# Distribution and bioavailability of dissolved organic matter in the Changjiang Estuary and adjacent sea

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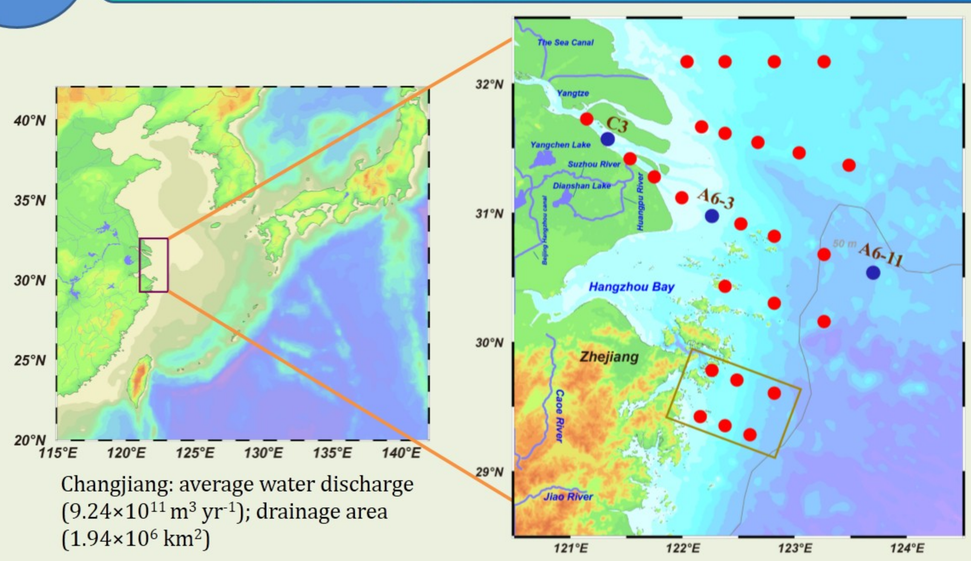
## 1 Introduction

Global rivers contribute approximately 0.25 Pg dissolved organic carbon (DOC) to the ocean each year. As a significant interface between land and ocean, the estuary has important ramifications for marine biogeochemistry. However, due to the highly dynamic, the bioavailability and fate of dissolved organic matter (DOM) in this area remains enigmatic. The Changjiang Estuary and adjacent sea (CEAS), which is a typical large-river estuary region, is influenced by the complex hydrodynamic processes. The objectives of this research are to investigate the distribution, behavior and bioavailability of DOM in the CEAS.

## 2 Sampling and Methods




Changjiang: average water discharge ($9.24\times10^{11}$ m$^3$ yr$^{-1}$); drainage area ($1.94\times10^6$ km$^2$)

Figure. 1. Study area and sampling stations in the CEAS during February, May and July. The stations in the rectangle were not investigated in July. Sampling sites for bioassay experiment are described in blue dot.

Three cruises:
February 2017
May 2017
July 2017

Sampling depth:
Surface
Middle (50% depth)
Bottom

Measured parameters:
DOC
Chromophoric DOM (CDOM)
Total dissolved amino acids (TDAA)

## 3 Results and Discussion

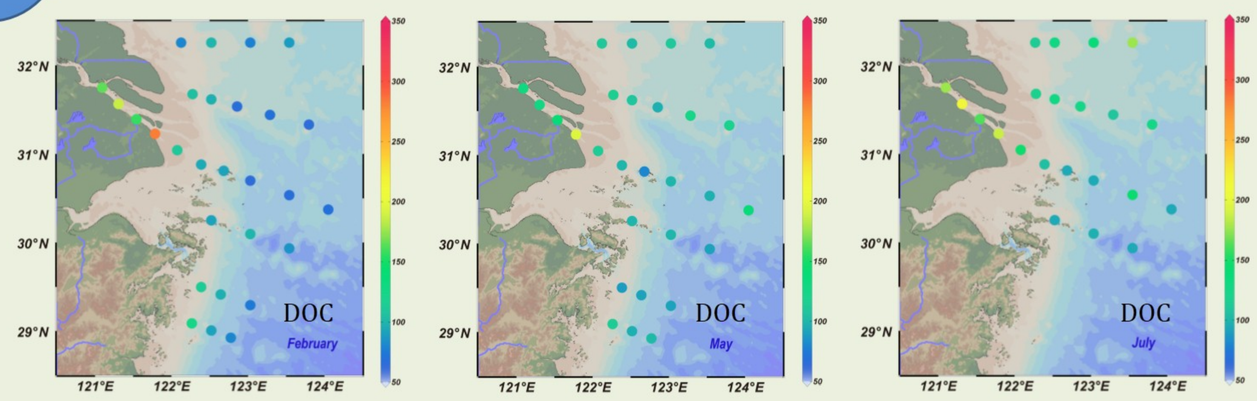



Figure. 2. Surface distribution of DOC (μmol L$^{-1}$) in the CEAS during three cruises.

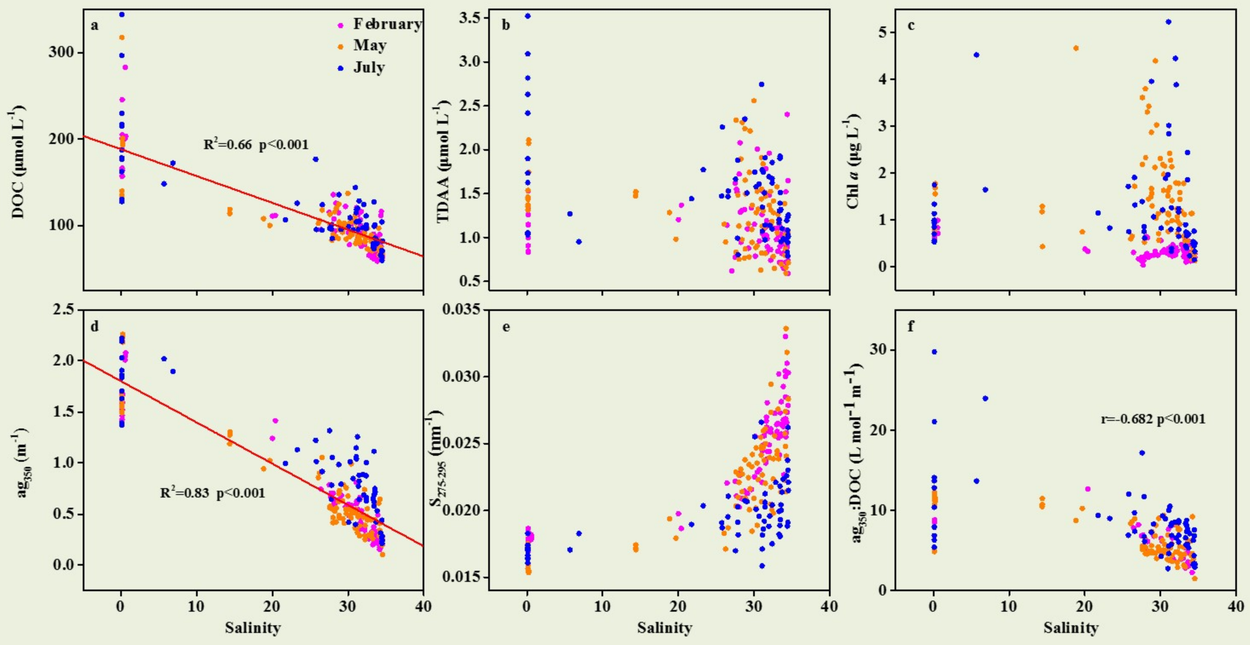



Figure. 3. Seasonal distributions and concentrations of (a) DOC, (b) TDAA, (c) Chl *a*, (d) $ag_{350}$ (e) $S_{275-295}$ and (f) $ag_{350}$:DOC across the salinity gradient.

DOM concentrations decreased from the coastal zone to the offshore sites. Non-conservative mixing across the salinity gradient was observed in concentrations of TDAA, and sources of TDAA were evident at salinities (28-33). The spectral slope coefficient $S_{275-295}$ exhibited an exponential increase with salinity, indicating the photodegradation decreases the aromaticity and molecular weight of DOM.

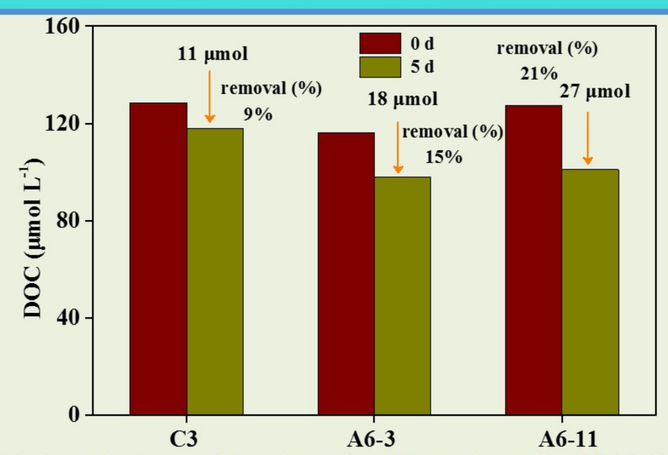



Figure. 4. DOC degradation at the selected stations along the CEAS during the 5-d on-deck incubation experiments. C3 (Salinity: 0.1); A6-3 (Salinity: 19.7); A6-11 (Salinity: 30.0).

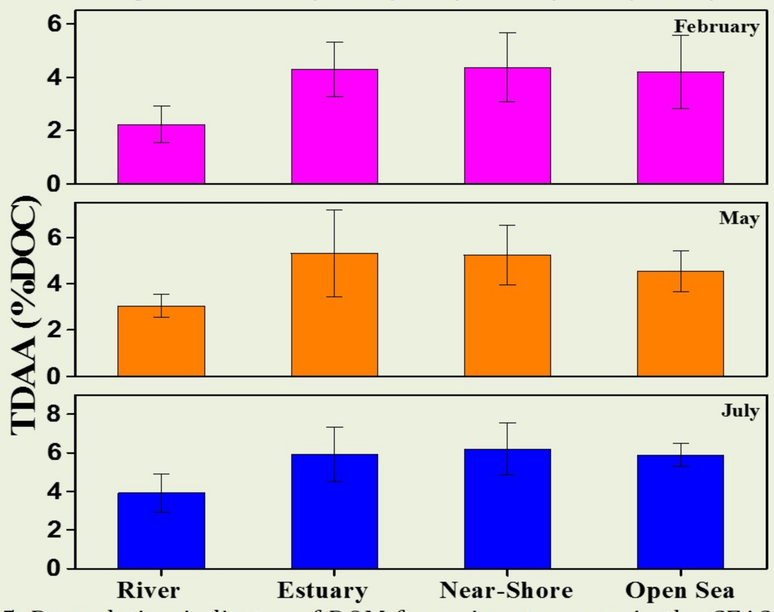



Figure. 5. Degradation indicator of DOM from river to ocean in the CEAS. River: S<1; Estuary: 20<S≤30; Near-shore: 30<S ≤33; Open Sea: S>33. S: salinity.

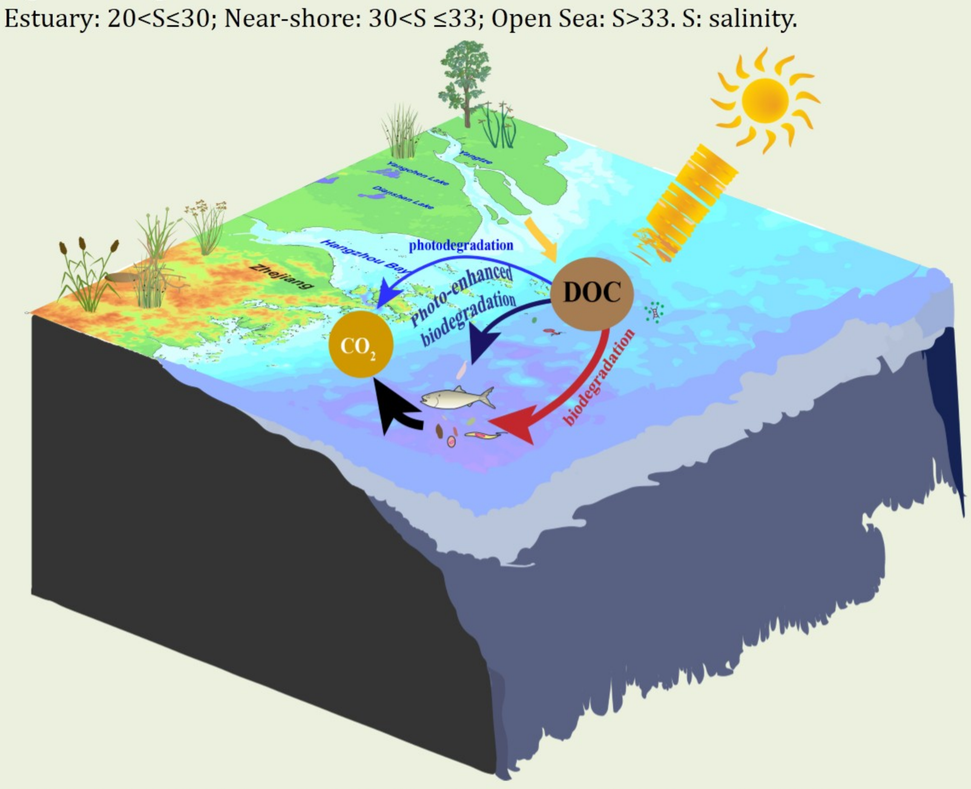



Figure. 6. Conceptual representation of DOM mineralization in the CEAS.

From river to open sea, the concentrations of DOM decrease progressively. Flocculation, bio- and photo-degradation can be important sinks of DOM. The values of TDAA (%DOC) indicated that bioavailability of DOC in the estuary and near-shore water is higher than those in the river water. That also confirmed by the results of DOC biodegradation experiment which is due to the contribution of fresh marine plankton production.

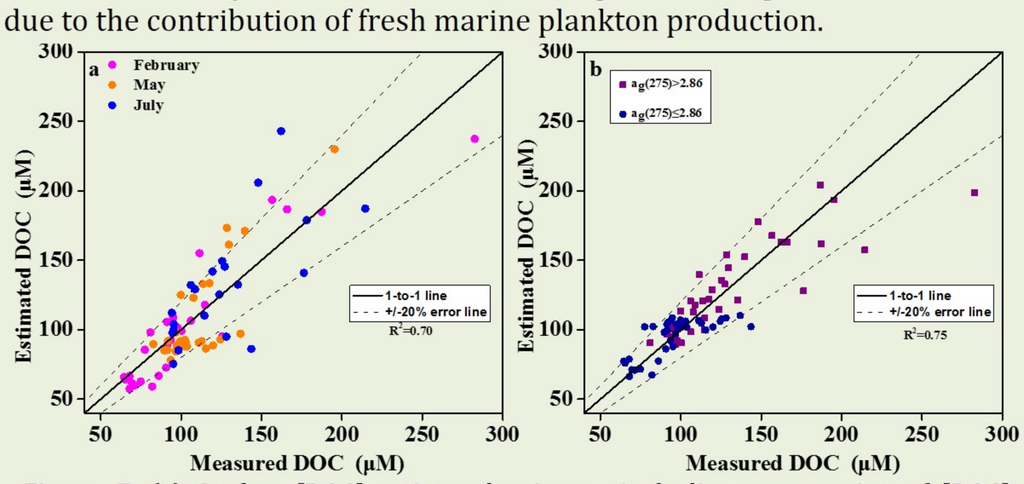



Figure. 7. (a) Surface [DOC] estimated using a single linear regression of [DOC] against [$a_{280}$] in the CEAS; (b) Surface [DOC] estimated using the multi-linear regression in the CEAS.

A model for retrieving surface DOC concentrations from CDOM absorption coefficients was established based on absorption coefficient ($a_{275}$ and $a_{295}$) and multi-linear regression. The model is suitable to use for high resolution and long-term field monitoring of DOC concentrations in the CEAS.

## Summary

1). DOM had a non-conservative behavior along the estuary due to the bio- and photo-degradation.

2). From river to ocean, marine plankton contributes fresh DOM results the high bioavailability DOM resent at Near-Shore area.

3). A model for retrieving surface DOC concentrations from CDOM absorption coefficients was established, can be apply for long-term field monitoring of DOC concentrations in the CEAS.

## Acknowledgements

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