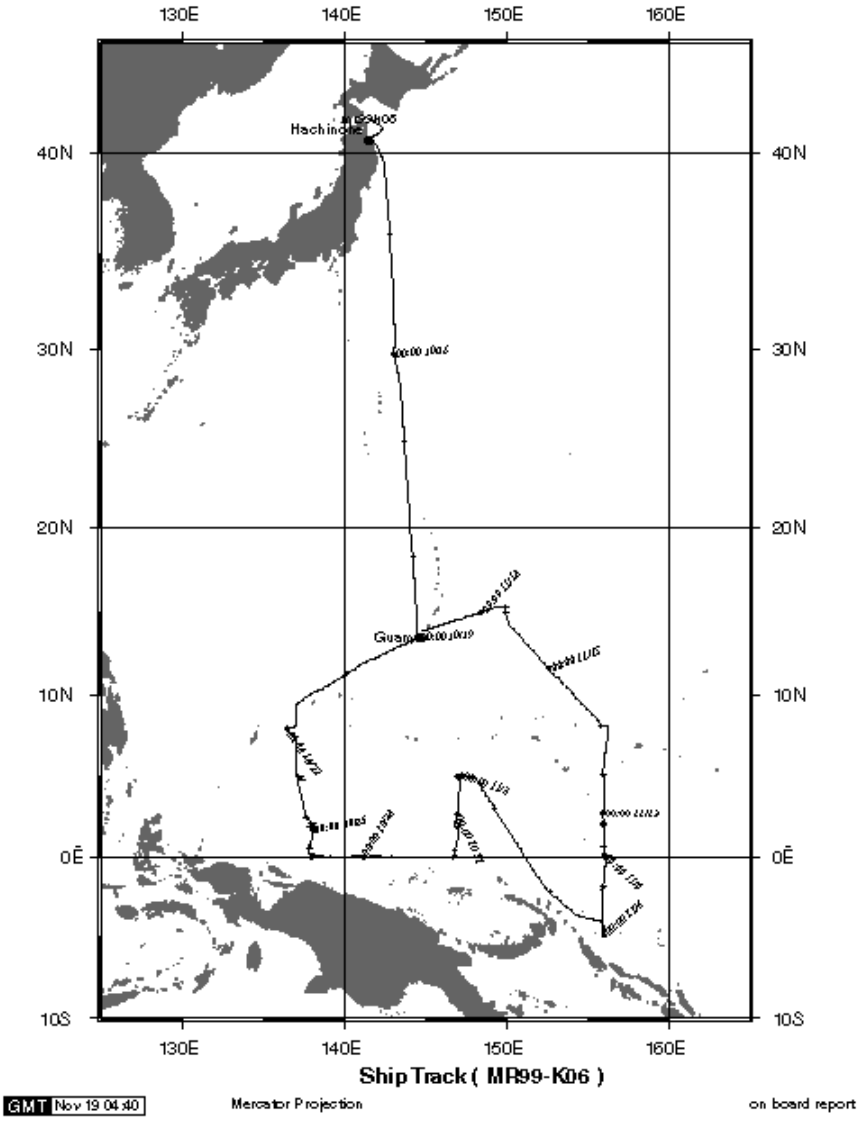
TRITON buoy deployment	: 6 sites
TRITON buoy recovery	: 2 sites
TRITON buoy repair	: 1 sites
ADCP subsurface buoy deploy	: 1 site
ADCP subsurface buoy recovery	: 1 site
CTD(Salinity, Temperature, Depth)	: 20 casts down to 1000m
XCTD (Salinity, Temperature, Depth)	: 18 times down to 1000m
Surface meteorology	: continuous
Atmospheric sounding	: ?? times
ADCP measurements	: continuous
Doppler radar measurements	: continuous
Surface temperature, salinity measurements by intake method	: continuous

Other specially designed observations have been carried out successfully.

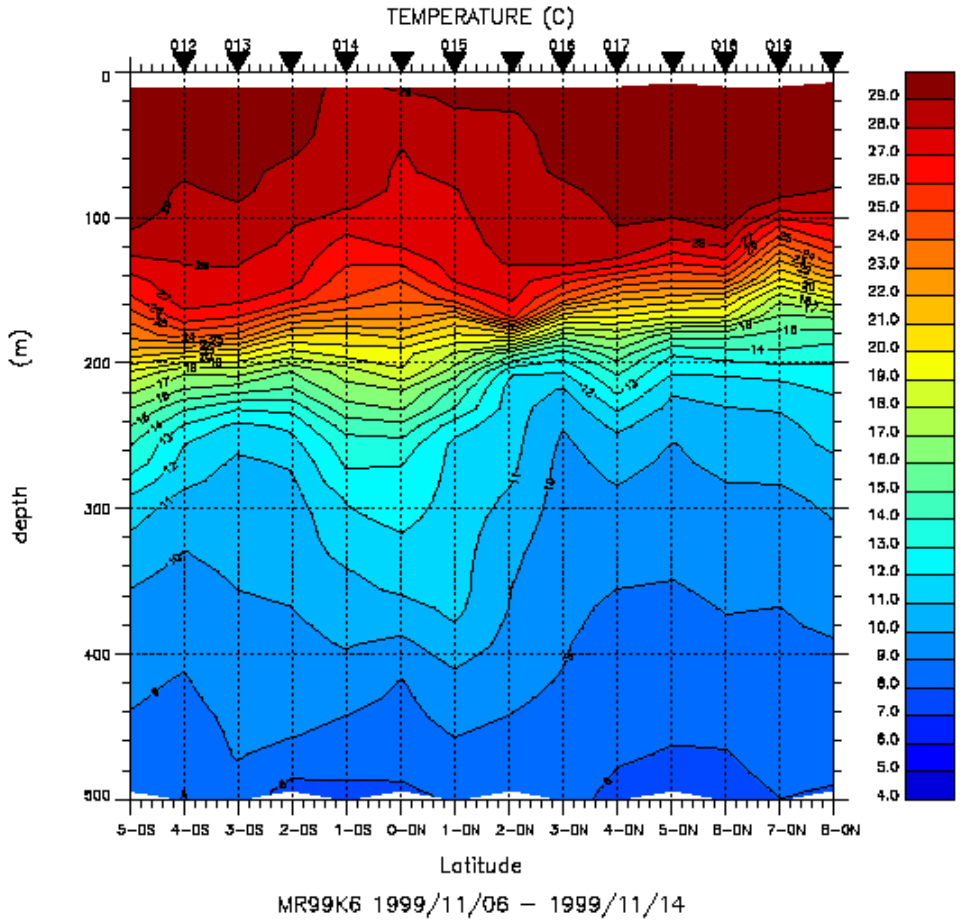
2.10 Observed oceanic and atmospheric conditions

This MR99-K06 cruise has been carried out under the still alive La Nina stage after the recovery from historical 1997–1998 El Nino event. The sea surface temperature (SST) along the equator (138E–156E) showed that higher temperature than 29 degree-C was found west of 147E. On the equator of 156E, the SST was lower than 29 and the temperature and salinity vertical section along 156E showed the strong upwelling and mixing in the mixed layer near the equator. The westward current in the surface layer is still strong (around 1.5 knot). The sea surface salinity (SSS) showed low salinity west of about 142E and higher to the east. This shows the fresh water pool is just confined in the far west region, and the atmospheric convection will be developed in the western region near Indonesia. Along the 156E line, the boundary layer atmosphere was rather dry, and the relative humidity sensor installed on the TRITON buoy often showed lower than usual relative humidity. The radio sonde data also shows the dry air in the lower layer. Under these conditions, the atmospheric convection would be suppressed, then SSS would be higher than usual.

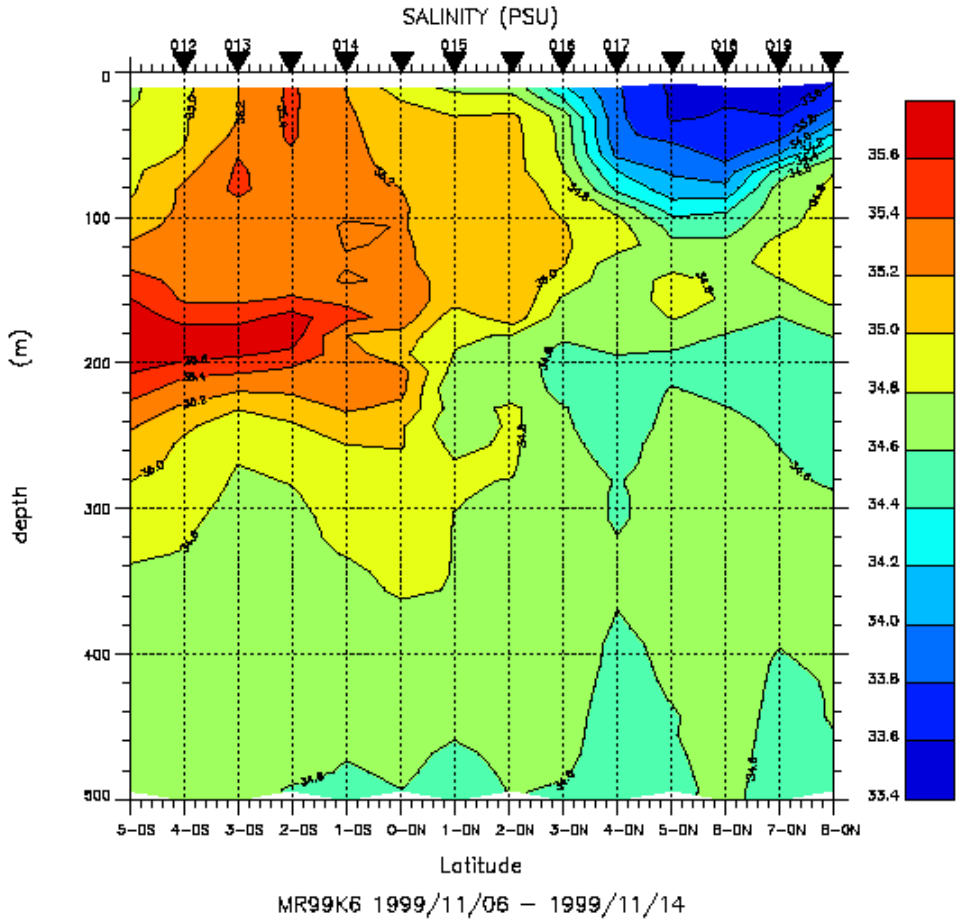
Figures



Ship Track



Temperature section along 156E from 5S to 8N in every one degree



Salinity section along 156E from 5S to 8N in every one degree

Figure caption

Figure shows the temperature and salinity section along 156E from 5S to 8N in every one degree. The CTD and XCTD systems on board Mirai were used to measure these data. The lower sea surface temperature and higher sea surface salinity can be found near the 1-2 degree south, showing the upwelling near the equator. The upwelling is seldom found in this area usually, showing the La Nina condition in the western Pacific.