

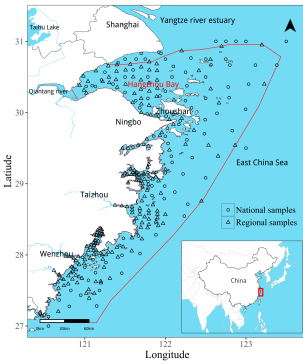


## Introduction

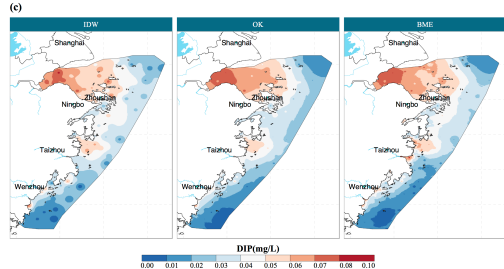
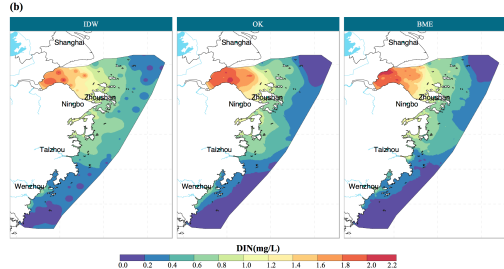
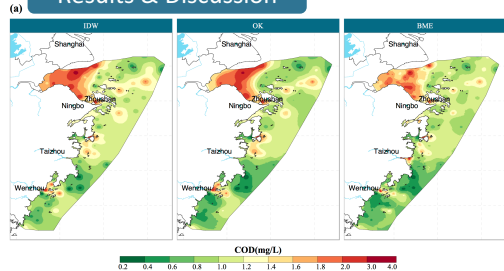
1. This work recognizes the importance of accurate seawater quality mapping in the effective eutrophication assessment and control of the coastal regions in China. This mapping is based on datasets with considerable uncertainty that can affect eutrophication assessment.
2. The **Bayesian maximum entropy (BME)** method of geostatistics was used to study the severely contaminated by eutrophication coastal waters of Zhejiang province. This method allows the assimilation of various data sources under conditions of uncertainty, and can generate accurate seawater quality maps across space.
3. The **Stochastic Site Indicators (SSI)** was calculated and used to improve the quantitatively characterization of the eutrophication risk in the Zhejiang coastal waters.

## Study area & Data

The study region is located near the Yangtze River and Qiantang River estuaries with developed shipping industry and fishery. Large amounts of anthropogenic nutrients flow into this area, resulting in severe eutrophication, frequent red tides, and deterioration of water quality.



## Results & Discussion



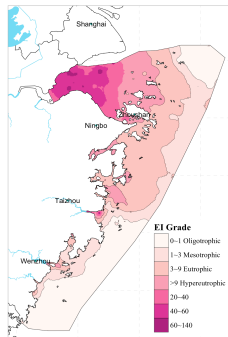
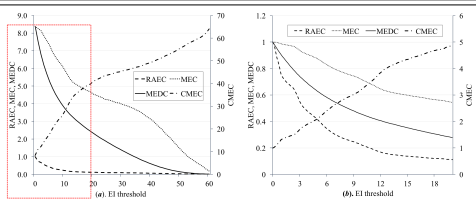
COD(a), DIN(b) and DIP(c) maps obtained by the IDW, OK, BME interpolation techniques. BME has the best cross-validation performance. Similar COD, DIN and DIP distribution trends emerge across space (all spatial maps of the COD, DIN and DIP concentrations show a global decreasing trend from the coastal estuary to the open sea).

## Methods

Let  $EI(s)$  be the random field model representing mathematically the variation of the eutrophication index (EI) in the Zhejiang coastal water region denoted as  $D$ . Then a binary random field, termed the binary EI characteristic, can be defined in terms of  $EI(s)$  as:

$$I_{EI}(s, \zeta) = \begin{cases} 1, & EI(s) \geq \zeta \\ 0, & \text{otherwise} \end{cases}$$

One-point SSI	Definition
Relative area of excess contamination (RAEC)	$R_{EI}(\zeta) = \overline{I_{EI}(s, \zeta)}$
Mean excess contamination (MEC)	$P_{EI}^D(\zeta) = \overline{EI(s)I_{EI}(s, \zeta)}$
Mean excess differential contamination (MEDC)	$L_{EI}^D(\zeta) = \overline{[EI(s) - \zeta]I_{EI}(s, \zeta)}$
Conditional MEC (CMEC)	$P_{EI}^{\theta}(\zeta) = \overline{EI(s) EI(s) \geq \zeta}$



About 25.95%, 19.18%, 20.53%, and 34.34% of coastal waters were oligotrophic, mesotrophic, eutrophic, and hypereutrophic. The larger the elasticity is, the more sensitive eutrophication is to threshold changes.

This work can contribute to an improved understanding of seawater quality, local risk assessment, policy making, and provide a practical approach for the identification of critical coastal water regions.