The slope current and the Diel Vertical Migration of zooplankton and micronekton in the northern slope of the South China Sea observed by a moored ADCP

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Liu QY, A Kaneko, JL SU, 2008

Wang DX
DSR2010

Aug~Nov 2016 monthly mean Mooring near Dongsha (depth 1210m)
(from: 何琦，魏泽勋等，2012)
Fig. 2. QG model-simulated SCS (a) winter-mean, (b) summer-mean, and (c) annual-mean upper-layer dynamical streamfunction (Sv). (d) Winter-mean, (e) summer-mean, and (f) annual-mean surface velocity field derived from SODA.
Fig. 4  Schematic of the SCSWBC based on the definition in this paper. The blue streamline denotes the SCSWBC in winter. The red solid streamline represents the SCSWBC in summer, and the red dashed streamline denotes the extension of the WBC which sometimes forms a cyclonic gyre. The green solid streamline denotes the current from the southwestern shelf, and the green dashed streamline represents the VOC in summer.

ACE(a), CE(b) for Z2
Drifter trajectory of Oct. 2014; Southwesterly current dominated
Drifter trajectory of March–June 2017 Eddy.
• Annual mean current is westward in the whole-profile, especially in the upper 400m layer.
• Eastward currents just occur only above 100m layer in June and July.
• Baroclinic effect is obvious.
• Cross-shelf intrusion maybe strong.

2014 - 2015
2015-2017

current vector
2015-2017
along-slope current
研究任务完成情况:陆坡海流及其变化

Nino3.4 Index & 2015~2018 monthly mean Velocity

Along-slope -7.4±8.8 cm/s，年平均为西南向海流，冬季强于夏季，夏季为负。Cross-slope 0.6±4.9 cm/s，More variable than that of along-slope component（Xu Dongfeng，2019）
a rare large phytoplankton bloom, which is ~500 km long, 100 km wide and lasting more than 19 day. SSS

He X.Q., D.F.Xu, Y. Bai et al., Eddy-entrained Pearl River plume into the oligotrophic basin of the South China Sea, Continental Shelf Research, 2016.
Salinity at 5m depth
32 psu line reaches 19.5N
Diel Vertical Migration of zooplankton and micronekton by Moored ADCP
Fig. 4. Vertical distributions of mean MVBS at dawn and dusk, respectively. Zero time indicates the sunrise time (a) and the sunset time (b). High value of MVBS (warm color) is proportional to high level of biomass, while low value is related to low level of biomass. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)
DVM of zooplankton and micronekton below the 200 m layer observed by the upward-looking ADCP.

**Descent speed** (cool color) occurs around the sunrise time (black line on the bottom half), and **upward migration** (warm color) occurs after the sunset time (black line on the top half), peaks one hour later.

Mean descend speed (-3.7 cm/s)

Mean ascend speed (2.6 cm/s)
Profile-mean MVBS during daytime (dashed line, between 2 hours after sunrise and 2 hours before sunset) and nighttime (solid line, between 3 hours after sunset and 2 hours before sunrise)

MVBS: mean volume backscattering strength
Zooplankton, micronekton

Depth / m

2014-04-08 2014-04-11

2015-03-20 2015-03-23 2015-03-26 2015-03-29 2015-04-01 2015-04-04

2014-04-26 2014-04-29


2014-05-13 2014-05-16


2014-05-30 2014-06-02


(7!)
Time series of mean MVBS above 270m at night, and dashed vertical lines indicate dates of full moon
Top row: rectified wavelet power spectra (left column) and time-averaged rectified wavelet power spectra in base 2 logarithm (right column) for profile-mean MVBS time series above 270m at night from the echo intensity of ADCP at the mooring station. Red and blue contours indicate high and low wavelet power spectrum values, respectively. The regions of greater than 95% confidence are shown with thick black contours. Cross-hatched regions indicate the ‘cone of influence’, where edge effects become important.

Bottom: time-averaged rectified wavelet power spectra (not log-transformed) for profile-mean MVBS time series above 270m at night.
The text is not completely legible due to the quality of the image. However, it appears to discuss variations in currents and their impact on marine life, specifically focusing on the LS (Luzon Strait) and the interaction of Rossby eddies with the Kuroshio. The text references studies by Yuan YC & Yang CH et al. (2017) and Yang CH, Xu D et al. (2019).
Fig. 11. Temperature time series (red lines) and depth time series (black lines) recorded by a CTD, which was fixed to the appropriate floating ball of the ADCP, when the tropical cyclones, Rammasun (a), tropical depression (b), and Kalmaegi (c) passed by the mooring site. The down-arrows are the times the three cyclones were closest to the mooring station.

(Warming ---Cooling  2 degree at  402m inertial oscillation)

Yang C H, D.F.Xu* et al., Diel Vertical Migration of live zooplankton and micronekton in the slope of northern South China Sea using a mooring ADCP. Deep Sea Research II, 2019
Conclusion

1. From the 3 years ADCP observation, the velocity of along slope component is $-7.4 \pm 8.8$ cm/s. while the across slope component is $0.6 \pm 4.9$ cm/s, which is more variable than the former.

2. DVM occurs throughout the year, with the maximum migrating speed reaching $9.0$ cm s$^{-1}$.

3. Neap-spring tidal cycle and full moon phase influences are prominent, and the peak at 112d may be driven by current variations.

4. Super and severe typhoons reduced the vertical migration, had less influence in the deep scattering layer.


Figure 1. Echograms. Examples of echograms at 38 kHz, spanning 24 hour periods, from different geographic regions, clockwise from upper left: North Atlantic ocean, Indian ocean, East Pacific, West Pacific. Lower threshold is –90 dB.

Klevjer et al Scientific Reports, 2016

西太：深，东太：浅、强；北大西洋：强；东印：弱、深
课题背景和总体思路
Group 1: Physical Process in slope

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