

Pollution level of volatile phenols in surface water in a bay in Shandong Province, eastern China

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Abstract. This paper analyzed the temporal and spatial distributions of volatile phenols in surface waters in Jiaozhou Bay in 1982. Results showed that the contents of volatile phenols in wet seasons were higher than in dry seasons yet were very low. Ocean current and overland runoff were major sources of volatile phenols in Jiaozhou bay. Ocean is the sink of various pollutants, once the ocean had been polluted, the eco-environmental risks were enormous.

Introduction

Jiaozhou Bay is a semi-closed bay located in the south of Shandong Province, eastern China (Fig. 1). This bay was surrounded by economic developed cities such as Qingdao, Jiaonan and Jiaozhou. After the reform and opening up, the economic and social development was rapid, yet the emissions of various pollutants were increasing [1]. Phenolic compounds had been widely applied in industries such as coking, coal gas, petroleum refining, chemical industry, iron and steel industry etc [2]; however phenolic compounds were harmful to organism and human health.

Volatile phenols were the major index of phenolic compounds in waters, and therefore the monitoring of volatile phenols is essential to the treatment and control of phenolic compounds pollution [3]. In order provided basis for environmental protection and remediation of volatile phenols in Jiaozhou Bay, this paper analyzed the content, pollution level, distribution and source of volatile phenols based on investigation data on volatile phenols in surface waters in 1982.

Material and method

The data in this paper was provided by North China Sea Environmental Monitoring Center. The survey was conducted in April, June, July and October 1982. In April, July and October, five sampling sites namely 083, 084, 121, 122 and 123 were layout; while for June, there were four sampling namely H37, H39, H40 and H41.

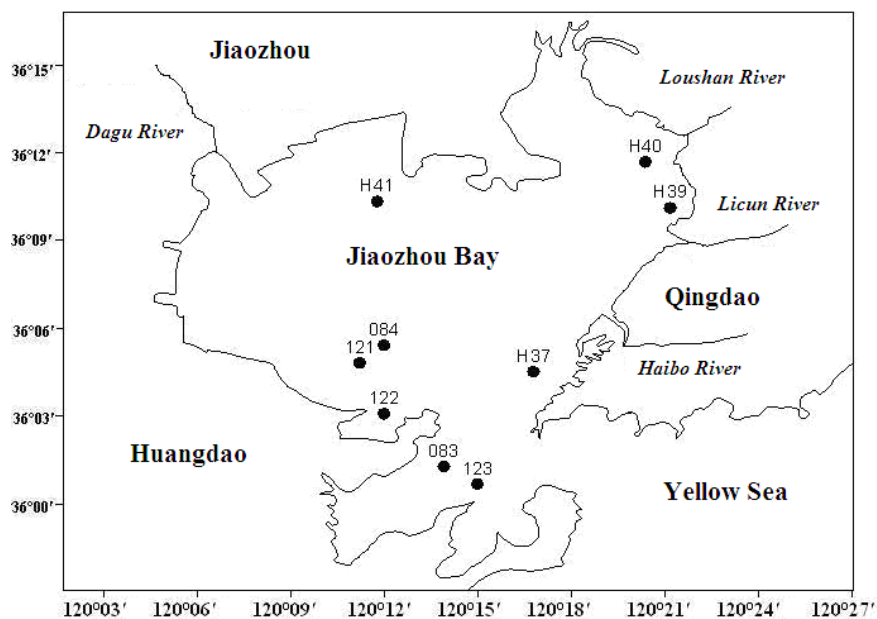


Fig.1 Sampling sites of volatile phenols

Results and discussion

Temporal variations of volatile phenols. The contents of volatile phenols in surface waters in the whole year ranged from $0.58\text{--}3.11\mu\text{g}\cdot\text{L}^{-1}$ (Fig. 2), even the highest value was lower than I ($5.00\mu\text{g}\cdot\text{L}^{-1}$) in National Sea Water Quality Standard (GB 3097-1997). It could be conclude that, the pollution level of volatile phenols in Jiaozhou Bay in 1982 was very low. In generally, volatile phenols contents in different months were in orders of July > June > April > October. In study area, Junly and July were wet season, while April and October were dry season. Obviously, the volatile phenols contents in wet seasons were higher than in dry seasons.

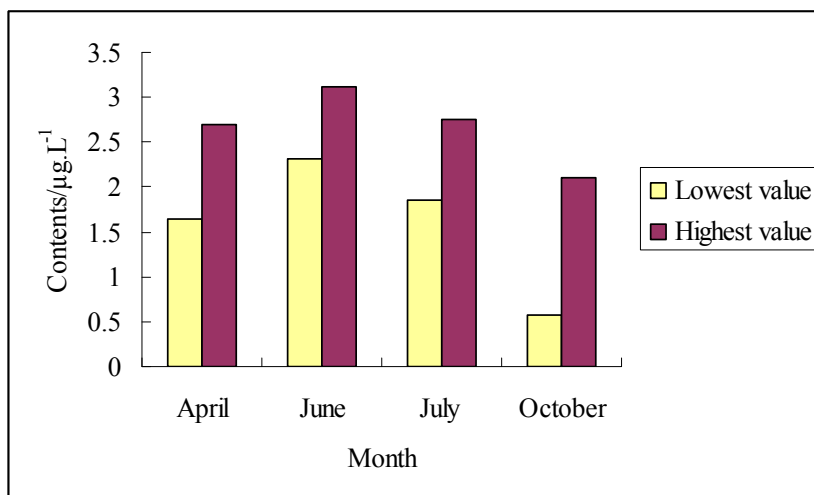


Fig.2 Volatile phenols contents in surface waters in April, June, July and October 1982 in Jiaozhou Bay/ $\mu\text{g}\cdot\text{L}^{-1}$

Spatial variations of volatile phenols. In order to reveal the distributions of volatile phenols in surface waters, contour maps of volatile phenols contents in different months were showed in Fig. 3a-d. Volatile phenols contents in April were decreasing from Site 083 in southwest to the center of the bay (Fig. 3a). In June, the contents of volatile phenols were clearly decreasing from the bay mouth to the northeast bottom of the bay. In July, high value occurred in Site 121 in southwest of the bay, and were decreasing to the center of the bay (Fig. 3c). In October, the contents of volatile phenols were decreasing from the southwest of the bay to the center of the bay and the bay mouth

(Fig. 3d). These contour maps indicated that the spatial variations of volatile phenols were significant.

Implications of the temporal-spatial distributions of volatile phenols. Based on the temporal variations, we found that volatile phenols contents in wet seasons were higher than in dry seasons. Meanwhile, the spatial distributions of volatile phenols in July and October were conformably decreasing from southwest to the center of the bay. Hence, it could be explained that overland runoff was one of the major sources of volatile phenols in this bay. The contents of volatile phenols in April and June were decreasing from the bay mouth to the northeast bottom of the bay, indicated that ocean current was another major sources of volatile phenols. Ocean is the sink of various pollutants as well as sources of many pollutants. Once the ocean had been polluted, the eco-environmental risks were enormous.

Conclusion

The contents of volatile phenols volatile phenols contents in wet seasons were higher than in dry seasons yet were very low. Ocean current and overland runoff were major sources of volatile phenols in Jiaozhou bay. Ocean is the sink of various pollutants, once the ocean had been polluted; the eco-environmental risks were enormous.

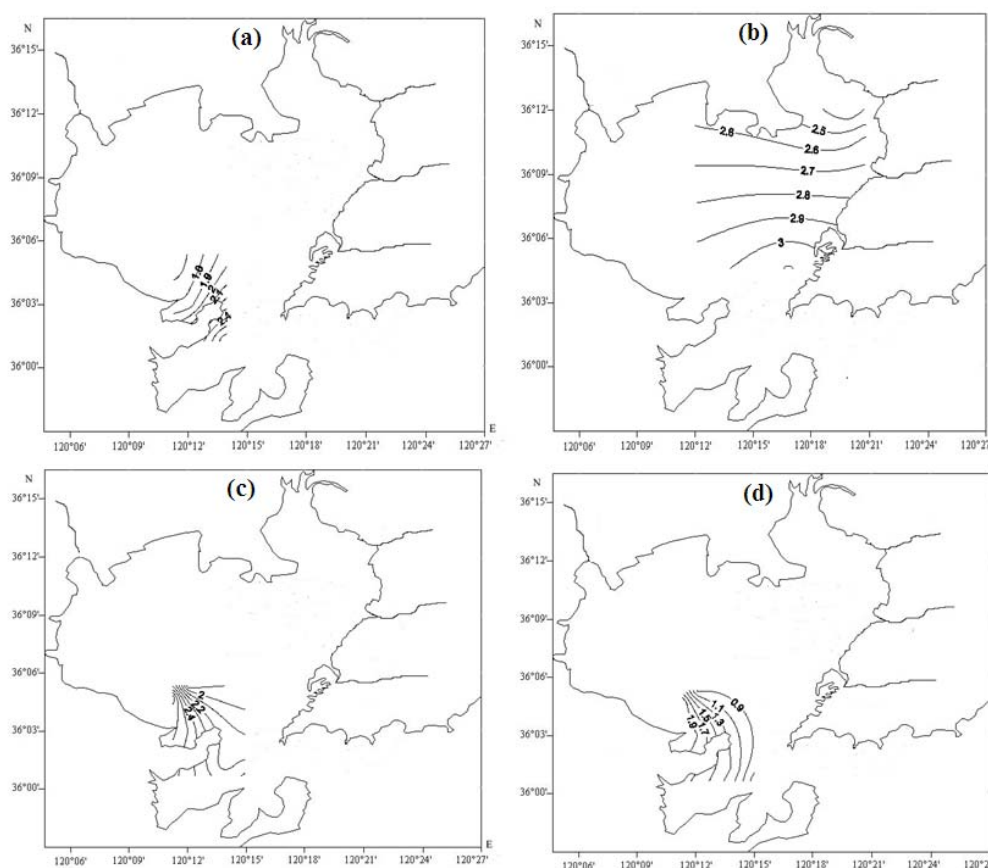


Fig.2 Distributions of volatile phenols in a) April, b) June, c) July and d) October 1982 in surface waters in Jiaozhou Bay/ $\mu\text{g.L}^{-1}$

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