Migration of Seychelles-Chagos thermocline ridge (SCTR) during CINDY/DYNAMO Field Campaign

Toshi Shinoda[1], Tommy Jensen[1], Maria Flatau[2], Sue Chen[2] , Weiqing Han[3], Chunzai Wang[4]

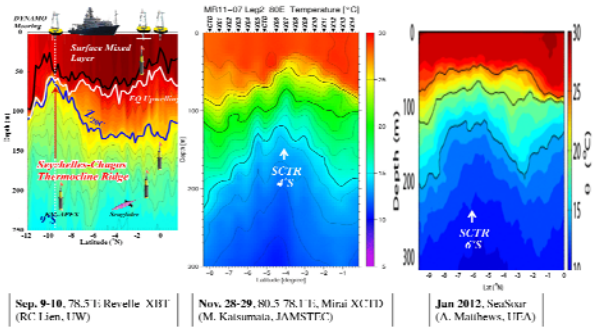
[1]Naval Research Laboratory, Stennis Space Center, [2]Naval Research Laboratory, Monterey, [3]University of Colorado, [4]NOAA-AOML

toshiaki.shinoda@nrlssc.navy.mil

Abstract: Because of the shallow main thermocline in the Seychelles-Chagos thermocline ridge (SCTR), large SST changes due to surface forcing fields are often observed in this region, and thus ocean variability in the SCTR may largely impact atmospheric convection.

During the CINDY/DYNAMO field campaign, meridional migration of SCTR is observed. Processes that control the SCTR migration are examined by the analysis of SODA (Simple Ocean Data Assimilation) and COAMPS experiments. During early September 2011, the shallowest thermocline in the CINDY/DYNAMO observational area (around 80ºE) is located near 9°S. However, in early January 2012, the minimum thermocline depth is found around 5ºS-6°S. This northward migration of SCTR during this period is consistent with the seasonal cycle derived from 60 years of SODA analysis. The analysis of COAMPS suggests that both local and remote forcing are responsible for the migration of SCTR observed around 4°S in late November 2011.

SCTR migration observed during the CINDY/DYNAMO field campaign



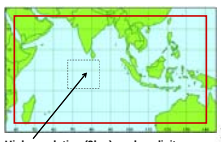
Sep. 9-10, 78.5°E Revelle XBT (RC Lien, UW) | Nov. 28-29, 80.5 78.1°E, Mirai XCTD (M. Katsumata, JAMSTEC) | Jan 2012, SeaSoar (A. Matthews, UEA)

Data and Model

SODA (Simple Ocean Data Assimilation)
Period: 1950-2010, Resolution 0.5 deg., does not cover the CINDY/DYNAMO period

COAMPS
October-December 2011 (CINDY/DYNAMO period), Indian Ocean domain
Data assimilation in the atmospheric component, no data assimilation in the ocean component

COAMPS simulation in October-December 2011

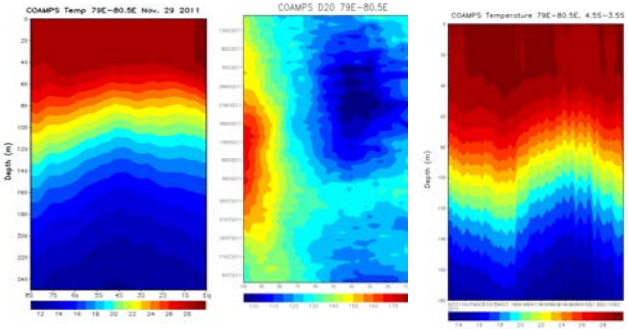


High resolution (9km) and explicit clouds covering DYNAMO area (10S-5N, 68-84E)

Atmosphere:
452x252x40 (27 km grid)
12 h data assimilation cycle

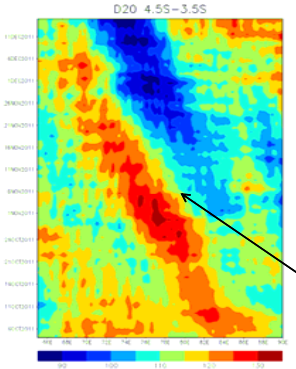
2-way

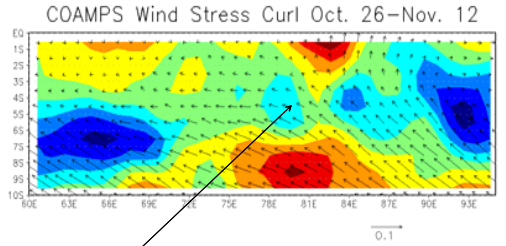
Ocean :
811x433x60 (1/8 °)
no data assimilation



COAMPS is able to simulate the SCTR located around ~4°S in late November 2011, as observed in CINDY/DYNAMO

Strong upwelling around 80°E, 4°S occurs in late October-early November



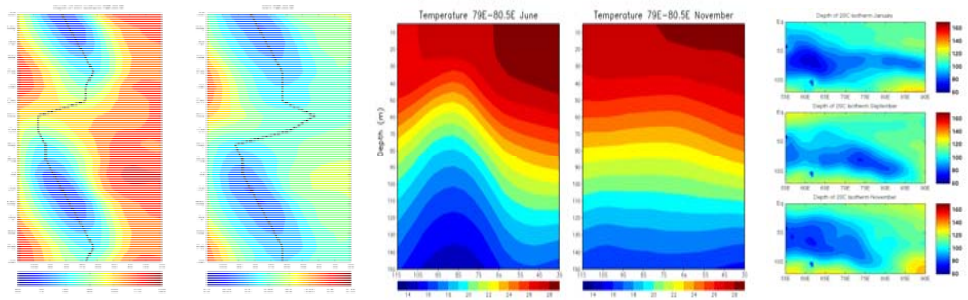


Negative wind stress curl is found around 4°S in late October-early November.

Upwelling associated with Rossby waves occurs in early November around the DYNAMO area.

➔ Both local and remote forcing contribute to the strong upwelling in early November around 80°E, 4°S

Seasonal cycle of SCTR in CINDY/DYNAMO area (SODA)



SCTR observed in CINDY/ DYNAMO in September (~9°S) and January (~6°S) are consistent with the seasonal cycle.

SCTR is well defined in January-September in the DYNAMO area, but the thermocline is nearly flat around November.

Summary

During CINDY/DYNAMO field campaign, meridional migration of the SCTR was observed around 80°E. SCTR is located around 9°S in September and around 6°S in January, which is consistent with the seasonal cycle derived from 60 years of SODA analysis.

The location of SCTR around 4°S, 80°E in November observed during CINDY/DYNAMO is different from the seasonal cycle. COAPMS is able to simulate the SCTR location during this period.

The strong upwelling around 4°S, 80°E is evident in late October-early November before the onset of the MJO convection in late November.

Both local and remote forcing contribute to the strong upwelling.

Issue

How does the SCTR migration in early November impact the ocean response to the strong westerly wind event in late November?