

Submesoscale eddy train off the southeastern Taiwan coast

Huan-Jie Shao, Feng-Chun Su, Ruo-Shan Tseng
邵煥傑，蘇峰鈞，曾若玄

Department of Marine Biotechnology and Resources, National Sun Yat-sen University,
Kaohsiung 80424, Taiwan

Motive

We used satellite data to observe the submesoscale cold core cyclonic eddy train along the coast of southeastern Taiwan. We based on sea surface temperature and ocean color satellite imageries acquired with the Moderate Resolution Imaging Spectroradiometer (MODIS) and Sea-viewing Wide Field-of-view Sensor (SeaWiFS). We tried to use the satellite data and observations to understand the mechanism of eddy formation.

Data and Methods

Observation Data:

OR3-1510 : 2010.12.29~3, SB-ADCP

Current Data and Minilog Data: 2011.02.08~04.01

Satellite Image:

MODIS Terra and Aqua ocean color and SST image

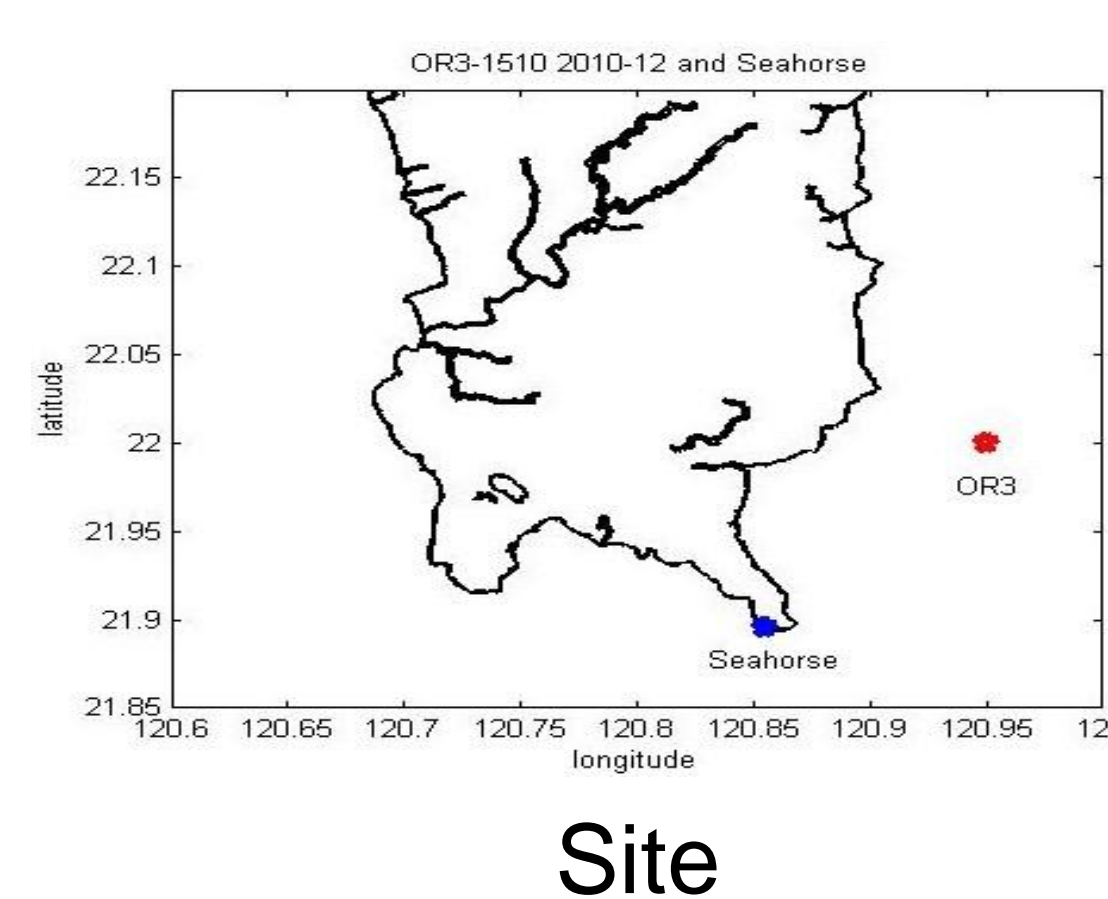
SeaWiFS ocean color image

Method:

Maximum Cross-Correlation (MCC) method

OSU tidal simulation model

Background



Site

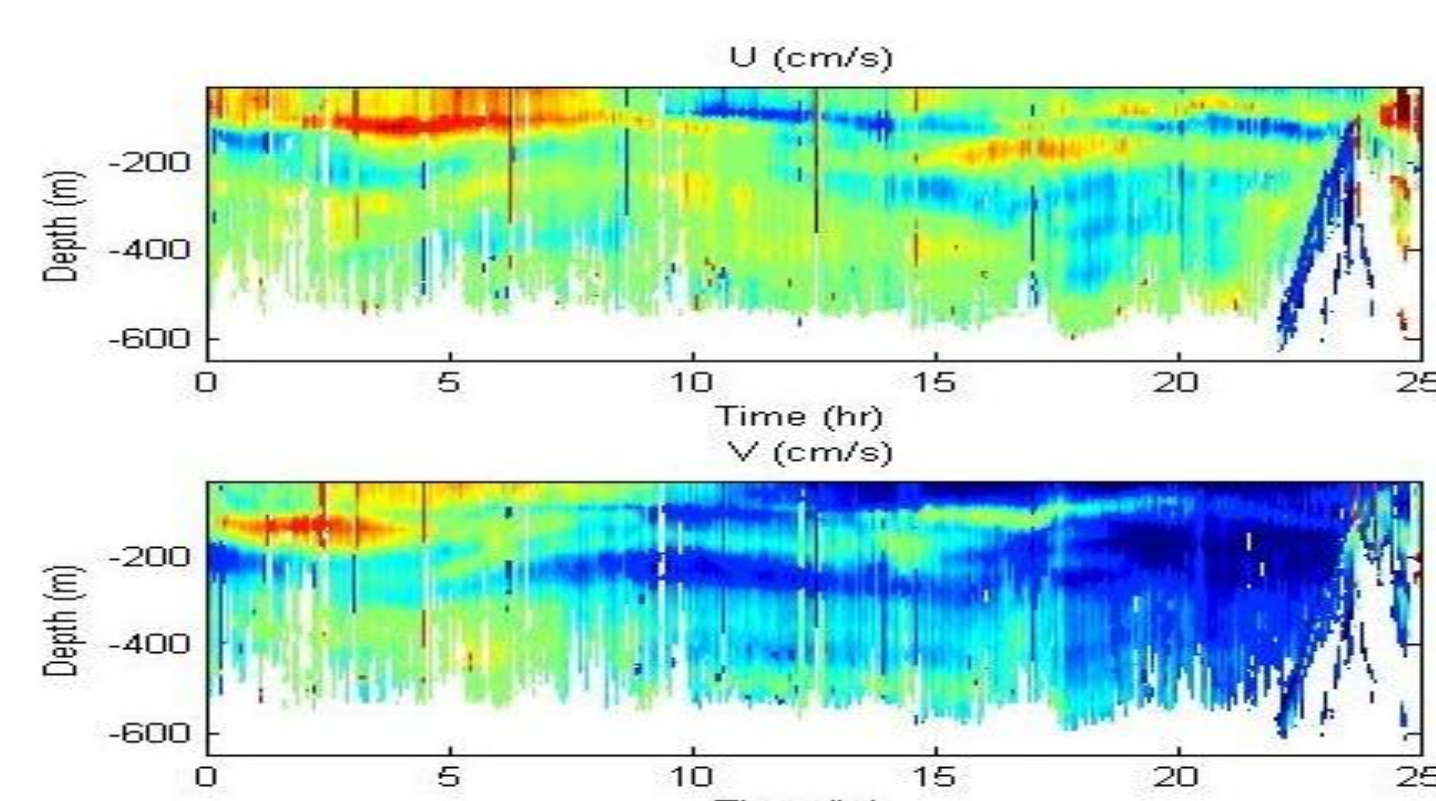


Figure 2. 24 Hr, SB-ADCP Data .

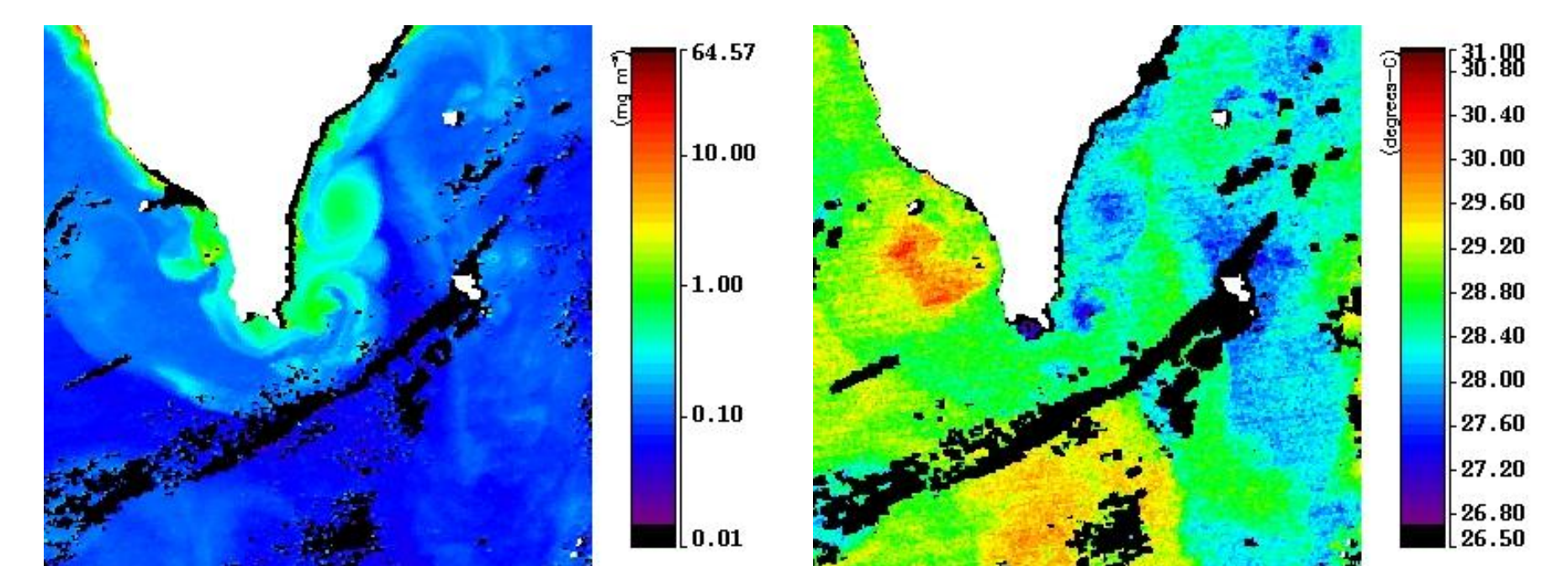


Figure 1. CHL Image and SST image are taken on 01:25 Oct 1, 2007.

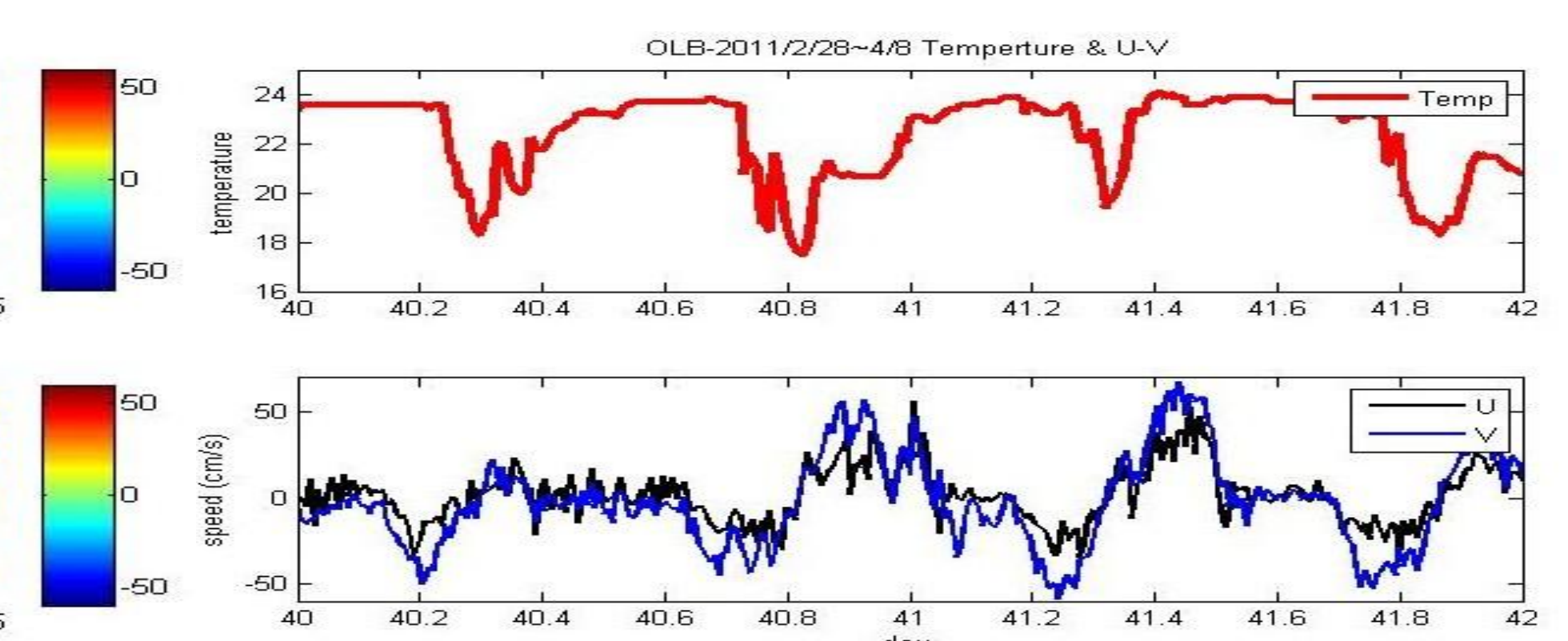
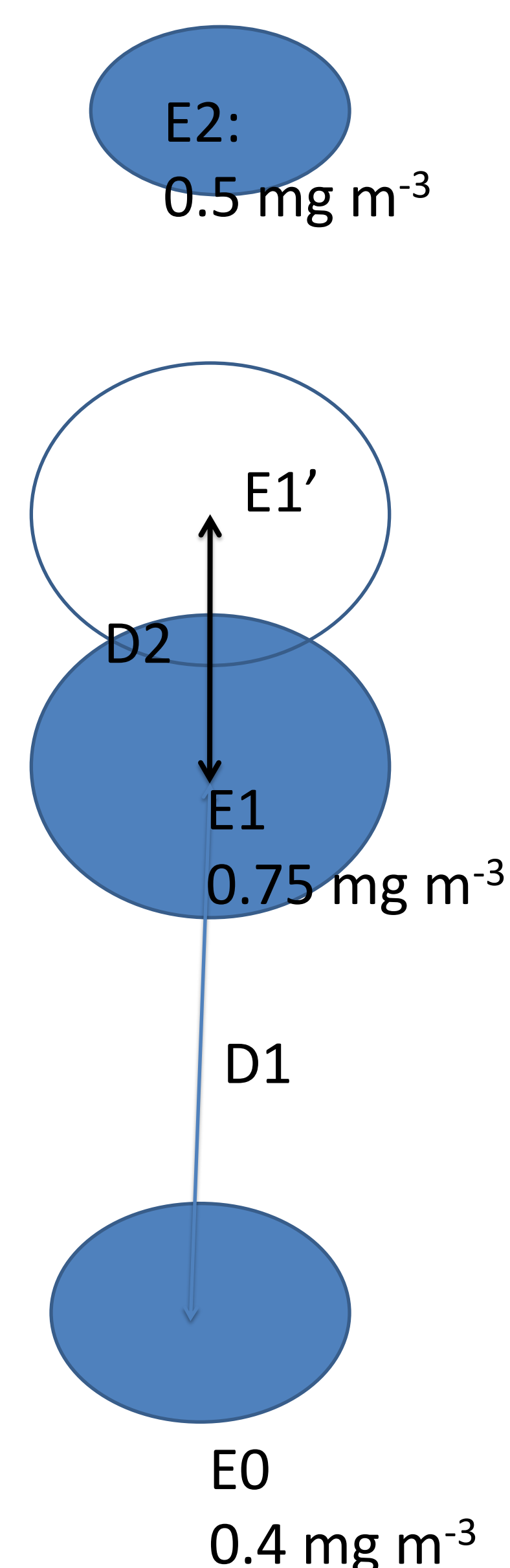


Figure 3. 48 Hr, Current Data and Minilog Data, 3/20~22.

Results



E0, E1, E2 are the positions of cold eddy in the satellite image (Figure 4), respectively.

E1' is the new position of eddy E1 in the next image. The translation rate of E1 is

$$v=(E1'-E1)/\text{image time interval}=74.29 \text{ (cm/s)}$$

The translation rate is similar as the velocity derived from the Argos surface drifter, for which the velocity is 65.9 cm/s.

The translation rate of eddies can be considered as the velocity of Kuroshio because Kuroshio is the main current in the area.

If the velocity of Kuroshio remains constant during a short time, the generation period between E1 and E0 is

$$F=D1/v=12.173 \text{ (hour)}$$

The generation period is almost equal to the period of semi-diurnal tide in Nan-Wan bay.

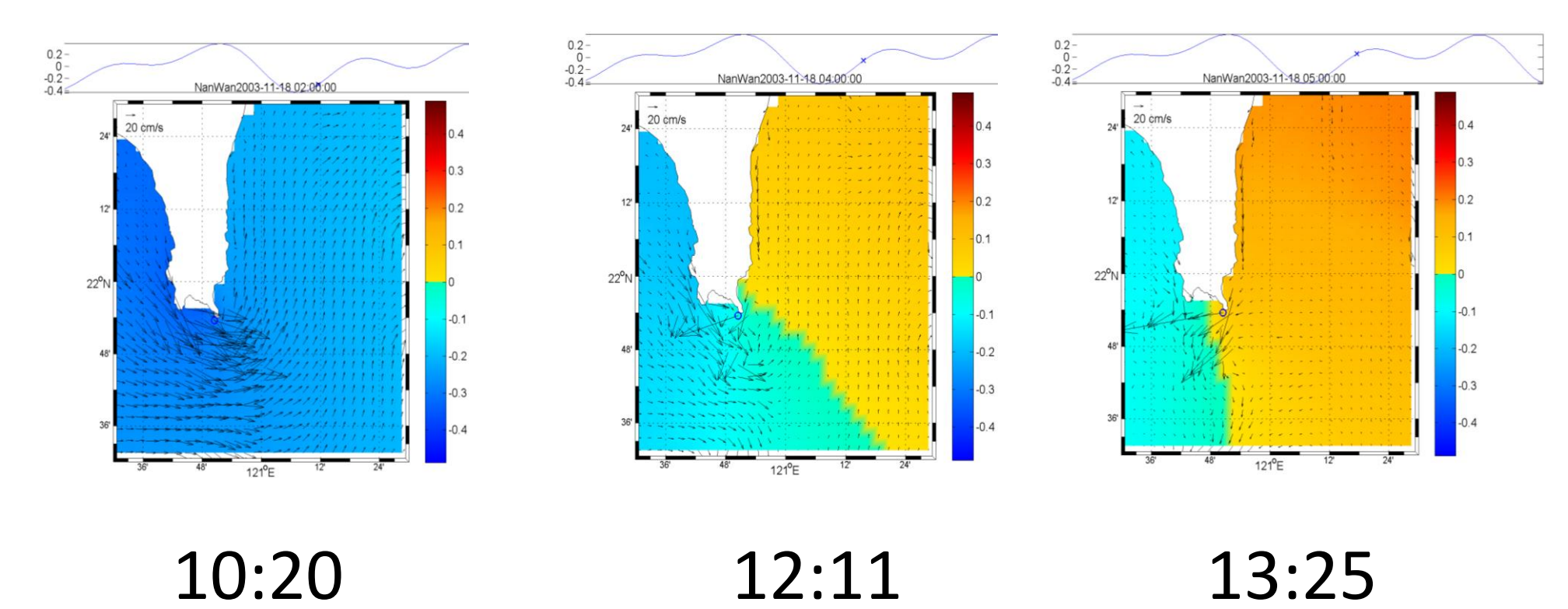
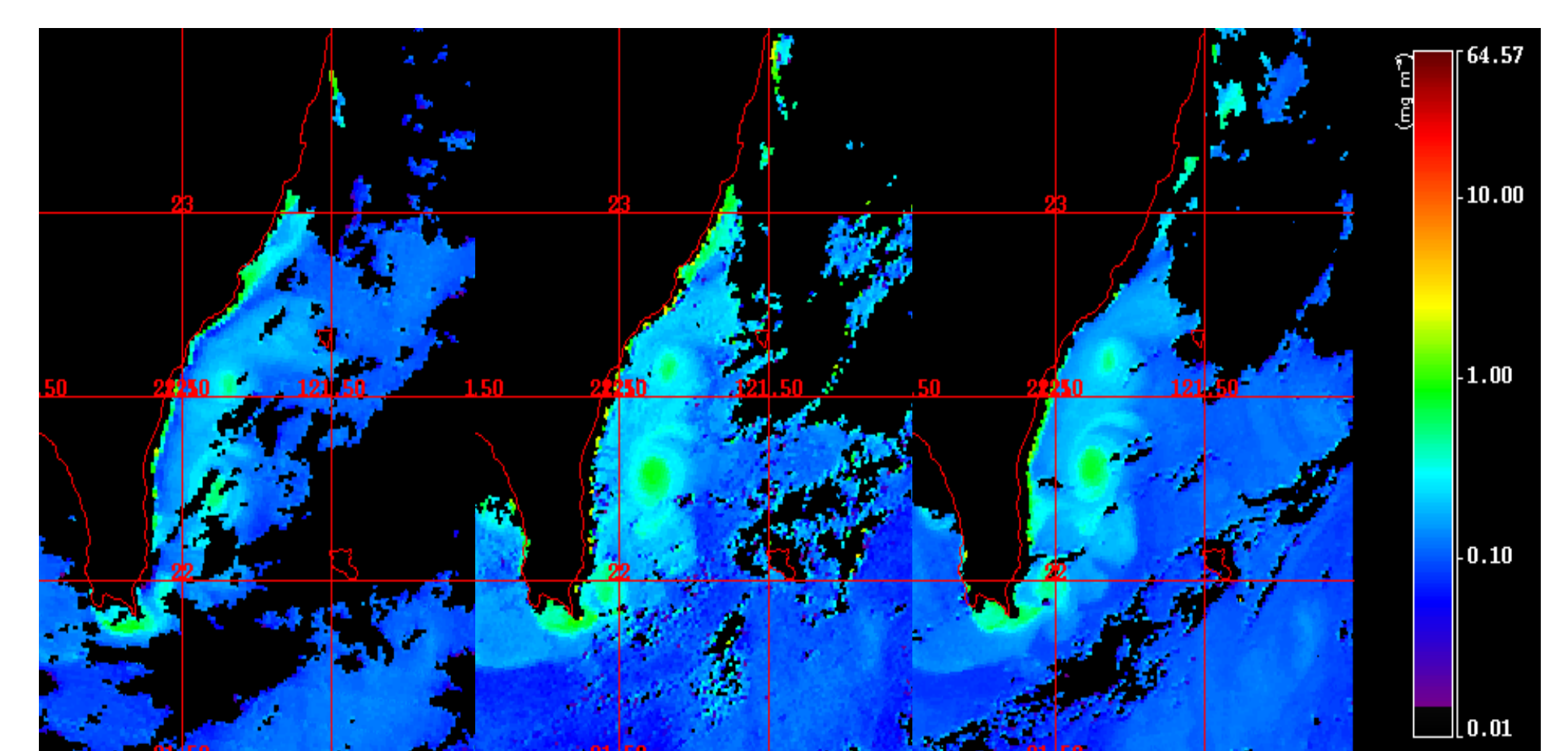


Figure 4. Simultaneous small-scale cold eddies observed from MODIS and SeaWiFS Chl Images on Nov. 18, 2003. The lower panels show the water elevation derived by OSU tide.

Summary

- Using sequent simultaneous satellite images, the moving speed and time interval between two consecutive eddies is estimated to be close to the semi-diurnal period.
- A hypothesis is proposed that the cyclonic eddies are generated periodically on the lee side of the OLB by the ebb flows of the NWB.
- Strong northeasterly winds will affects the develop of eddies.

Future work

- Get observation data. Collaboration with Bio-Geo Chemistry.
- Calculate the number of eddies.

