OceanTeacher Global Academy (OTGA)
Regional Training Centre-Tianjin
Regional Marine Observation and Quality Control Training Course

25-28 March 2019
Tianjin, China

Course Report

By

浙江大学

Tolulope Emmanuel, Oginni

Student ID: 21735175

Major: Physical Oceanography

General Introduction

The training course focus on the Marine Observation using Conductive-Temperature-Depth (CTD), it was a detailed lecture which took place from Monday, 25th of March, 2019 to Thursday, 28th of March, 2019 which finally ends with a field trip to visit the laboratory of National Center of Marine Standards and Metrology (NCOSM), China.

The course was brake down or outline in 4 part which are

- Overview of Global Ocean Observing System
- The Application and Quality control of CTD
- Development and New Technology of CTD
- CTD Calibration

Overview of Global Ocean Observing System

The Global ocean was d from past to future, and from the local time, Ocean is known as Okeanós and it name by the people that lives around the ocean in the past. In the past people tends to understand the ocean base on their daily need for occupations and foods that are being supply by the ocean. Must fishermen in the past tends to understand the dynamics of the ocean because the fishes move with some of these physical features.

Why do we care for the Ocean? From the past to the present and foreseen the future, the ocean as been a support for food production and economic interest and will still be more of focus in the future. Most civilization of the world today comes from the oceanic area of the world.

Also, has one the techniques used in the past was the knowledge that fishes tends to produce their young one at the north-western part of the ocean (Pacific and Atlantic) but migrate to the Northeastern part for feeding, because in this area most upwelling occurs, so in the past most fishers target this period and capture most fish at the surface.

Indian ocean was discovered in 1490 by Zheng He, Vascoda gama, and other members of the crew, they were able to sail through using their understanding of the dynamics of Monsoon.

However, as time goes on the detailed study are done and more area are been focused on as at 600 years ago, most focus was on age exploration and understanding the ocean from the past voyage of challenger is the starting of oceanography surface.

Why do we need to study/observe the ocean? They are different reason and questions that surround this and few are

1) For our climate Systems

2) The Anthropogenic population (CO_2)

3) Human Vulnerability and the Ocean

How Could we know the Ocean? They are different ways in which the ocean could be study and the most recent are as follow

- **From Satellite:** In the ocean study today many satellites have been deployed to revolve around our earth to give an instantaneous state of our ocean and from this it easier for us to study the nature of some parameter like Sea Surface Temperature (SST), Sea Surface Height (SSH), Precipitation (Rainfall) and many other parameter that the satellite is capable of observing using the Microwave from the Remote Sensing System （RSS）.

- **In situ Observations：** this is a direct measurement of ocean features with the instrument or sensor used, some are CTD, ARGO, SVP drifter, Buoy and many more, some deploy at a station, some drift from a place to another, some are deployed and retrieved back, some are for water sampling, but CTD is mainly design for measuring Conductivity, Temperature with depth, but this days CTD now carries other sensors along with it, some are used to determine pressure along

the depth and some bottle for water sampling. Others in situ observation instrument also has their own techniques and different parameter to determine, all this are deployed to help us understand our modern ocean dynamics.

The Application and Quality control of CTD

The most application of CTD is to collect and in situ oceanic data down the ocean depth and the application goes through these four steps;

- **Hardware and Deployment:** different crew or scientist has preference on the type of hardware device they are in interested on base on their expertise and goals of the research, some of the hardware of CTD that can be deployed are SBE 9-11 plus which gives the system diagram for real time profiling, also there is SBE 17 plus which has the autonomous sampling backup as one of is major difference from others and others are sensor from some brand like ALEC, RBR and many more.

- **Software:** the interface between the user (scientist) and the instrument (CTD) to translate the language read by instrument to the understanding language of the user is the software, they are many software designs for different instrument and most current software of CTD these days is Sea Save.

- **Sensors and Calibration:** the characteristic of all sensor is their response time and also the calibration sheet is also used to calibrate sensors. This should be done at least once in a year by the expertise in charge of sensor calibration (NCOSM).

- **CTD data processing:** data are been processed using different type of APP and also before data are been used or upload to data set online some checkup (data treatment) to determine some out-flier's data, so intend quality control should be done on data. In the course of the course we used ODV software to analyzed some date from WMO and we are shown how all the software can be used to processed and the determine trend of temperature and pressure and other parameter with dept and coordinate.

Development and New Technology of CTD

The more the request on ocean observations keeps increasing the more research are done to increase the precision and accuracy of our sensors, so for a good result there must be a good observation, for a good observation to be archived there must be a good sensor. So many manufactural was invited to tell us how their product functions, like its operations, its sensitivities, parameter capable to sense, physical features, durability, the strength and weakness of the various model of their products. Some of the manufactural present was RBR Ltd, NKE marine electronics and also from Sea Bird.

In summary must sensor developers of CTD have been able to address some past features disadvantages of some sensor like sensor response time, dynamic error, difficulties in deployment, interference with other sensors and many more, and now come out with a well design sensor that can be used along other CTD sensors without any interference, or use on buoy, use on ARGO, or use individually.

CTD Calibration

For a well define observation, sensor needs to be calibrated before every deployment to determine the sensor characteristic state. The process of how to calibrate sensor was shown to us during the visit to the NCOSM laboratory in Tianjin, China. And the technician shown the laboratory set up that start from the calibration of temperature sensor (Thermometer) and Conductivity sensor, by keeping a constant water temperature of a sea water in a tank with deployed CTD, the water temperature will be change (decreased) with response to time to see the response of the sensors with response to the change. Also, at every time the water temperature needs to be change a water sample is taken to de other lab and determine the absolute conductivity (salinity) of the water at that time. In addition, there is a pressure calibration lab, where the sensor pressure is calibrated either using the automatic pressure calibrating machine or using the manually calibrated machine, the technician at NCOSM prefer the use of manually pressure calibration because it took a short period to calibrate a pressure sensor compare

to the automatic machine. It was advice that sensors calibration should be done at lease once in a year if not every time before deployment. After every calibration of sensors, certificate is been issue to guarantee the use of the sensor on the field.