High sedimentation rate of Pb and the mechanism in Jiaozhou Bay

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Keywords: Pb; Bottom water; Horizontal distribution; Features; Jiaozhou Bay.

Abstract. Based on investigation data on Pb in bottom waters in Jiaozhou Bay in May, September and October 1983, we analyzed the horizontal distribution of Pb, and reveal the mechanism of high sedimentation of Pb. Results showed that the horizontal distributions of Pb in May, September and October 1983 were totally different. In May, high value was in the inside of the bay mouth, and was decreasing from the inside of the bay mouth to the outside of the bay mouth. In September, high value was in the outside of the bay mouth, and was decreasing from the outside of the bay mouth to the inside of the bay mouth. In October, high value was in the bay mouth, and was decreasing from the bay mouth to the inside and outside of the bay mouth. The mechanism of high sedimentation of Pb was that, the overlaying of the high sedimentation of Pb in the bay mouth leading to the high value region in bottom waters in the bay mouth.

Introduction

Lead (Pb) pollution marine bay has been one of the critical environmental issues in the whole word since ocean is the sink of the pollutants, and therefore the understanding of the distribution features and their features of Pb in bottom waters in marine bay is essential to environmental protection [1-6].

Jiaozhou Bay is located in Shandong Province, China. Previous studies showed that this bay had been polluted by various pollutants including Pb [1-6]. This aim of this paper is to analyze the horizontal distribution features of Pb contents in bottom waters and their mechanisms, and to provide scientific basis for pollution control.

Study area and data collection

Jiaozhou Bay (35°55′-36°18′ N, 120°04′-120°23′ E) is located in the south of Shandong Province, eastern China (Fig. 1). It is a semi-closed bay with the total area and average water depth are 446 km^2 and 7 m, respectively. The bay mouth is located between Tuandao Island and Xuejiadao Island, and is connect to Yellow Sea in the south. The width of the bay mouth is only 3 km. Most of the rivers have seasonal features [7, 8].

The data was provided by North China Sea Environmental Monitoring Center. Pb contents in bottom waters were investigated in May, September and October 1983. Bottom water samples were collected and measured followed by National Specification for Marine Monitoring [9].

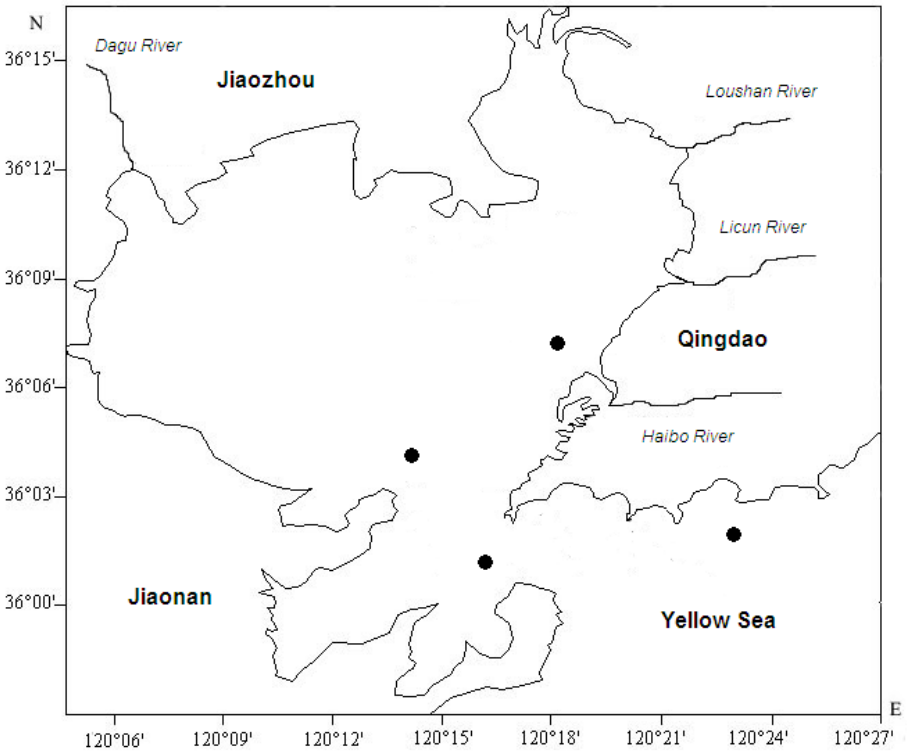

Fig.1 Geographic location and monitoring sites in Jiaozhou Bay

Results and discussion

Horizontal distributions of Pb. In according to the location, the sampling sites were distribution from the inside of the bay, the bay mouth and the outside of the bay, respectively (Fig. 1). In September 1983, high value region was occurring in the outside of the bay mouth, and the contour lines were parallel and decreasing from the high value center (1.56μg L^{-1}) to the bay mouth (1.06μg L^{-1}) (Fig. 3). In October 1983, high value region was occurring in the bay mouth, and the contour lines were parallel and decreasing from the high value center (2.33-2.40 μg L^{-1}) to the inside of bay mouth (0.93μg L^{-1}) and the outside of the bay mouth (0.46μg L^{-1}) (Fig. 4). Obviously, the horizontal distributions of Pb in May, September and October 1983 were totally different.

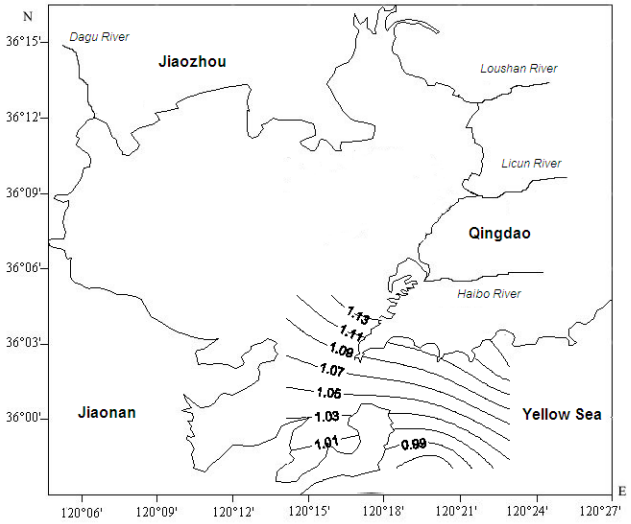

Fig. 2 Horizontal distribution of Pb in bottom waters in Jiaozhou Bay in May 1983/μg L^{-1}

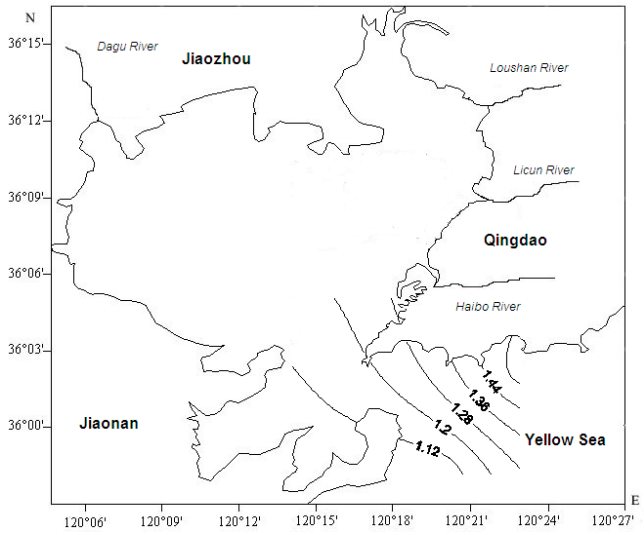

Fig.3 Horizontal distribution of Pb in bottom waters in Jiaozhou Bay in September 1983/μg L^{-1}

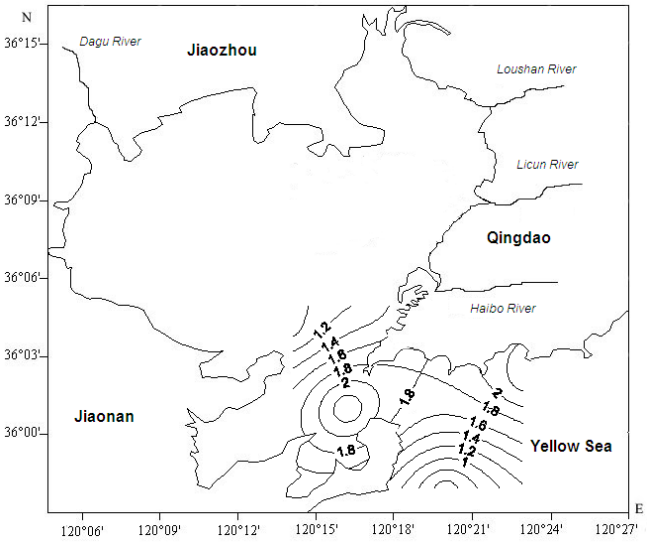

Fig. 4 Horizontal distribution of Pb in bottom waters in Jiaozhou Bay in October 1983/μg L^{-1}

Mechanism of the distribution features of Pb. In May, high value was in the inside of the bay mouth, and was decreasing from the inside of the bay mouth to the outside of the bay mouth. In September, high value was in the outside of the bay mouth, and was decreasing from the outside of the bay mouth to the inside of the bay mouth. In October, high value was in the bay mouth, and was decreasing from the bay mouth to the inside and outside of the bay mouth. Hence, in May and September, there were two reverse distribution arrangements, which were overlaying in the bay mouth. Moreover, in the meeting point the Pb content was highest. Therefore, high value region was occurring in the bay mouth in October, and Pb contents were decreasing from the bay mouth to the inside and outside of the bay mouth. It could be found that the overlaying of the high sedimentation of Pb in the bay mouth leading to the high value region in the bottom waters in the bay mouth (Fig. 5), that was the mechanism of high sedimentation of Pb.

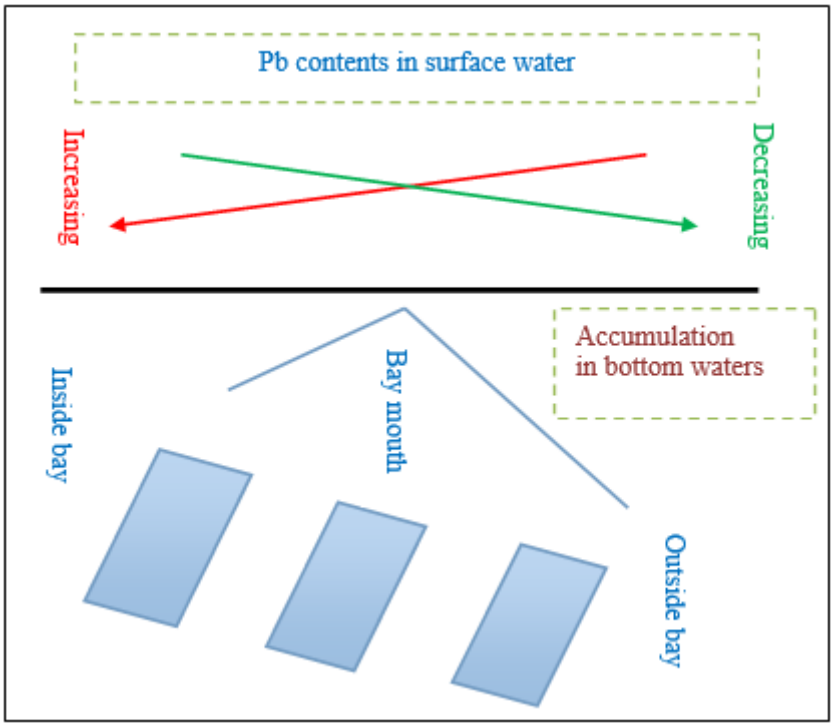

Fig.5 Changing processes of Pb contents in waters in the bay mouth

Conclusion

Obviously, the horizontal distributions of Pb in May, September and October 1983 were totally different. In May, high value was in the inside of the bay mouth, and was decreasing from the inside of the bay mouth to the outside of the bay mouth. In September, high value was in the outside of the bay mouth, and was decreasing from the outside of the bay mouth to the inside of the bay mouth. In October, high value was in the bay mouth, and was decreasing from the bay mouth to the inside and outside of the bay mouth. The overlaying of the high sedimentation of Pb in the bay mouth was leading to the high value region in the bottom waters in the bay mouth. That was the mechanism of high sedimentation of Pb.

Acknowledgement

This research was sponsored by Doctoral Degree Construction Library of Guizhou Nationalities University, Education Ministry's New Century Excellent Talents Supporting Plan (NCET-12-0659), the China National Natural Science Foundation (31560107), Major Project of Science and Technology of Guizhou Provincial ([2004]6007-01), Guizhou R&D Program for Social Development ([2014] 3036) and Research Projects of Guizhou Nationalities University ([2014]02), Research Projects of Guizhou Province Ministry of Education (KY [2014] 266), Research Projects of Guizhou Province Ministry of Science and Technology (LH [2014] 7376).

References

[1] Yang D F, Su C, Gao Z H, et al.: Chin. J. Oceanol. Limnol., Vol. 26(2008): 296-299.

[2] Yang DF, Guo JH, Zhang YJ, et al.: Journal of Water Resource and Protection, Vol. 3(2011): 41-49.

[3] Yang DF, Zhu SX, Wang FY, et al.: Applied Mechanics and Materials, Vol. 651-653(2014), p. 1419-1422.

[4] Yang DF, Geng X, Chen ST, et al.:Applied Mechanics and Materials, Vol. 651-653 (2014), p.

1216-1219.

[5] Yang DF, Ge HG, Song FM, et al.: Applied Mechanics and Materials, Vol. 651-653 (2014), p. 1492-1495.

[6] Yang DF, Zhu SX, Wang FY, et al.:Applied Mechanics and Materials, Vol.651-653 (2014), p. 1292-1294.

[7] Yang DF, Chen Y, Gao ZH, Zhang J, et al.:Chinese Journal of Oceanology and Limnology, Vol. 23(2005): 72-90.

[8] Yang DF, Wang F, Gao ZH, et al.: Marine Science, Vol. 28 (2004), p.71-74.

[9] State Ocean Administration. The specification for marine monitoring: Beijing, Ocean Precess, (1991).

[10] Yang DF, Wang FY, He HZ, et al.:Proceedings of the 2015 international symposium on computers and informatics, (2015), p. 2655-2660.