

The Lowest Deposition of Hg Content is in the Jiaozhou Bay Center

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Abstract: Based on the investigation data of Jiaozhou Bay in 1992, this thesis studied the present situation and horizontal distribution of Hg content in the bottom of Jiaozhou Bay mouth. The results showed that in May, August and October, the range of Hg content in the bottom of Jiaozhou Bay was 0.007-0.040 µg/L, which was in line with the national water quality standard for class I seawater. This showed that in terms of Hg content, the bottom water of Jiaozhou Bay from the center of the bay to the south of the bay mouth was not polluted by any Hg content in May, August and October. In the bottom of Jiaozhou Bay, in May, the range of Hg content in Jiaozhou Bay was 0.013-0.019 µg/L. In August, the range of Hg content in Jiaozhou Bay was 0.021-0.025 µg/L. In October, the range of Hg content in Jiaozhou Bay was 0.007-0.040 µg/L. Therefore, in May, August and October, the water of Jiaozhou Bay was not polluted by any Hg content. In May, a high sedimentation of Hg content was in the coastal waters of the eastern part of the Bay. In August, a high sedimentation of Hg content was in the coastal waters and the estuary waters in the east of the Bay. In October, a high sedimentation of Hg content was in the south of the bay mouth. However, from May to August, and then to October, the lowest Hg content sedimentation was in the central waters of the Bay.

1 Introduction

With the increase of human mercury (Hg) emission, the Hg content is constantly migrating on land, in the atmosphere and in the ocean, and finally reaches the ocean [1-11]. It is not easy for Hg content to metabolize and degrade from the surface of the ocean to the bottom. Through the effect of vertical water [12-14], the Hg content changes in the bottom layer of the ocean. Therefore, based on the investigation data of mercury content in Jiaozhou Bay in 1992, this paper studies the bottom layer of Jiaozhou Bay, determines the size, distribution and deposition area of Hg content, shows the current situation and distribution features of Hg content in the bottom layer of Jiaozhou Bay, and provides a scientific basis for the study of the existence and migration of Hg content in the bottom layer.

2 Investigation Waters, Materials and Methods

2.1 Natural Environments of Jiaozhou Bay

Jiaozhou Bay is located in the south of Shandong Peninsula. Its geographical location is 120° 04' - 120° 23' E, 35° 58' - 36° 18' N. It is bounded by the line between Tuan island and Xuejia island and connected

with the Yellow Sea, covering an area of about 446 km², with an average water depth of about 7m. It is a typical semi closed Bay. There are more than ten rivers flowing into the sea in Jiaozhou Bay, among which Dagu River, Yang River and Haibo River, Licun River and Loushan River are the ones with large runoff and sediment concentration. These are all seasonal rivers. The hydrological characteristics of these rivers can alter in different seasons [15, 16].

2.2 Materials and Methods

The survey data of Hg in Jiaozhou Bay in May, August and October 1992 were provided by the North Sea Monitoring Center of The State Oceanic Administration. 5 stations were set up in Jiaozhou Bay to take water samples: 52, 53, 54, 55, 60 stations (Figure 1). The samples were taken in May, August and October of 1992 respectively. According to the water depth, water samples were taken (> 10m, surface layer and bottom layer, and < 10m, only surface layer). The Hg content of Jiaozhou Bay water body was investigated according to the national standard method, which was included in the National Marine Monitoring Code (1991) [17].

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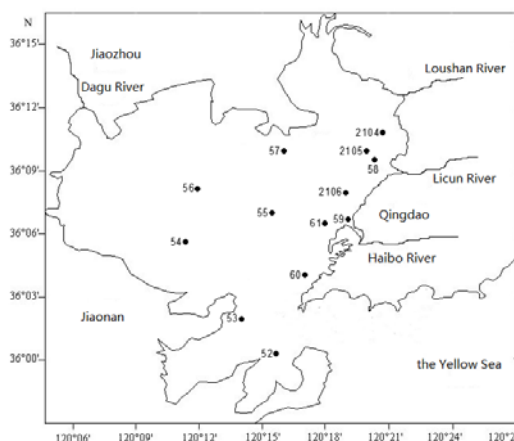


Fig.1 Investigation sites in Jiaozhou Bay

3 Results

3.1 Content in Bottom Layer

In May, August and October, from the center of Jiaozhou Bay to the south of the bay mouth, the range of Hg content in the bottom was 0.007-0.040 $\mu\text{g/L}$, which conformed to the national water quality standard for class I seawater (0.05 $\mu\text{g/L}$). In May, the range of Hg content in Jiaozhou Bay waters was 0.013-0.019 $\mu\text{g/L}$, which was in line with the national water quality standard for class I seawater. In August, the range of Hg content in Jiaozhou Bay waters was 0.021-0.025 $\mu\text{g/L}$, which was in line with the national water quality standard for class I seawater. In October, the range of Hg content in Jiaozhou Bay waters was 0.007-0.040 $\mu\text{g/L}$, which was in line with the national water quality standard for class I seawater. Therefore, in May, August and October, the range of Hg content in Jiaozhou Bay was 0.007-0.040 $\mu\text{g/L}$, which was in line with the national standard for class I sea water quality. This showed that in terms of Hg content, in May, August and October, the water in the bottom layer of Jiaozhou Bay, from the center of the bay to the the south of the bay mouth was not polluted by any Hg content (Table 1).

Table 1 The surface water quality in Jiaozhou bay in May, August and October

	May	August	October
Hg content in seawater / μgL^{-1}	0.013-0.019	0.021-0.025	0.007-0.040
seawater standard of China	first-class	first-class	first-class

3.2 Horizontal Distribution of Bottom Layer

In May, at the station 60 that located in the east coastal waters of Jiaozhou Bay, the concentration of Hg reached a relatively high level of 0.019 $\mu\text{g/L}$, and a series of parallel lines with different gradients were formed. The Hg content decreased from 0.019 $\mu\text{g/L}$ in the high concentration area near the east coast to 0.013 $\mu\text{g/L}$ in the center of the bay.

In August, at station 60 and 53 that located in the east coastal waters of Jiaozhou Bay, the content of Hg reached a high level of 0.025 $\mu\text{g/L}$, and a series of parallel lines with different gradients are formed. The Hg content decreased along gradients from 0.025 $\mu\text{g/L}$ in the high content area near the east coast and the mouth of the bay to 0.021 $\mu\text{g/L}$ in the center of the Bay (Fig. 2).

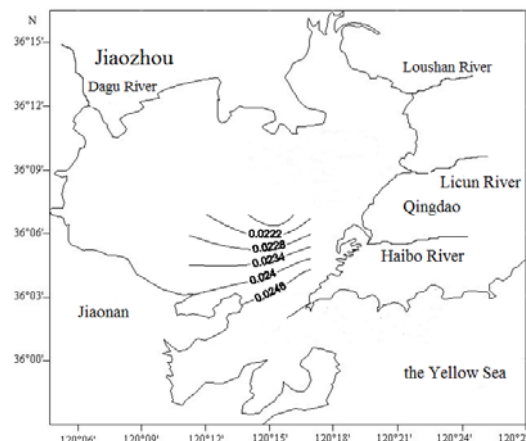


Fig.2 Hg content distribution at the bottom in Jiaozhou Bay in August ($\mu\text{g/L}$)

In October, station 52 was in the south water area of Jiaozhou Bay mouth, the content of Hg reached a high level of 0.040 $\mu\text{g/L}$. And a high content area of Hg was formed with the south water area of bay mouth as the center, forming a series of parallel lines with different gradients. The Hg content decreased along the gradients from 0.040 $\mu\text{g/L}$ in the south of the bay mouth to 0.007 $\mu\text{g/L}$ in the center of the Bay (Fig. 3).

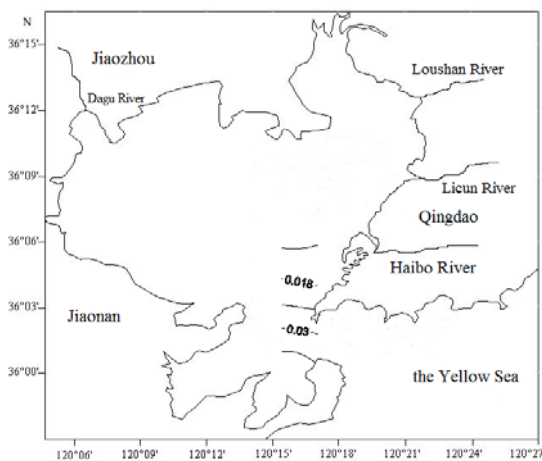


Fig.3 Hg content distribution at the bottom in Jiaozhou Bay in October ($\mu\text{g/L}$)

4 Discussion

4.1 Water Quality

In Jiaozhou Bay, Hg content came from the surface runoff and atmospheric deposition. Hg firstly reached the surface of the water, and then, passed through the water from the

surface to the bottom. Under the effect of vertical water [12-14], the Hg content in the bottom water of Jiaozhou Bay from the center of the bay to the south of the bay mouth varied from 0.007 $\mu\text{g/L}$ to 0.040 $\mu\text{g/L}$, which was in line with the national water quality standard for class I seawater. This showed that in terms of Hg content, in May, August and October, the water quality of Jiaozhou Bay from the center of the bay to the south of the bay mouth was not polluted by any Hg content.

In May, in the bottom of Jiaozhou Bay, the range of Hg content was 0.013-0.019 $\mu\text{g/L}$, and the water of Jiaozhou Bay was not polluted by any Hg content. In the bottom of Jiaozhou Bay and the coastal water area in the East, the content of Hg reached a high level of 0.019 $\mu\text{g/L}$, which was lower than 0.020 $\mu\text{g/L}$. This showed that not only in the bottom of the east coast, but also in the bottom layer of other waters of Jiaozhou Bay, the water was not polluted by any Hg content.

In August, in the bottom of Jiaozhou Bay, the range of Hg content of Jiaozhou Bay was 0.021-0.025 $\mu\text{g/L}$, and the water of Jiaozhou Bay was not polluted by any Hg content. In the bottom of Jiaozhou Bay, the east coastal area and the bay mouth water area, the content of Hg reached a high level of 0.025 $\mu\text{g/L}$, and the content of Hg was far lower than 0.05 $\mu\text{g/L}$. This showed that not only in the bottom of the east coast and bay mouth, but also in the bottom layer of other areas of Jiaozhou Bay, the water was not polluted by any Hg content.

In October, the content of Hg in the bottom of Jiaozhou Bay was between 0.007-0.040 $\mu\text{g/L}$. The water of Jiaozhou Bay was not polluted by Hg content. In the bottom of Jiaozhou Bay and the south water area of the bay mouth, the content of Hg reached a relatively high level of 0.040 $\mu\text{g/L}$, lower than 0.05 $\mu\text{g/L}$. This showed that not only in the bottom of the bay mouth south, but also in the bottom of other water areas of Jiaozhou Bay, the water was not polluted by any Hg content.

4.2 Areas with Deposition

In May, the range of Hg content was 0.013-0.019 $\mu\text{g/L}$ in the bottom of Jiaozhou Bay from the center of the bay to the south of the bay mouth. From the coastal waters in the east to the central waters of the Bay, the Hg content decreased along the gradients. It showed that in the coastal waters of the eastern part of the bay, there was a high deposition of the Hg content.

In August, the Hg content in the bottom water of Jiaozhou Bay, from the center of the bay to the south of the bay mouth ranged from 0.021 $\mu\text{g/L}$ to 0.025 $\mu\text{g/L}$. The Hg content decreased along the gradients from the east coastal waters and the bay mouth waters to the center of the bay. It was shown that there was a high deposition of Hg content in the east coastal waters and the bay mouth waters of the bay.

In October, in the bottom water of Jiaozhou Bay from the center of the bay to the south of the bay mouth, the Hg content ranged from 0.007 to 0.040 $\mu\text{g/L}$. From the south water of the bay mouth to the central water of the Bay, the Hg content decreased along the gradients. It showed that

there was a high deposition of Hg content in the south of the bay mouth.

Therefore, in May, August and October, in the bottom layer from the center of the bay to the south of the bay mouth in Jiaozhou Bay, there was a high deposition of Hg content in the eastern part of the bay, the bay mouth waters and the south of the bay mouth. From May to August, and then to October, there was a low deposition of Hg content in the central water area.

5 Conclusion

In Jiaozhou Bay, Hg content comes from the surface runoff and atmospheric deposition. Hg firstly came to the surface of the water, and then, passed through the water body from the surface to the bottom. In May, August and October, the range of Hg content in Jiaozhou Bay water body was 0.007-0.040 $\mu\text{g/L}$, which was in line with the national water quality standard of class I sea water. This showed that in terms of Hg content, in May, August and October, the water of Jiaozhou Bay from the center of the bay to the south of the bay mouth was not polluted by any Hg content.

In the bottom of Jiaozhou Bay, in May, the range of Hg content in Jiaozhou Bay was 0.013-0.019 $\mu\text{g/L}$. In August, the content range of Hg in Jiaozhou Bay water was 0.021-0.025 $\mu\text{g/L}$. In October, the range of Hg content in Jiaozhou Bay water was 0.007-0.040 $\mu\text{g/L}$. Therefore, in May, August and October, the water of Jiaozhou Bay was not polluted by any Hg content in the eastern part of the bay, the bay mouth waters and the south of the bay mouth.

In May, August and October, in the bottom layer from the center of the bay to the south of the bay mouth in Jiaozhou Bay, there was a high deposition of Hg content. From May to August, and then to October, there was a low deposition of Hg content in the central water area.

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