

Author's Accepted Manuscript

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www.elsevier.com/locate/csr

PII: S0278-4343(17)30667-2
DOI: <https://doi.org/10.1016/j.csr.2018.07.007>
Reference: CSR3793

To appear in: *Continental Shelf Research*

Received date: 28 December 2017
Revised date: 27 June 2018
Accepted date: 17 July 2018

Cite this article as: Mingzhu Fu, Ping Sun, Zongling Wang, Qinsheng Wei, Pei Qu, Xuelei Zhang and Yan Li, Structure, characteristics and possible formation mechanisms of the subsurface chlorophyll maximum in the Yellow Sea Cold Water Mass, *Continental Shelf Research*, <https://doi.org/10.1016/j.csr.2018.07.007>

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Structure, characteristics and possible formation mechanisms of the subsurface chlorophyll maximum in the Yellow Sea Cold Water Mass

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Abstract

The Yellow Sea Cold Water Mass (YSCWM) is the most prominent oceanographic phenomenon in the bottom layer of the Yellow Sea. A subsurface chlorophyll maximum (SCM) has been widely observed in this area, yet it has only been briefly described in previous research. In this study, we present the first in-depth analysis of the spatial distribution and intrinsic characteristics of the SCM in the YSCWM, based on two comprehensive cruises conducted in the central Yellow Sea during August 2011 and July 2013. In general, the spatial distribution of the SCM coincides approximately with the YSCWM area during the stratified seasons, with the southern boundary at around 33.5°N and the western boundary at approximately 122.5°E. The vertical position of the SCM varied between 12–29 m and 13–25 m during August 2011 and July 2013 respectively, which is mainly located within or at the bottom of the thermocline and the upper part of the nitracline. The averaged Chl *a* concentration in the SCM was $1.24 \pm 0.27 \text{ mg m}^{-3}$ and $1.92 \pm 0.65 \text{ mg m}^{-3}$ respectively during the two cruises. The shallower but stronger intensity characteristics are consistent with the meso-trophic status of the Yellow Sea. Picophytoplankton, composed of *Synechococcus* and picoeukaryotes, dominated the phytoplankton community in cell abundance and carbon biomass, contributing >90%. The micro- and nanophytoplankton were almost completely dominated by dinoflagellate species. The phytoplankton community at the SCM depth was not significantly different from that in the surface mixed layer, while the relatively higher photosynthetic yields (F_v/F_m) indicated the active growth of the phytoplankton assemblage in the SCM layer. Significantly lower carbon-to-chlorophyll *a* ratios estimated in the SCM layer suggest that the main contribution originates from photoacclimation. Our results

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